

Tanta Scientific Nursing Journal

Chairman of Board Director

Prof. Dr. Afaf Abdelaziz Basal

Editor in Chief

Prof. Dr. Afaf Abd Elaziz Basal

Managing editors

Prof. Dr. Amaal Mohamed Elzeftawy

Assist. Prof. Dr. Safaa Zahran

International Editors

Prof. Grace M. Lindsay

Prof. Dr. Dalal Bashir

Prof. Lillian Ohene

Prof. Marcia Leigh Van Riper

Editor Secretaries

Assist. Prof. Dr. Seham Eid El-halafawy

Dr. Shaimaa Abd Elsalam Khalil

Dr. Manar Gamal Mohamed Ali

Volume 42 Number 3

August

2026

- **Publisher:**

Tanta University, Faculty of Nursing

- **Chairman of Board of Directors**

Prof Dr. Afaf Abdelaziz Basal: Medical Surgical Nursing, Tanta University,
afaf.basal@nursing.tanta.edu.eg

- **Editor- in -Chief**

Prof Dr. Afaf Abdelaziz Basal: Medical Surgical Nursing, Tanta University,
afaf.basal@nursing.tanta.edu.eg

- **Managing editor**

Prof Dr. Amaal Mohamed Elzeftawy: Community Health Nursing, Tanta University.
amal.elzeftawi@nursing.tanta.edu.eg

Assist. Prof Dr. Safaa Zahran: Nursing Administration, Tanta University,
safaa.zahran@nursing.tanta.edu.eg

- **Advisory Board**

Prof. Dr. Fouada Mohamed Ahmed Shaban: Nursing Administration, Tanta University
fouada.shaban@nursing.tanta.edu.eg

Prof. Dr. Rahma Soliman Bahget: Pediatric Nursing, Tanta University,
rahma.youssif@nursing.tanta.edu.eg

Prof. Dr. Latifa Mahmoud Fouda: Pediatric Nursing, Tanta University,
latifa.fouda@nursing.tanta.edu.eg

Prof. Dr. Essmat Mohamed Gemeay: Psychiatric and Mental Health Nursing, Tanta University, esmat.gemie@nursing.tanta.edu.eg

- **Editorial Board**

Prof. Dr. Reda Abd Elfatah Gad: Nursing Administration, Tanta University,
reda.gad@nursing.tanta.edu.eg

Prof. Dr. Samar Ghadery: Nursing Administration, Tanta University,
samer.ahmed1@nursing.tanta.edu.eg

Prof. Dr. Mervat Hosny Shalby: Psychiatric and Mental Health Nursing, Tanta University,
mervat.shalabi@nursing.tanta.edu.eg

Prof. Dr. Seham Ahmed Abd El- Hay: Medical Surgical Nursing, Tanta University,
drsehamahmed@yahoo.com

Prof. Lobna Khamis Mohamed Ibrahim: Nursing Administration, Tanta University.
lobna.ibrahim@nursing.tanta.edu.eg

External Editorial Board

Prof. Dr. Enass Kassem: Obstetric and gynecological Nursing, Menofeya University,
krmenas@yahoo.com

Prof. Dr. Nefertiti Hasan Zaki: Obstetric and gynecological Nursing, Alexandria University,
Nefertiti.zaki@alex.edu.eg

Prof. Dr. Amel Ahmed Hassan Omran Obstetric and gynecological Nursing, Benha
University,amel.omran@fnur.bu.eg

Prof. Dr. Soad Abdl El Salam Ramadan Obstetric and gynecological Nursing, Benha
University, dr.soadabdelsalam2012@gmail.com

Prof. Dr. Faten Shafik Mahmoud Pediatric nursing, Benha University,
drfaten_shafik@yahoo.com

Prof. Dr. Fatma Hussein Ramadan Mohamed Psychiatric and Mental Health Nursing,
Alexandria University,Fatma.ramadan@alexu.edu.eg

Prof. Dr. Yomn Yousef Sabry: Pediatric Nursing, Alexandria University,
dr_yomn2005@yahoo.com

Prof. Dr. Sohier Mohamed Wehida: Medical Surgical Nursing, Alexandria University,
wehidasohier@gmail.com

Prof. Amal Sobhe, Psychiatric Nursing and Mental Health, Port said university,
sunmoonstars217a@gmail.com, sunmoonstars25@yahoo.com

Prof Dr. Mimi Mohamed Mikawy : Medical Surgical Nursing,Algallah University,
mekkawymimi@yahoo.com , mim.mohamed@aun.edu.eg

Prof. Dr. Wafaa Ismail Sallam: Medical Surgical Nursing, Mansura University,
dr_wafaaismail@yahoo.com

Prof. Hala Abdelfattah Ali, Women health and midwifery Nursing, Kafr El Shiekh
University,dr.Halafttah@yahoo.com.

Prof. Sahar Mansour Lamadah: Obstetric and gynecological Nursing, Tanta University,
dr.saharlamadah@yahoo.com

Prof. Dr. Hoda Abdel azim Mohamed

Professor of Maternal and Newborn Health Nursing Faculty of Nursing, El-minia University,
Egypt. Hoda.azim@yahoo.com

Prof. Dr. Nahed Saied Elnaggar

Professor of Pediatric Nursing Faculty of Nursing, Ain Shams University, Egypt
Dr.nahed.said@nursing.asu.edu.eg

Prof. Dr. Lamiaa Ahmed Elsayed

Professor of Pediatric Nursing Faculty of Nursing, Ain Shams University, Egypt
Lamiss400@gmail.com

Prof. Dr. Orban Ragab Bayoumi

Professor of Pediatric Nursing Faculty of Nursing, Ain Shams University, Egypt

Orban.bayoum@yahoo.com

Prof. Dr. Hanan Said Ali Mohamed

Professor of Medical Surgical Nursing Faculty of Nursing, Ain Shams University, Egypt

Dr.hanan.said@nursing.asu.edu.eg

Dr_hanan10@yahoo.com

- **International Editorial Board**

Prof. Grace Lindsay: Medical-Surgical Nursing,

Saudi Arabia Makkah 21955, P.O. Box715 Umm AlQura University, Saudi Arabia,

gracemlindsy@gmail.com

Prof. Lillian Ohene: Pediatric nursing, Ghana Legon,

Accra P.O. Box LG 43 School of Nursing and Midwifery, University of Ghana,

lohene@ug.edu.gh

Prof. Dr. Dalal Bashir: President of the Arab Scientific Association for Nursing and the

Assistant Professor of Maternal Health, Faculty of Nursing, Elzaitona University, Jordon.,

bashir_dalal@yahoo.com

Prof. Dr. Marcia Leigh Van Riper: Professor and Chair, Family Health DivisionUniversity of North Carolina, School of Nursing/ Carolina Center, vanriper@email.unc.edu

- **Editor Secretary**

Assist. Prof. Dr. Seham Eid Elhalafawy: Pediatric Nursing, Tanta University,

seham_elhalafawi@nursing.tanta.edu.eg

Dr. Shaimaa Abd Elsalam Abd El-kader Khalil: Medical Surgical Nursing, Tanta University.

Shaymaa_abdelkader@nursing.tanta.edu.eg

Dr. Manar Gamal Mohamed Ali: Maternal and Neonatal Health Nursing, Tanta University.

manar.gamal@nursing.tanta.edu.eg

Guide for Authors

General Instructions for authors:

- Tanta Scientific Nursing Journal (TSNJ) welcomes original scientific nursing contributions from all nursing researchers all over the world.
- Previously published articles or articles under publication elsewhere are not accepted for publication in TSNJ.
- Scientific research ethical approval must be attached with the research article.
- A copy of plagiarism report including the percentage must be provided with the article.
- Articles must have a structured abstract not more than 250 words and keywords.
- The article must include: Background, Aim, Subjects & Method, Results (including illustrated tables and figures), Discussion, Conclusion & Recommendations.
- Issues/ year: Quartile publication. Four issues per year (February - May - September & November) supplemental issues can be added to the original issues as needed accordingly.

Submission:

Follow the process of submission in the journal website from submit a manuscript – submit a new manuscript.

General Rules:

Original research articles,

- Articles should be type-written in English language.
- Font: 14, times new Romans.
- Paragraph Spacing: 1.5 spaces.
- Heading: Font 16 Bold, Sub heading: Font 14 Bold.

Peer review process

- All contributions will be initially assessed by the editor for suitability for the journal.
- Initially accepted papers are sent to independent expert reviewers to assess the scientific quality of the paper.
- Blinded manuscript (no author details): such as the authors' names or affiliations must not be included in the article.
- The Editor is responsible for the final decision regarding acceptance or rejection of articles. The Editor's decision is final.
- The published article must contain title page (with author details) including the title, authors' names, affiliations, e-mail address and contact details of the corresponding author.
- Proofreading is submitted to authors for final revision and send back to editors for final publication.

References writing guidelines:

- The journal follows the APA reference writing style (Manual of Style 7th Edition).
- Author(s). Note: List each author's last name and initial as Author, A. A., Author, B. B., & Author, C. C. Use an ampersand (&) before the final author's name.
- (Year) year of publication.
- Title of the article. Note: For works that are part of a greater whole (e.g. articles, chapter), use sentence case. Only the first word of the title and subtitle and proper nouns are capitalized.
- Title of the Journal, Note: Italicize and capitalize each word in the journal.
- Volume Note: Italicize the journal volume. If there is no issue, include a comma before the page range.
- (Issue), Note: If there is an issue number in addition to a volume number, include it in parentheses ().

- Page range. Note: If there is no page range within the journal volume/issue, this can be excluded.
- DOI (Digital Object Identifier) .

EXAMPLE

- Brown, B. (2010). The gifts of imperfection: Let go of who you think you're supposed to be and embrace who you are. Hazelden.
- Edited book chapter with a DOI:
- Author's Last Name, Initial(s)., & Author's Last Name, Initial(s). (Year of publication). Title of chapter (Edition ed.) *Title of book* (pp. xx-xxi). Publisher. <https://doi.org/DOI>

EXAMPLE

- Singh, A. A., Hwahng, S. J., Chang, S. C., & White, B. (2017). Affirmative counseling with trans/gender-variant people of color. In A. Singh & L. M. Dickey (Eds.), *Affirmative counseling and psychological practice with transgender and gender nonconforming clients* (pp. 41–68). American Psychological <https://doi.org/10.1037/14957-003>

Publication Fee:

- B: payments should be done at the time of submitting the proofs.
- Manuscript submission, processing and publication charges 2000 Egyptian pounds for Egyptian and 200 \$ for foreigners for 20 pages, 50 pounds must be paid for each extra page.

Editor in Chief, Prof. Dr/ Afaf Abdelaziz Basal

Faculty of Nursing, Tanta University, Tanta.

E-mail: Afaf_abdelaziz@nursing.tanta.edu.eg

Tel: 01126379929

Titles	Pages
Designing and Implementing Bundle of Care about Postoperative Pain and Quality of Recovery for Patients Undergoing Rotator Cuff Repair Surgery Eman M Emara¹, `Nagwa R Attia², Waleed M Ewais³, Shaimaa A. Khalil⁴ ¹Assistant Lecturer of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt. ²Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt. ³Professor of Orthopaedic Surgery, Faculty of Medicine, Tanta University, Egypt. ⁴Lecturer of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.	13
Relation between Mothers' Knowledge and Attitude Regarding their Children with Autism Spectrum Disorders Sahar Mahmoud El-khedr Abd-Elgawad¹, Amany Tarek Ali Batta², Osama Ibrahim Younes³, Nahla Abdelnaby Elkandoz⁴ ¹Professor of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt. ²Assistant Lecturer of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt. ³Lecturer of Psychiatry, Faculty of Medicine, Tanta University, Egypt. ⁴Assistant Professor of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt.	35
Educational Needs of Adult Patients with Leukemia Basma Ahmed^{1,2}, Nagwa Ragb³, Reda Abd EL salam⁴ ¹Nurse Specialist at El Mahalla Fever Hospital, Egypt. ²Master Student of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt. ³Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt. ⁴ Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.	54

Effect of Applying Cryotherapy on Incisional Wound Pain and Physiological Parameters among Patients Post Cardiothoracic Surgery Safaa E. Ahmed¹, Dina S. Omar^{2,3}, Abd Alhady M. Taha⁴, Abeer F. Elfar⁵ ¹Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University. ²Nurse Specialist at El Mahalla Ophthalmology Hospital. ³Master Student of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt. ⁴Professor of Cardiothoracic Surgery, Faculty of Medicine, Tanta University, Egypt. ⁵Lecturer of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt.	72
Effect of Nursing Interventions on Early Identification and Management of Paroxysmal Sympathetic Hyperactivity of Patients with Traumatic Brain Injury Rokia Ibrahim El Nagar¹, Shaimaa Abdelbast Abdelrazk Abdelrahman^{2,3}, Safaa Eid Said Ahmed⁴ ¹Lecturer of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt. ²Nursing Specialist at Mahalla Al- Kubra Fever Hospital, ElGarbia Governorate, Egypt. ³Master Student of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt. ⁴Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt.	100
Effect of an Educational Bundle on Bridging the Gap of Knowledge and Perceived Barriers regarding Oncofertility among Maternity and Oncology Nurses Ola Abdel-Wahab Afifi Araby¹, Enas Ibrahim Abbas Badr², Mona Abo Bakr Abd Ellatif³& Nesma Abd-Elaziz Ibrahim EL Desoky⁴ ¹Assistant Professor of Obstetrics and Gynecology Nursing, Faculty of Nursing, Benha University. ²Lecturer of Maternal and Newborn Health Nursing, Faculty of Nursing, Helwan University. ³Assistant Professor of Community Health Nursing, Faculty of Nursing, Ain Shams University. ⁴Lecturer of Obstetrics and Gynecology Nursing, Faculty of Nursing, Benha University.	132

Effect of Negative Pressure Wound Therapy on Clinical Outcomes For Patients Undergoing Vascular Surgeries Amira Mohamed Elneny^{1,2}, Adel Hussein kamhawy³, Monira Bassuni Elsheimy⁴, Reda Abdelsalam Elbastawesy⁵ ¹Nurse Educator at Secondary Technical Nursing School in Samanoud. ²Master Student of Medical Surgical Nursing, Faculty of Nursing, Tanta University. ³Professor of Vascular Surgery and Interventions, Faculty of Medicine, Tanta University. ⁴Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University. ⁵Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University.	162
Effect of Nurse-led Educational Package on Mothers' Knowledge and Home Care Practices for Children with Acute Diarrheal Disease Sahar Saleh Kamal ¹, Rasha Abd Elateef Abd Elaziz Ramadan², Miada Mohamed Ali Hanfy³, Azza El-Sayed Ali Hegazy⁴ ¹Lecturer of Pediatric Nursing, Faculty of Nursing, Ain-Shams University. ²Lecturer of Pediatric Nursing, Faculty of Nursing, Zagazig University. ³Lecturer of Pediatric Nursing, Faculty of Nursing, Zagazig University. ⁴Assistant Professor of Pediatric Nursing, Faculty of Nursing, El-Fayoum University.	197
Awareness of the Cognitive Intact Elderly To ward Alzheimer's Disease Majda Shubrum Alshammari^{1,2}, Entisar Abo Elghite Elhossiny ELkazeh³, Nahla Said Mahmoud⁴, Hend Reda Ali Elkest⁵ ¹ Master Student of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt. ² Nursing Specialist at Sharaf hospital in Hail, Saudi Arabia. ³ Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt, ^{4,5}Assistant Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.	221

Academic Stress of University Students: Interrelationship Between Stressors and Coping Strategies Dina Aly Rashad Aly¹, Manal Mansour Mostafa², Hala Hassan Sayed³, OLa Hussien Abo Elmaaty⁴ ¹Clinical Instructor at Faculty of Nursing, El Fayoum University. ²Professor of Community Health Nursing, Faculty of Nursing, El Fayoum University. ³Professor of Community Health Nursing, Faculty of Nursing, El Fayoum University. ⁴Assistant Professor of Family and Community Health Nursing, Faculty of Nursing, Demietta University.	243
Awareness of Nursing Students regarding the Applications of Artificial Intelligence in Nursing Fatma Mohammed Rashed Donia^{1,2}, Ikbal Fathala Elshafie³, Entisar Abo Elghite Elhossiny Elkazeh⁴, Hend Reda Ali Alkest⁵ ¹Nursing Specialist at Tanta General Hospital, Egypt. ²Master Student of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt. ^{3,4}Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt. ⁵Assistant Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.	262
Academic Resilience among Adolescents with Deafness; The Role of Peer Relationship and Perceived Parenting Style Dalia Elsayed Gomaa Abd El Salam¹, Amal Awad Abd El-Nabi Moussa², Rodaina Ahmed Mokbel³, Azza Medhat Aziz Mansy⁴ ¹Nursing Specialist at Kafr El Dawar General Hospital. ²Professor of Psychiatric and Mental Health Nursing, Faculty of Nursing, Damanhur University, Egypt. ³Assistant Professor of Pediatric Nursing, Pediatric Nursing Department, Faculty of Nursing, Damanhur University, Egypt. ⁴Lecturer of Psychiatric and Mental Health Nursing, Faculty of Nursing, Damanhour University, Egypt.	283

Effect of Benson Relaxation Technique on Clinical Outcomes of Patients Undergoing Arthroscopic Meniscus Surgery Amina Elsayed Abd alazez¹, Hend Mohamed Elazazy², Waleed Mohamed Ewais³, Reda Abdel Salam Ibrahim⁴, Amany Kamal Mohamed⁵ ¹Assistant Lecturer of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt. ²Professor of Medical- Surgical Nursing, Faculty of Nursing, Tanta University, Egypt. ³Professor of Orthopedic Surgery, Faculty of Medicine, Tanta University, Egypt. ⁴Assistant Professor of Medical- Surgical Nursing, Faculty of Nursing, Tanta University, Egypt. ⁵Assistant Professor of Medical- Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.	309
Relation between Parental Phubbing and Cyberbullying among University Students Afaf Abdlaziz Basal¹, Ahmed Ibrahim Elaghoury², Abdallah Khairy Attia³, Abdallah Mohammed El-Ahmar⁴, Abdulrahman Mohammad El-Kronz⁵, Maria Wafeek Eltaweel⁶, Mai Serag Elden El Zayat⁷, Sahar Mahmoud El-Khedr Abdelgawad⁸, Heba Kamal Obied⁹ ¹Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt. ²Assistant Lecturer of Psychiatric and Mental Health Nursing, Faculty of Nursing, Tanta University, Egypt. ³⁻⁷ 4th Year Nursing Students, Faculty of Nursing, Tanta University, Egypt. ⁸Professor of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt. ⁹ Professor of Nursing Administration, Faculty of Nursing, Tanta University, Egypt.	337
Worker's Knowledge and Practice Related to Occupational Hazards in Medical Waste Disposal Hagar Mahmoud Abdullah¹, Amal Ibrahiem Fouad², Ola Hussien Abo El-maaty³ ¹Demonstrator of Community Health Nursing, Faculty of nursing, El- Fayoum University. ²Professor of Community Health Nursing, Faculty of Nursing, El- Fayoum University. ³Assistant Professor of Community Health Nursing, Faculty of Nursing, Damietta University.	364

Effects of the Unpleasant Symptoms- Relief Program on Pregnant Women at Risk of Preterm Labour

387

Aya M. Abdelhafez¹, Saleh Omar Abdullah², Safaa H Mohamed^{3,4}

¹Lecturer of Maternity, Obstetric and Gynecological Nursing, Faculty of Nursing, Assiut University, Egypt.

²Assistant Professor of Psychiatric and Mental Health Nursing, Faculty of Medicine & Health Science, Hodeidah University, Yemen.

³Assistant Professor of Obstetrics and Gynecological Nursing, Faculty of Nursing, Assiut University, Egypt.

⁴Assistant Professor of Obstetrics and Gynecological Nursing, Al-Rayan National College of Nursing, Medina, Al Munawwarah, Saudia Arabia.

Designing and Implementing Bundle of Care about Postoperative Pain and Quality of Recovery for Patients Undergoing Rotator Cuff Repair Surgery

Eman M. Emara¹, `Nagwa R. Attia², Waleed M. Ewais³, Shaimaa A. Khalil⁴

¹Assistant Lecturer of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

²Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

³Professor of Orthopaedic Surgery, Faculty of Medicine, Tanta University, Egypt.

⁴Lecturer of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Eman M Emara

Email: eman_emara@nursing.edu.tanta.eg

Abstract

Background: Worldwide rotator cuff (RC) conditions are the most common cause of disability related to the shoulder which produce significant pain and impaired function. **Aim:** To evaluate the impact of designing and implementing bundle of care about postoperative pain and quality of recovery for patients undergoing rotator cuff repair surgery. **Design and Setting:** A quasi-experimental research design was conducted at the Orthopedic Department of Tanta International Teaching Hospital, Tanta University New Surgical Hospital affiliated to Ministry of Education and Scientific Research, Egypt. **Subjects:** The study consisted of 60 adult patients distributed into two equal groups, the study group who received the nursing care bundle and control group who received routine care. **Tools:** Three tools were utilized. **Tool (I):** Structured interview questionnaire about patients undergoing rotator cuff repair surgery it included 2 parts, **part (1):** Bio socio demographic data and **part (2):** Medical and clinical data. **Tool (II):** Pain assessment tool and **tool (III):** Quality of Recovery Score Questionnaire (QoR-40). **Results:** Patients in the study group demonstrated significantly higher quality of recovery score across all postoperative time points compared with the control group ($p < 0.05$) and there was a high statistically significant improvement of postoperative pain after 2 weeks from rotator cuff repair surgery. **Conclusion:** The bundle of nursing care had a significant improvement in quality of recovery and postoperative pain for the study group patients. **Recommendations:** Encourage the rotator cuff repair patients to use the bundle of care as a basic part of self-care to improve post-operative pain and quality of recovery.

Keywords: Box breathing relaxation technique, Cryotherapy, Hegue point message, Postoperative pain, Quality of recovery, Rotator cuff repair surgery.

Introduction

Rotator cuff tears frequently lead to shoulder discomfort and functional limitations for people globally. The rotator cuff comprises of four muscles and their tendons that surround the shoulder joint (**Witten et al., 2025**).

A rotator cuff tear involves damage to the tendons that link the muscles to the bones in the shoulder. Tears can range from partial to full thickness (**Wang et al., 2026**). Shoulder pain is the third most prevalent musculoskeletal complaint in primary care since the shoulder is the most freely mobile joint in the body (**Stewart et al., 2025**).

Rotator cuff tears are managed differently depending on the degree of the injury, the patient's age, and level of activity (**Honoki, et al., 2026**). It could be conservative or surgical treatment. Conservative management focuses on maintaining range of motion and preventing the shoulder from getting stiff (**Altamimi et al., 2024**). The major indication for surgical management of the rotator cuff tear is a full thickness or partial tear that has not responded to conservative management (**Aden et al., 2024**).

Postoperative pain management and assessment of quality of recovery are key components of nursing management after rotator cuff

surgery (**Toyooka, Miyamoto & Ito, 2020**).

Care bundles are a set of three to five evidence-based nursing practices that are implemented in a consistent and coordinated manner to improve care quality (**Sebastiani et al., 2024**). There are several therapeutic evidence-based nursing practices for managing post-rotator cuff repair surgery, including approaches to medical treatment as well as physical therapy, including relaxation technique, cryotherapy, Hegu point ice massage, Pendulum exercise, wrist clenching technique, and forearm pronation and supination.

Nurses have an important role in ensuring that patients receive enough pain management, functional recovery, and psychological care during the postoperative period (**Alanazi et al., 2024**). Nurses must also monitor patients for potential consequences such as infection, vascular or neurological injury, and joint stiffness, all of which can have an impact on overall recovery quality (**Nayak et al., 2025**).

Significance of the study

Managing post-operative pain and improving quality of recovery after surgery reduces the physiological load of surgery, improves outcomes, improves post-operative quality of life, shortens hospital stays, and lowers costs (**Lopez et al., 2025**).

There are few studies on the management of postoperative pain and the quality of recovery following rotator cuff repair surgery. As a result, the aim of this study was to assess the impact of designing and implementing a bundle of care on postoperative pain and quality of recovery for patients following rotator cuff repair.

Aim of this study was to

To evaluate the effect of designing and implementing bundle of care about postoperative pain and quality of recovery for patients undergoing rotator cuff repair surgery.

Research Hypothesis:

The study group who received the bundle of care may exhibit reduction of postoperative pain and have higher quality of recovery rather than control group who received routine nursing care.

Subjects and Method

Research design:

This study employed a quasi-experimental research approach.

Setting:

The study was carried out at the Orthopedic Departments of Tanta International Teaching Hospital, Tanta University New Surgical Hospital and Kafr El-sheikh General Hospital.

Subjects:

Sixty patients made up the study's sample, which was split into two

equal groups. There were thirty patients in each group.

-The sample size was determined using the following criteria: confidence level of error 5%, type 1 error.05, and power of test 95% confidence in the Epi info. software program.

Steven Thimpsona equation for calculating the study's patient sample size at a 95% confidence level

$$n = \frac{N \times P (1-P)}{(N-1 \times (d^2 / z^2) + P (1-P)}$$

N is the size of the entire civilization.

Z is the corresponding standard class of significant 95% (1.69) and

D is the error percentage (0.05).

P is equal to the proportion of objectivity that is available (0. 1).

Subjects were selected based on the following criterion:

The inclusion criteria

- Conscious able to communicate verbally.
- Adult patients (18- 65years).
- Both sexes.
- Patients with rotator cuff injuries scheduled for surgery.

Exclusion criteria

- Patients with other shoulder diseases.
- Patients with prior shoulder surgery.
- Neurological disorders of upper extremities.
- Significant cognitive impairment.

- Trauma or injuries on any other region of the body.
- Joint injuries, including upper and lower limbs.

Tools of data collection: Three tools were employed to conduct this investigation.

Tool (I): Structured interview questionnaire about patients undergoing rotator cuff repair surgery. This tool was created by the researcher after studying relevant literature (Vartanian KB, et al., 2025; Baur et al., 2025; Harris, Page & Buchbinder, 2025). It contains two parts.

Part (A): Bio socio demographic data: The patient's age, gender, marital status, educational level, occupation, and place of living were all covered.

Part (B): Medical and clinical data: which included; diagnosis, mechanism of injury, name of the operation, current medical history, past medical and surgical history, chief complaints and the usage of analgesics or muscle relaxant.

Tool (II): Pain assessment tool.

The Indiana Polyclinic Combined Pain Scale (IPCPS) was created in 2001 and modified by **Dimitry Arbuck** in 2019. It was made up of eleven statements that represented how patients responded to pain severity. The researcher adopted it

and translated it into Arabic to assess pain severity.

Scoring system:

Zero represents no pain; one represents an unpleasant sensation; two represents minimal pain; three represents mild pain; four represents mild to moderate pain; five represents moderate pain; six represents moderate to severe pain; seven represents severe pain; eight represents debilitating pain; nine represents agonizing pain; and ten represents the worst imaginable pain.

Total scoring:

- No pain equals (0).
- Mild pain = (1-3).
- Moderate pain= (4-6)
- Severe pain rated (7-9).
- The worst pain is comparable to (10).

Tool (III) Quality of Recovery Score Questionnaire (QoR-40):

This tool was first developed by **Myles et al. (2000)** and was updated by **Lee et al. (2018)**. It is a self-rated questionnaire designed to assess patients' postoperative recovery quality and health status in the early stages after surgery. It was used by the researcher and translated into Arabic to assess the patient's postoperative health status. The quality of recovery score consists of 40 measures organized into five dimensions: emotional state (9 items), physical comfort (12 items),

patient support (7 items), physical independence (5 items), and pain (7 items).

Scoring system:

All items were assessed on a five-point Likert scale from one (worst) to five (best), with 1 indicating none of the time, 2 indicating some of the time, 3 indicating usually, 4 indicating most of the time, and 5 indicating always. All negative elements were flipped to facilitate interpretation. The scale has a maximum score of 200 degrees, which represents exceptional quality of recovery following anesthesia and surgery, and a minimum score of 40, which represents extremely poor quality of recovery.

Total scoring system:

A poor recovery quality is less than 67. **Fair** quality of recovery after surgery, ranging from 67 to less than 132. **A good** post-operative quality of recovery that is more than 132 and equal to 200.

Method

The following procedures were used to carry out the study:

Administrative process:

1-An official hospital permission and written approval to conduct this study were obtained from the responsible authority of New Surgical Hospital, Tanta University Educational Hospital, as well as Kafr

El-sheikh General Hospital. prior to carrying out the study.

2-Ethical considerations:

The nature of the study caused no harm or pain to any of the subjects.

Approval from the Tanta University Faculty of Nursing's ethical and research committee was acquired with a code number (573/1/2025).

3- Developing the study tools:

Tool (I): Developed by the researcher and used only once before implementation of nursing intervention.

Tool (II): Used four times throughout period of the study the first time was before surgery. Second time was in the first postoperative day, the third time after one week from nursing intervention and lastly the fourth time was after two weeks postoperatively by interviewing with patients as it is a self-report questionnaire.

Moreover tool (III): This tool also was utilized three times throughout the period of the study first postoperative day, one week and two weeks postoperatively in order to assess rotator cuff repaired patients quality of recovery.

4-Content validity:

Five jury experts from orthopedic specialists and medical-surgical nursing assessed the proposed tools for content validity, questionnaire clarity and application.

5-Apilot study was done, and the generated tools were tested for visibility and usability on 10% (6) of total patients and any necessary modifications were made. It wasn't included in the study's initial sample.

6- Reliability of the tools

The study tools' reliability was assessed using the Cronbach's alpha test; the results were 0.824 for Tool (I) part one, 0.801 for Tool (I) part two, 0.832 for Tool (II), and 0.856 for Tool (III).

7- Data collection

Data collection began in March 2025 and continued for a full year, ending in March 2026. To avoid distorting the data, the researcher began with the control group before progressing to the study group.

8- Phases of the actual study:

The study was carried out over five phases, which include the following:

Assessment phase:

Both the study and control groups were evaluated as soon as they were admitted utilizing tools I and II to gather patient data and determine who would fit the study's inclusion criteria.

Planning phase:

The nursing care bundle was created using data from the assessment phase and literature research; the patient's goals, priorities, and anticipated results were taken into account when organizing their care.

Preparation of patients and preparation of material (squeezing ball & ice bag).

Designing the novel bundle of nursing care:

Based on the evidence-based research findings the novel bundle of care was developed to be implemented immediately after rotator cuff surgery repair in order to improve quality of recovery and pain post-surgery.

The developed novel bundle of care consists of Box breathing relaxation technique, Cryotherapy, Hegu point ice message, Early mobilization of unaffected joint that consists of (ball squeezing technique, pronation and supination of forearm) and finally Passive pendulum exercise.

Implementation phase:

The bundle of care was performed to the study group 2 times per day for 3 consecutive days starting from the first postoperative day after recovery from anesthesia for all components of bundle of care except the passive pendulum exercise that was started after one week to two weeks post-surgery.

Evaluation phase:

Both the control and study groups were evaluated four times: once prior to the application of nursing intervention using tools I and II; again, on the first postoperative day using tools II and III; as well as one

week following nursing intervention using tool II. After two weeks, this is the fourth time that tools II and III have been used.

Results

Table (1): Reveals that (40%, 33.3%) of study and control group patient respectively were in the **age** group from (40 – < 50) years, also approximately (50%, 56.7%) of study and control group patient were **females** respectively. **Also**, approximately three quarters (73.3%, 76.7%) of the study and control groups respectively live in rural areas. In relation to educational level more than half (56.7%) of study patients were secondary educated, while nearly one half (43.3%) of control patients were secondary educated.

Figure (1): Demonstrates that concerning the cause of the injury near to half (46.7%) of the study group and more than one third (36.7%) of the control group were exposed to falls. **Furthermore**, less than three quarters (70%) of the study and control group had right shoulder injury.

Figure (2): Reflects the level of postoperative pain according to the Indiana poly clinic combined pain scale. It exposes that **before the intervention up on admission** more than half (56.7%, 60%) of study and control group had severe pain

respectively. Finally, **after 2 weeks** more than one third of the study group (36.7) had no pain, while less than half (40%) of control group had severe pain. **There was highly statistical significance difference of reduction of pain** where ($p = 0.001^*$).

Figure (3): Lights that in the first postoperative day the majority (80%, 96.7%) of both groups had poor total quality of recovery score. Furthermore **after 2 weeks** less than two thirds (63.3%) of study group had good total quality, also more than one half (56.7%) of control group had poor quality of recovery. Additionally, there was highly statistical significance difference of total quality of recovery score between two groups **where ($p = 0.001^*$)** after one and two weeks.

Table (2): Shows correlation between sociodemographic data and postoperative pain. It was found that **concerning age**, there is significant positive correlation between age and Indiana polyclinic pain index for the study group patients with $p = (0.001^*)$ and control group with non-significant positive correlations $p = (0.168)$.

Regarding sex, there is positive correlation between sex and Indiana polyclinic pain scale **among study group patients** with $p = (0.127, 0.493)$ at first post-operative day and

after two weeks respectively, also there a positive correlation between sex and pain among control group patients with $p = (0.250)$ after two weeks of rotator cuff repair surgery. Relating to BMI, there is significant positive correlation between BMI and Indiana polyclinic pain scale among study group patients with $p = (0.005^*, 0.001^*)$ at first post-operative day and after two weeks respectively, while there was non-significant positive correlation between BMI and pain among control group patients with $p = (0.838)$ after two weeks.

Table (1): Dissemination of the studied patients of both groups according to their socio demographic characteristics (n=60)

Socio-demographic characteristics	The studied groups				χ^2	P value
	Study (n=30)		Control (n=30)			
	No.	%	No.	%		
Age					2.115	0.549
18 – < 30	3	10	5	16.7		
30 – < 40	7	23.3	7	23.3		
40 – < 50	12	40	10	33.3		
50 – 65	8	26.7	8	26.7		
Sex					0.268	0.605
Male	15	50	13	43.3		
Female	15	50	17	56.7		
Residence					0.089	0.766
Urban	8	26.7	7	23.3		
Rural	22	73.3	23	76.7		
Education level					5.586	0.232
Illiterate	1	3.3	0	0		
Read and write	2	6.7	6	20		
p	0	0	2	6.7		
Secondary education	17	56.7	13	43.3		
University education	10	33.3	9	30		
Marital status					1.176	0.278
Single	6	20	3	10		
Married	24	80	27	90		
Occupation					3.743	0.587
Employee	4	13.3	1	3.3		
Worker	3	10	2	6.7		
Manual work	6	20	9	30		
Housewife	13	43.3	15	50		
Student	3	10	3	10		
Driver	1	3.3	0	0		

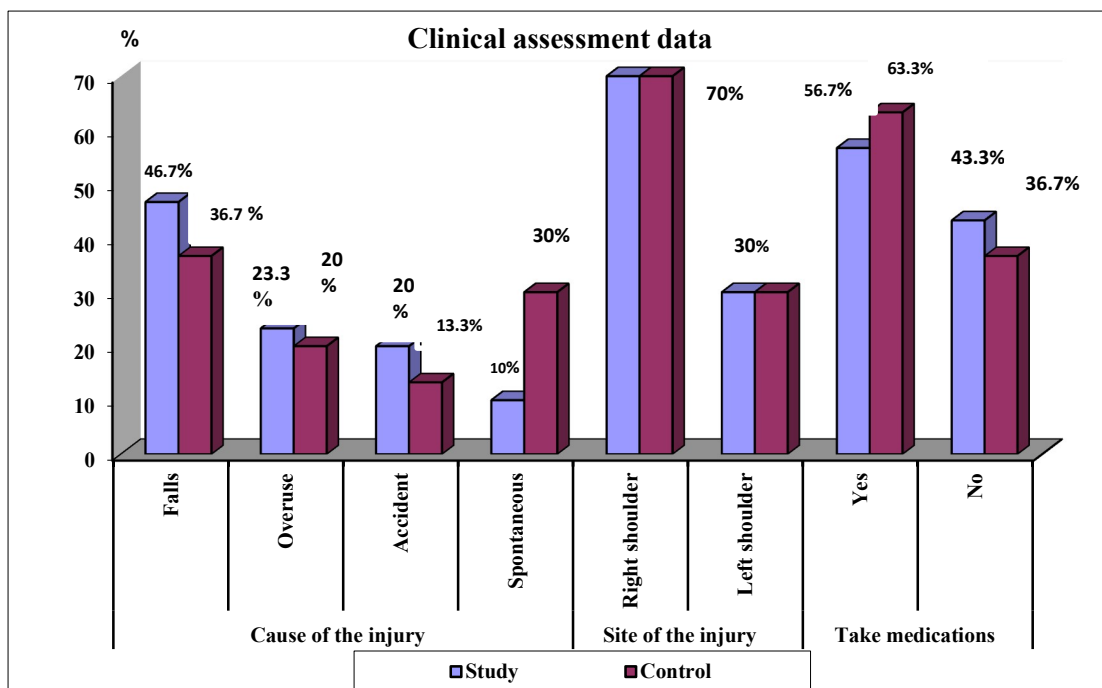


Figure (1): Dissemination of the studied patients of both groups according to their clinical assessment data (n=60)

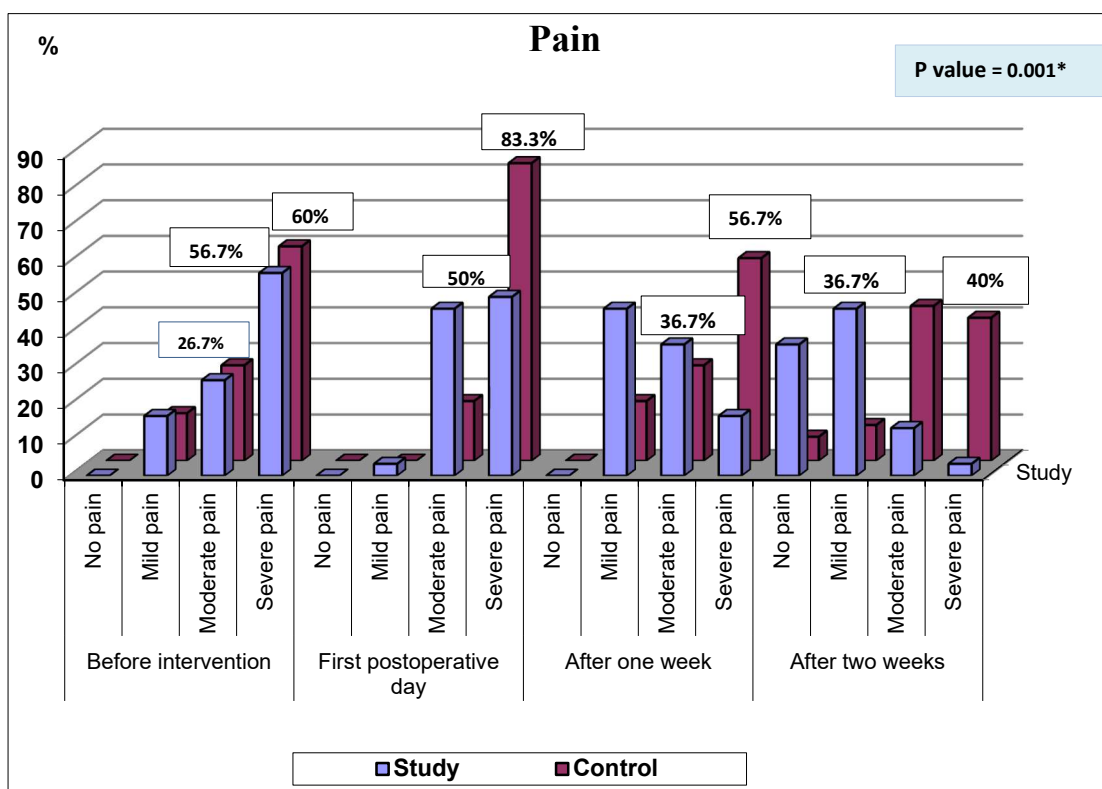


Figure (2): Distribution of the studied patients of both groups according to the Indiana Polyclinic Combined Pain Scale (n=60)

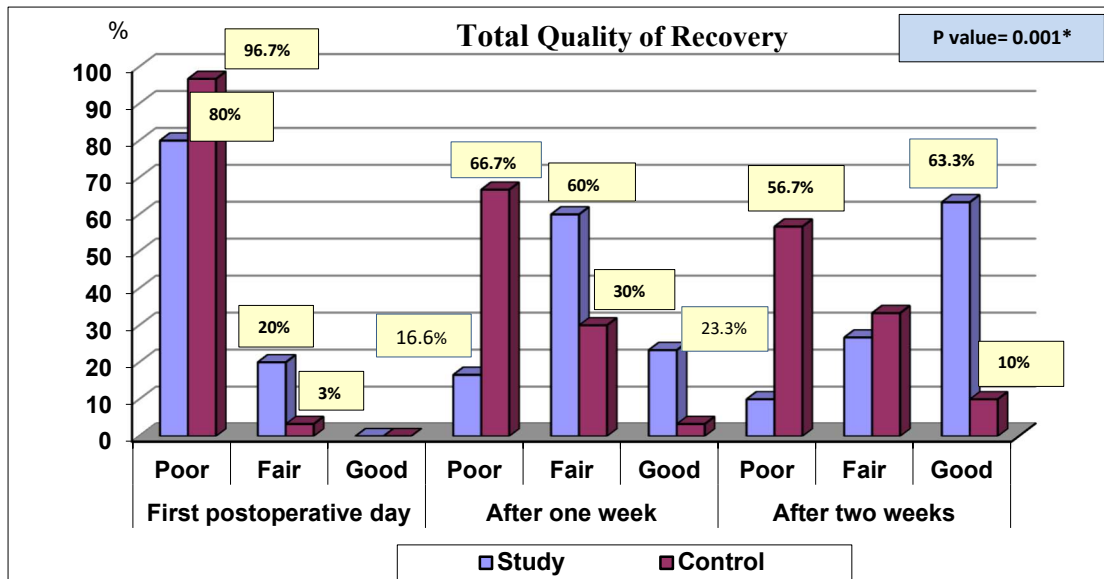


Figure (3): Percent distribution of the studied patients of both groups according total quality of recovery score questionnaire (QoR-40) (n=60)

Table (2): Correlation between Socio demographic characteristics and Indiana Polyclinic Combined Pain index

Characteristics		(IPCPS) pain score					
		Study group (n=30)			Control group (n=30)		
		First postoperative day	After one week	After two weeks	First postoperative day	After one week	After two weeks
Age	r	0.452	0.395	0.482	0.102	0.182	0.180
	P value	0.001*	0.001*	0.001*	0.438	0.164	0.168
Sex	r	0.199	0.210	0.090	0.013	0.122	0.151
	P value	0.127	0.108	0.493	0.921	0.354	0.250
BMI	r	0.312	0.365	0.408	0.130	0.119	0.027
	P value	0.005*	0.001*	0.001*	0.324	0.364	0.838
Occupation	r	0.185	0.187	0.115	0.139	0.059	0.165
	P value	0.158	0.152	0.381	0.290	0.655	0.450
Education level	r	- 0.058	- 0.045	- 0.067	-0.185	-0.031	-0.019
	P value	0.661	0.730	0.317	0.158	0.817	0.613
Marital status	r	- 0.452	- 0.341	- 0.397	-0.084	-0.124	-0.051
	P value	0.001*	0.001*	0.001*	0.525	0.344	0.701

* Significance at $P < 0.05$.

Discussion

Rotator cuff (RC) abnormalities are the furthestmost common cause of shoulder impairment globally, resulting in pain, limited shoulder joint movements, and decreased function. However, rotator cuff repair is linked with severe postoperative discomfort, and efficient pain management can influence recovery quality (Prabhu et al., 2024).

In the current study the findings of socio demographic data shown that the highest proportion of the studied patients in both study and control groups were in age group from forty to less than fifty years old. This result is consistent with Pinto (2025), who stated that more than half of the studied patients with rotator cuff injuries were in age group forty to sixty years old. On the other hand, these findings were in contrast to the findings of Van Dung et al. (2016), who found that more than half of the patients were in the age group from fifty-four to sixty-eight years old. This result may be due to, this age group are the most productive and reproducible age, and they expose to hard work.

** Highly Significance at $P \leq 0.001$.

Regarding sex, almost half of the study patients were females which is in line with the findings of Sabo, LeBlanc, and Hildebrand (2021), who indicated that more than half of the studied patients were females. Conversely this finding was in contrast with the findings of Monteleone et al. (2024); Paul et al. (2024) who mentioned that more than half of the study patients were male. This finding possibly due to the female hormonal factors, lower muscle mass, also due to overuse of shoulder in household activities.

The residence finding of this study indicates that approximately three quarters of the study patients were from rural areas. These results aligned with Ames et al. (2023), who stated that the majority of the study patients were live in rural regions, but this result was contradicted with a study conducted by Kang et al. (2022), who reported that about two thirds of study patient were live in urban area. The finding of the present study may be due to the higher rate of manual work and agricultural activities in rural populations.

Concerning educational level, more than half of the study group had

secondary education. This study is in accordance with the findings of **Jensen et al. (2025)** who reported that most patients had medium education. This is in disagreement to previous study of **Holle et al. (2025)**, who reported that more than half of the study patients were College graduate or advanced degree. Moreover, this finding was in dissimilarity of the finding of the study conducted by **Paul et al. (2024)**, who reported that slightly less than three quarters had higher education. The results of the current study may be linked moderate education levels with a higher prevalence of musculoskeletal problems, as these individuals often engage in physically demanding jobs rather than sedentary office work **Zhang et al. (2024)**.

In relation to clinical assessment data more than one-third of the research subjects were exposed to falls which the most common cause of injury among both study and control groups. These findings were in agreement with the findings of the study of **Gumina et al. (2023)**, who mentioned that two thirds of the study group were exposed to falls.

By contrast to the results of the study conducted by **Deurzen et al. (2023)**, who said that the majority of study patient had non traumatic rotator cuff tear.

With respect to the site of injury, the majority of patients in both groups experienced right shoulder involvement. This finding is in line with the results of **Grusky et al. (2021)**, who indicated that slightly near three quarters had dominant shoulder rotator cuff tear. These results may be attributed to increased mechanical load and recurrent overhead motions to the dominant shoulder

As regard effect of bundle of nursing care on the severity of postoperative pain after the rotator cuff repair surgery for both study and control group according to the **Indiana polyclinic combined pain scale**, the current study exposed that **before the intervention up on admission** more than half of both the study and control group had severe pain, while the minority of study and control group had mild pain, which significantly impairs daily functioning and quality of recovery. This is consistent with findings from

Cho et al. (2019); Hardrick et al. (2025), who reported that untreated rotator cuff tears commonly result in persistent moderate-to-severe pain, particularly during activity and sleep and approximately two thirds of studied patients experience severe pain prior the intervention, while in disagreement with **Chillemi et al. (2024)**, who reported that about one half of patients had moderate pain prior the intervention.

After two weeks, more than one third of the study group had no pain, while less than half of control group had severe pain. The highly significant difference between the groups ($p=0.001^*$) emphasises the long-term benefit of the implemented bundle of nursing care in improving pain outcomes. This result is consistent with a randomized controlled trial by **Saltzman, Leroux, and Romeo (2021); Miškulin et al. (2025)**, which showed that patient-centred multimodal interventions effectively enhanced pain control and facilitated earlier return to functional activities after shoulder surgery.

As regard total quality of recovery score questionnaire, the findings of

this study shown that on the first postoperative day, the majority of patients in both groups had poor total quality of recovery score. This finding was as the same with **Jiang et al. (2025)**, who found that majority of patients had poor score at the first postoperative day.

At the end of week one, while both groups showed some improvement, the study group began to demonstrate noticeably better recovery progression. However, it was by the second week that the true impact of the nursing care bundle became clear as near to two third of the study group had good total QoR-40 scores, compared to minority in the control group, where more than half of them remained at poor level. This substantial difference suggests that structured, holistic nursing bundle of care do not merely improve isolated domains of recovery (e.g., pain or comfort), but rather synergistically enhance the total quality of recovery across multiple dimensions. This is in agreement with **Schoenherr et al. (2022); Gianluca et al. (2025)**, who found that more than half of study patient had good quality of recovery

after two weeks of rotator cuff repair surgery.

Regarding correlation between Socio demographic characteristics and Indiana Polyclinic Combined Pain index, the current study's findings are shown that there was a significant positive correlation between age also BMI and Indiana polyclinic pain index for the study group patients and non-significant positive correlation for control group. This may indicate that older patients tended to report higher levels of postoperative pain than younger patients and increased body weight was associated with higher pain intensity. This finding is in agreement with **Sahoo et al. (2020)** who found that there was a positive correlation between age and BMI at discharge after rotator cuff repair surgery **Lazaridou et al. (2024)** who stated that there was strong correlation between age and BMI and level of post-operative pain by using numerical rating scale. On the other hand, these findings were in contrast with the findings of the study conducted by **Sandler et al. (2024)** who mentioned that there was no correlation between obesity and pain

level. Moreover, in contrast with the findings of **Perez-Dominguez et al. (2023)**, who discovered a substantial association between postoperative discomfort and the age group of 18 to 39 years old. **In contrast**, the findings of the present study shown that, there was a negative correlation between **educational level** and postoperative pain level pain for both study and control group after two weeks, while there was significant negative correlation between **marital status** and Indiana polyclinic pain scale **among study group patients**, however there was non-significant negative correlation **among control group patients**. These findings may be due to that patients with higher education and those who were married reported lower postoperative pain, possibly due to better health awareness and social support. These findings are comparable to **Perez-Dominguez et al. (2023)** Who discovered that there was a substantial negative association between educational level, marital status and postoperative pain, while in contrast with the findings of **Rizvi et al. (2021)** who stated that there was a positive correlation between

marital status and pain level six weeks after rotator cuff repair surgery.

Conclusion

The following conclusions can be drawn from the current study's findings:

- Implementing a nursing bundle of care resulted in a reduction in postoperative discomfort following rotator cuff replacement.
- There was a statistically significant difference in postoperative pain and quality of recovery scores between the study and control groups following the adoption of the nursing care bundle.

Recommendations

After completion of this study, it can be recommended that:

- The study needs to be conducted over an extended period of time, in a variety of situations, and with a bigger sample size in order to be generalized.

References

- Aden, A., Alsayeh, S., Aburas, L., & Masood, Q. (2024). Surgical interventions for rotator cuff tears: A comprehensive literature Review. *Cureus*. 2024 Dec 12, 16(12), e75606.
- Alanazi, A., Alhazmi, A., Alruwaili, F., Alenzi, R., Alhazmy, A., & Alshammari, N. (2024). Nursing care for patients before and after surgery: Strategies to ensure safe and effective recovery. *Gland Surgery*, 9(2), 478-484.
- Altamimi, T., Alkathami, A., Al-Awn, R., Alkhaldi, M., Alhudaithi, M., Alqahtani, A., ... & Almutawah, A. (2024). A Narrative review of rotator cuff tear management: Surgery versus conservative treatment. *Cureus*, 2,16(12), e74988. Doi: 10.7759/cureus.74988.
- Ames, K., Parzick, J., Ives, K., Ross, G., & Shah, S. (2023). Social determinants of health influence clinical outcomes of patients undergoing rotator cuff repair: A systematic review. *Journal of Shoulder and Elbow Surgery*, 32 (2), 419-434, ISSN1058-2746, <https://doi.org/10.1016/j.jse.2022.09.007>.
- Arbuck, D. (2019). *Assessment and Monitoring of Pain. Current Tools. Models for Pain Management*. 2nd ed. Centres for Disease and Prevention. 2019. Available at: <https://www.practicalpainmanagement.com/resourcecenters/opioid->

monitoring-2nd-ed/assessment-monitoring-pain-current-tools.

Baur, A., Lemons, W., Protzuk, O., & Goodloe, J. B. (2025). Early Rotator Cuff Repair Yields Lower Retear Rates and Superior Functional Outcomes: A systematic review and meta-analysis. *Journal of Clinical Medicine*, 14(15), 5552. <https://doi.org/10.3390/jcm14155552>

Cho, C., Song, K., & Min, B. (2019). Pain characteristics in patients with symptomatic rotator cuff tears. *Journal of Shoulder and Elbow Surgery*, 28(5), 956–963. <https://doi.org/10.1016/j.jse.2018.10.021>.

Deurzen, D., Yang, K., Onstenk, R., Raven, E., van den Borne, M., Hoelen, M., ... & Scholtes, V. (2023). Long head of biceps tenotomy is not inferior to suprapectoral tenodesis in arthroscopic repair of nontraumatic rotator cuff tears: A multicenter, non-inferiority, randomized, controlled clinical trial. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, 37(6), 1767-1776. <https://doi.org/10.1016/j.arthro.2021.01.036>

Gianluca, C., Daniele, N., Fabrizio, Q., & Emanuela, R. (2025). Rehabilitation outcome domains following rotator cuff surgical repair: A systematic review, *Journal of Orthopaedic Reports*, 4(2), 2773-157X. <https://doi.org/10.1016/j.jorep.2024.100409>.

Grusky, A., Song, A., Kim, P., Ayers, G., Higgins, L., Kuhn, J., ... & Jain, N. (2021). Factors associated with symptomatic rotator cuff tears: The rotator cuff outcomes workgroup cohort study. *American Journal of Physical Medicine & Rehabilitation*, 100(4), 331-336. Doi: 10.1097/PHM.0000000000001684.

Gumina, S., Mezzaqui, L., Aimino, R., Rionero, M., Spagnoli, A., Campagna, V., & Candela, V. (2023). Aetiopathogenesis of rotator cuff tears in patients younger than 50 years: Medical conditions play a relevant role. *Medicina*, 22, 59(5), 998.

Doi: 10.3390/medicina59050998

Hardrick, J., Ifarraguerri, A., Collins, M., Trofa, D., Fleischli, J., Hamid, N., ... & Saltzman, B. (2025). Liposomal bupivacaine after

arthroscopic rotator cuff repair moderately decreases early postoperative pain and demonstrates equivocal opioid consumption compared to traditional interscalene nerve blocks: A systematic review and meta-analysis of level 1 studies. *Orthopaedics & Traumatology: Surgery & Research*, 17, 104190. Doi: 10.1016/j.otsr.2025.104190. Epub ahead of print. PMID: 39971098.

Harris, I., Page, R., & Buchbinder, R. (2025). ARC (Australian Rotator Cuff) trial: Study protocol for a randomised placebo-controlled trial comparing rotator cuff repair to no repair during arthroscopic shoulder surgery for people with shoulder pain and non-acute rotator cuff tears. *Trials*, 26, 116. <https://doi.org/10.1186/s13063-025-08822-w>

Holle, A., Boddu, S., Gill, V., Brinkman, J., Tummala, S., Verhey, J., & Tokish, J. (2025). Younger age, female sex, low-income, and poor mental health are patient perceived risk factors for poor access to care for rotator cuff tears. *Arthroscopy, Arthrosc Sports Med Rehabil*, 21, 7(4), 101167. Doi:

10.1016/j.asmr.2025.101167. PMID: 40980249; PMCID: PMC12447153

Honoki, K., McRae, S., MacDonald, P., Prior, H., Tytgat, H., Fowler-Woods, M., & Woodmass, J. (2026). The impact of socioeconomic status on the management of rotator cuff tears in a publicly funded health care system. *Canadian Journal of Surgery*, 69(1), E15. Doi: 10.1503/cjs.010924.

Jensen, M., Valsamis, E., Madrid, A., Olsen, B., & Rasmussen, J. (2025). Association between socioeconomic status and patient-reported outcome at 1 year after shoulder arthroplasty for osteoarthritis or cuff-tear arthropathy: A nationwide cohort study of 2,292 arthroplasties. *Acta Orthop*, 9(96), 45-51. Doi: 10.2340/17453674.2024.42700.

Jiang, X., Xu, C., Yuan, C., Gao, W., Liu, W., Wang, Y., ... & He, Y. (2025). The effect of postoperative Tranexamic acid and dexamethasone on quality of recovery after arthroscopic rotator cuff repair: A Double-Blinded, randomized controlled trial. *Journal of Pain Research*, 259-270.

Kang, S., Park, C., Woo, S., Kim, T. W., Moon, M., Yang, J., & Choi,

- M. (2022).** Factors influencing the size of a non-traumatic full-thickness rotator cuff tear: Focusing on socioeconomic factors. *International Journal of Environmental Research and Public Health*, 19(10), 6137. <https://doi.org/10.3390/ijerph19106137>
- Lazaridou, A., Brune, D., Schneller, T., George, S., Edwards, R., & Scheibel, M. (2024).** Understanding the multifactorial influences on postsurgical pain after Rotator Cuff Repair: A retrospective cohort study. *Orthopaedic Journal of Sports Medicine*, 12(11).
Doi:10.1177/23259671241290223
- Lee, J., Kim, D., Seo, D., Son, J., & Kim, D. (2018).** Validity and reliability of the Korean version of the quality of recovery-40 questionnaire. *Korean J Anesthesiol*, 71(6), 467-475. Doi: 10.4097/kja.d.18.27188. Epub 2018 Apr 24. PMID: 29684992; PMCID: PMC6283711.
- Lopez, B., Lee, B., Miller, M. D., Ibrahim, M., Vanderah, T., & Riegel, A. (2025).** Postoperative multimodal pain management: A narrative review of current practices, clinical and educational gaps, and future directions. *Frontiers in Anesthesiology*, 4. <https://doi.org/10.3389/fanes.2025.1709252>
- Miškulin, M., Savić, J., Dulić, O., Dragaš, E., & Košec, A. (2025).** Combined Subacromial Bursal Stem Cell Therapy and Platelet-Rich Plasma Alongside Arthroscopic Rotator Cuff Surgery Reduces Postoperative Pain and Improves Functional Outcomes: A retrospective study. *Journal of Clinical Medicine*, 14(15), 5590. <https://doi.org/10.3390/jcm14155590>
- Monteleone, A., Salerno, M., Mondini, C., Gonalba, G., Candrian, C., & Filardo, G. (2024).** The influence of sex is a neglected focus in rotator cuff repair: A systematic review and meta-analysis: Knee surgery, sports traumatology, *Arthroscopy*, 32(10), 2699-2710. <https://doi.org/10.1002/ksa.12201>
- Myles, PS., Weitkamp, B., Jones, K., Melick, J., & Hensen, S. (2000).** Validity and reliability of a postoperative quality of recovery score: the QoR-40. *Br J Anaesth*, 84(1), 11-5. Doi:

10.1093/oxfordjournals.bja.a013366.

PMID: 10740540.

Nayak, M., Prabhu, B., Balthillaya, M., Ramachandra, P., Poojari, D., Ts, S., ... & Meeus, M. (2025). Exploring patient perspectives, socioeconomic status and beliefs on rehabilitation after arthroscopic rotator cuff repair: A qualitative study. *Shoulder & Elbow*, 17(5). <https://doi.org/10.1177/17585732251327175>

Paul, R., Osman, A., Nigro, A., Muchintala, R., Destine, H., Tjoumakaris, F., & Freedman, K. (2024). The effects of social determinants of health on rotator cuff repair utilization and outcomes: A systematic review. *JSES Reviews, Reports, and Techniques*, 4(3), 346-352.

Perez-Dominguez, B., Perpiña-Martinez, S., Garcia-Isidoro, S., Escobio-Prieto, I., Rodriguez-Rodriguez, A., & Blanco-Diaz, M. (2023). Associations between preoperative patient socioeconomic status and pain-related outcomes with pain and function in patients undergoing rotator cuff repairs. *In Healthcare*, 11, 20, 2786).

Pinto, G., Dantas, C., Campos, MCO., Assunção, J., Gracitelli, M., & Malavolta, E. (2025). Reinforcement with the long head of the biceps tendon in large and massive repairable rotator cuff tears: A prospective case series. *Acta Ortop Bras*, 2025 Oct 13; 33(Spe2), e288796. Doi:

10.1590/1413785220253302e28879.

Prabhu, B., Maiya, G., Pandey, V., Acharya, K., Raja, G., Elliott, M., & Meeus, M. (2024). Factors contributing to persistent shoulder pain after arthroscopic rotator cuff repair. *F1000Res*, 6(1), 1236. Doi: 10.12688/f1000research.156193.2

Rizvi, S., Bishop, M., Lam, P., & Murrell, G. (2021). Factors predicting frequency and severity of postoperative pain after arthroscopic rotator cuff repair surgery. *The American Journal of Sports Medicine*, 49(1), 146-153. Doi: 10.1177/0363546520971749. Epub 2020 11(23), PMID: 33226843.

Sabo, MT., LeBlanc, J., & Hildebrand, KA. (2021). Patient gender and rotator cuff surgery: Are there differences in outcome? *BMC Musculoskelet Disord*, 30, 22(1),

838. Doi: 10.1186/s12891-021-04701-y.
- Sahoo, S., Ricchetti, E., Zajichek, A., Cleveland Clinic Shoulder Group, Evans, P., Farrow, L., ... & Derwin, K. (2020).** Associations of preoperative patient mental health and sociodemographic and clinical characteristics with baseline pain, function, and satisfaction in patients undergoing rotator cuff repairs. *The American Journal of Sports Medicine*, 48(2), 432-443.
<https://doi.org/10.1177/0363546519892570>
- Saltzman, B., Leroux, T., & Romeo, A. (2021).** Multimodal pain management strategies in shoulder surgery: A randomized controlled trial. *American Journal of Sports Medicine*, 49(10), 2761–2770. <https://doi.org/10.1177/03635465211024573>.
- Sandler, A., Green, C., Scanaliato, J. P., Fares, A., Dunn, J., & Parnes, N. (2024).** The influence of obesity on outcomes following arthroscopic rotator cuff repair: A systematic review and meta-analysis of 118,331 patients internationally. *JBJS Open Access*, 9(2), e2. Doi: 10.2106/JBJS.OA.23.00047.
- Schoenherr, J., Gonzalez, M., Serrano, R., Park, M., Lee, Z., Cobb, K., ... & Bullard, T. (2022).** Quality of recovery after Rotator Cuff Repair with Interscalene Liposomal Bupivacaine Versus Interscalene Nerve Catheter. *Orthop J Sports Med*. Nov 22, 10(11), 23259671221134819. Doi: 10.1177/23259671221134819. PMID: 36458106;
- Sebastiani, E., Scacchetti, M., Cesare, M., Maurici, M., & Loiudice, M. (2024).** Identifying the Bundle/Care development process in Clinical Risk Management: A systematic review. *Healthcare (Basel)*, 11,12(22), 2242. Doi: 10.3390/healthcare12222242.
- Stewart, C., Bravata, D., Nelson, M., Datta, E., & Behal, R. (2025).** Clinical and economic outcomes associated with musculoskeletal care in an integrated advanced primary care model: Controlled cohort analysis. *Journal of Medical Internet Research*, 27, e76794. Doi: 10.2196/76794.
- Toyooka, S., Miyamoto, W., & Ito, M. (2020).** Editorial commentary: Postoperative pain management after arthroscopic rotator cuff repair: The Journey to Pain Relief. *Arthroscopy*.

- 36(5), 1251-1252. Doi: 10.1016/j.arthro.2020.02.030.
- Van Dung, H., Khanh, N., Son, N., Ha, H., Don, T., Ngan, T., & Phuong, N. (2026).** Structural severity outweighs laboratory biomarkers in predicting short-term failure under nonoperative management for partial-thickness supraspinatus tears: A prospective cohort study. *BMC Musculoskeletal Disorders*, 27(1), 409. <https://doi.org/10.1186/s12891-026-09773-2>
- Vartanian, K., Ghookas, K., Eskandar, T., Najafi, N., & Agrawal, DK. (2025).** Outcomes of Rotator Cuff Repair: Open vs. Arthroscopic Approaches in Patients with Diabetes or Hyperlipidemia. *J Orthop Sports Med*, 7(2), 240-249. Doi: 10.26502/josm.511500201. Epub2025May15.PMID:40546245; PMCID: PMC12180584.
- Wang, Z., Tang, L., Wang, N., Huang, L., Schmitz, C., Zhou, J., ... & Ma, Y. (2026).** Radial Extracorporeal Shock Wave Therapy Versus Multimodal Physical Therapy in Non-Traumatic (Degenerative) Rotator Cuff Tendinopathy with Partial Supraspinatus Tear: A Randomized Controlled Trial. *Journal of Clinical Medicine*, 15(2), 471. <https://doi.org/10.3390/jcm15020471>.
- Witten, A., Bak, K., Gramkow, J., Kino, W., Hølmich, P., & Sørensen A. (2025).** Rotator cuff-rupture. *Ugeskr Laeger*, 1, 187(36), V02250110. Danish. Doi: 10.61409/V02250110.
- Zhang, G., Xiong, L., Kuang, G., Zhang, Y., Jing, H., Gu, M., ... & Xiao, Z. (2024).** Knowledge, attitude and practice towards arthroscopic shoulder surgery in patients with rotator cuff tears: Cross-sectional study. *BMJ Open*, 2024 Nov 9, 14(11): e088135. Doi: 10.1136/bmjopen-2024-088135.

Relation between Mothers' Knowledge and Attitude Regarding their Children with Autism Spectrum Disorders

Sahar Mahmoud El-khedr Abd-Elgawad¹, Amany Tarek Ali Batta², Osama Ibrahim younes³, Nahla Abdelnaby Elkandoz⁴

¹Professor of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt.

²Assistant Lecturer of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt.

³Lecturer of Psychiatry, Faculty of Medicine, Tanta University, Egypt.

⁴Assistant Professor of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Amany Tarek Ali Batta.

Email: amanyt117@gmail.com

Abstract

Background: Autism Spectrum Disorder is a neurodevelopmental condition marked by difficulties in social interaction, communication, and repetitive behaviors that begin in early childhood. Mothers' knowledge & attitude toward autism play a crucial role in caregiving, as positive understanding supports better management and outcomes. **Aim:** Evaluate the relation between mothers' knowledge and attitude regarding their children with autism spectrum disorders. **Design:** Descriptive correlation design was used. **Setting:** Pediatric Outpatient Clinic in Psychiatric Center of Tanta Main University Hospital. **Subjects:** A purposive sample of 50 mothers was included. **Tools:** Two tools were used to collect data. Tool (I): Autism spectrum disorder knowledge questionnaire. Tool (II): Mothers' attitude toward their children with Autism. **Results:** More than three quarters of the studied mothers had low level of knowledge and nearly two fifths of them had negative attitude toward autism, statistically significant correlation between mothers' total level of knowledge and their attitude about autism. **Conclusion:** Most mothers had low level of knowledge and negative attitude toward autism. There was a highly statistically significant positive correlation between mothers' total knowledge and their attitude toward autism. **Recommendation:** Improving mothers' knowledge through educational programs is essential to maintain a positive attitude toward autism spectrum disorders of their children.

Keywords: Autism Spectrum Disorder, Attitude & Mothers' knowledge.

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that typically appears in early childhood and often continues into later stages of life. It is mainly characterized by difficulties in communication, impaired social interaction, and repetitive or restricted patterns of behavior (Upreti, Labib, Luopa, & Maimaiti, 2026).

Over time, the reported prevalence of ASD has increased markedly. While early estimates in the 1960s suggested very low rates, more recent data indicate that a significant proportion of children are diagnosed worldwide, with higher occurrence among males compared to females. The condition is commonly classified into levels based on severity, ranging from mild to more severe forms, depending on the degree of impairment in communication, behavior, and social skills (Xiong, & Yu, 2026).

Autism Spectrum Disorder (ASD) is considered a multifactorial disorder, where both genetic susceptibility and environmental influences play important roles. Clinically, ASD is identified by core features such as

deficits in social communication, language difficulties, and the presence of stereotyped or repetitive behaviors. These may include movements like hand flapping, body rocking, or repetitive speech, in addition to a strong focus on specific objects or patterns (Ayoub, 2025).

Individuals with ASD may also experience a range of associated conditions, including intellectual disabilities, anxiety, attention problems, sleep disturbances, and sensory processing issues (Theodoratou, et al., 2026).

Diagnosis typically requires a comprehensive assessment conducted by a multidisciplinary team, relying on developmental history and standardized evaluation tools. However, delayed diagnosis remains a concern due to factors such as limited awareness, delayed referrals, and difficulty recognizing early symptoms (Male et al., 2023).

Although awareness of ASD has improved, early detection and intervention are still critical challenges. Timely therapeutic approaches, particularly behavioral and parent-focused interventions, can

lead to better developmental outcomes. At the same time, caring for a child with ASD places considerable emotional and psychological demands on caregivers, who may experience stress, anxiety, and reduced well-being. These challenges are often intensified by social stigma and limited access to appropriate support services **(Parveen, Nayab, & Mushtaq, 2026)**.

Mothers' attitudes toward ASD are a key factor influencing how they deal with their child's condition. These attitudes are shaped by their beliefs, cultural background, and level of understanding about autism. Mothers who adopt a positive outlook such as accepting the diagnosis and actively participating in care and rehabilitation can support their children's development and improve adaptation. In contrast, negative perceptions, including denial or fear of social judgment, may hinder early intervention and reduce the effectiveness of care **(Kasem, Alghazawi, Ahmad, Alkhamiseh, & Al-Waked, 2025)**.

Increased knowledge often leads to more constructive and supportive

attitudes, as it helps mothers better understand their child's needs and behaviors. Well-informed mothers are more likely to seek appropriate services, follow therapeutic recommendations, and respond effectively to challenges. Conversely, limited awareness may result in misunderstandings and less effective caregiving practices, which emphasizes the need for educational efforts to enhance both knowledge and attitudes **(Al Aqel, Al Saed, Alsaber, & Al Bustan, 2026)**.

Nurses support children with autism by providing individualized care and helping meet their health and communication needs. They also assist families and promote the child's well-being and development **(André, et al., 2025)**.

Significance of the study:

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by impairments in social interaction, communication difficulties, and repetitive behaviors that appear in early childhood. In Egypt, reported prevalence rates vary across studies, with estimates ranging from approximately 0.7% to 1.5% among children. Some local

screening studies have indicated that about 1 in 100 to 1 in 66 children may show features consistent with ASD. These figures are generally comparable to global estimates, which report a prevalence of around 1 in 54 to 1 in 68 children (Metwally, 2025).

There is an important role of mothers in caring for children with autism spectrum disorder, and how their knowledge and attitudes affect early detection and management. Adequate knowledge and a positive attitude may contribute to better developmental outcomes for the child and improve overall family well-being (Al-Juhaishi, 2025). So, the current study aims to evaluate the relation between mothers' knowledge and attitude regarding their children with autism spectrum disorders.

Aim of this study

Assess the relation between mothers' knowledge and attitude regarding their children with autism spectrum disorders

Research Question:

1. What are the levels of mothers' knowledge regarding autism spectrum disorder?

2. What are the levels of mothers' attitudes regarding autism spectrum disorder?

3. What is the relation between mothers' knowledge and their attitude regarding autism spectrum disorder?

Subjects and Method

Design:

A descriptive correlation design was used in this study.

Study settings:

The study was conducted at Pediatric Outpatient Clinic in Psychiatric Center of Tanta Main University Hospital, which is affiliated to the Ministry of Higher Education and Scientific Research.

Study subjects:

A purposive sample of 50 mothers were included.

Study tools:

Two tools were used in this study:

Tool (I): Autism spectrum disorder knowledge questionnaire:

Part (1): Mothers' socio-demographic characteristics:

This tool was developed by the researcher to assess: mothers' age, residence, level of education, occupation, number of children, and family history (parents'

consanguinity, chronic illness or autism).

Part (II): Mothers' knowledge about Children' autism spectrum disorder:

A structured questionnaire sheet was developed by the researcher after reviewing recent and related literatures (Burak, Sarisaltik, Hidiroğlu, & Karavuş, 2021; Sarisaltik, Hidiroğlu, & Karavuş, 2023; Elhawat, 2023) to assess mothers' knowledge about children' autism. It included data related to meaning of autism, types, causes, manifestation, predisposing factors, management approaches and complication of autism spectrum disorder.

Mothers' knowledge was scored as follows:

- Correct and complete answer was scored (2).
- Correct and incomplete answer was scored (1).
- Wrong answer or don't know was scored (0).

The total score of Mothers' knowledge was calculated and classified into:

- High level of knowledge will be considered from 75% and more.

- Moderate level of knowledge will be considered from 50 to < 75%.
- Low level of knowledge will be considered < 50%.

Tool (II): Mothers' attitude toward their children with Autism.

This tool was developed by the researcher in Arabic after revision of recent related literatures (Ferenc, Byrka, & Król, 2022; Kanamori, Suzuki, & Ota, 2024; Mohamed & Mahmoud, 2017) It included statements such as mothers can determine whether child's autism gets better or worse, the course of child's autism depends on mothers, mothers have the power to influence of child's autism.

It was rated on a 3-points Likert Scale from 1 to 3, in which (1) = Disagree, (2) = Uncertain, (3) = Agree.

Scoring system

- Less than 50% will be considered negative attitude.
- From 50% to 75% will be considered neutral attitude.
- More than 75% will be considered positive attitude.

Method:

The study was accomplished through the following steps:

Administrative process:

An official approval to carry out the study was obtained from the Dean of the Faculty of Nursing and the administrators of the predetermined settings.

Ethical consideration:

- a. Ethical approval for conducting the study was obtained from the Scientific Research Ethics Committee of the Faculty of Nursing, code number (418-3-2024).
- b. The nature of the study did not cause any harm or pain to any participant in the sample.
- c. Confidentiality and privacy of all collected data was strictly maintained throughout the study.
- d. Informed consent was obtained from the participated mothers prior to participation. They were informed of their right to voluntarily withdraw from the study at any point without any consequences.
- e. Two tools were used for data collection.
- f. The study tools were reviewed for content validity by a jury consisting of five experts in Pediatric Nursing.
- g. A pilot study was conducted on 10% of the total sample (5 mothers) to assess the clarity, applicability, and

feasibility of data collection tools. Based on the results, necessary modifications were made. The participants involved in the pilot phase were excluded from the main study sample so, they were replaced.

- h. Test of reliability using Cronbach's Alpha Coefficient test was utilized by the pilot subjects. It was (0.987) for mother's knowledge questionnaire, and (0.984) for mothers' attitude.
- i. Data collection was conducted over a 6-month period start from June until November

Results

Table (1): Presents percentage distribution of the studied mothers according to their socio-demographic characteristics. It was revealed that more than half of mothers (52%) their age ranged between 20 and less than 30 years. It was observed that more than two thirds of the studied mother's (70%) lived in rural areas and 98% of them were married. Regarding education, 48% had completed secondary education, whereas only 28% had a university degree. Nearly three quarters of the studied mothers (76%) were housewives, while 24% were employed.

Table (2): Demonstrates percentage distribution of the studied mothers according to family history of autism & chronic illness. A positive family history of autism was reported in 2% of the studied mothers. Consanguineous marriage was found in 16% of parents. It was noticed that one quarter of the mothers (25%) were first degree relation with husbands, while 75% of them were second degree. Moreover, half of the studied mothers (50%) reported a positive history of chronic illness, mainly hypertension or diabetes 44% of each.

Table (3): Illustrates percentage distribution of the studied mothers' knowledge about autism. It was observed that 52% of the studied mothers had incorrect answers about meaning and causes of autism. In addition, it was revealed that 44% and 58% of the mothers had incorrect answers about symptoms and diagnosis of autism respectively.

Figure (1): Shows mothers' total knowledge about ASD. It was found that more than two thirds of the studied mothers (76%) had low level of knowledge about autism, while

only 4% had high level of knowledge.

Table (4): Illustrates percentage distribution of the studied mother's according to their attitude toward autism spectrum disorder. It was observed that a few percentage of the studied mothers (12%) were believed that they can influence their autistic child, their children are not jealous about their autistic sibling, and that they did not embarrass to take their autistic child in public, while more than half of the studied mothers (56% & 52%) were believed that the autistic child causes anger for the mothers and mothers feel upset when people pity their autistic child respectively.

Figure (2): Presents mothers' total attitude toward ASD. It was noticed that more than one third of the studied mothers (42%) had negative attitude toward autism while minority of them (18%) had positive attitude.

Table (5): Illustrates relation between the mothers' total attitude about autism and their socio-demographic characteristics. The table reveals highly statistically significant differences regarding

mothers' total attitude about autism and their age and educational level.

Table (6): Shows relation between mothers' total knowledge and total attitude. It was observed that all of the mothers (100%) who had high knowledge about autism spectrum disorder, had a positive attitude and more than half of the mothers (56.4%) who had low level of knowledge had a negative attitude toward their children with autism spectrum disorder with a highly statistically significant difference ($P = 0.001$).

Table (7): Presents correlation between studied mothers' total knowledge about autism, and their attitude toward autism. It was observed that there was a highly statistically significant positive correlation were found between mothers' knowledge and their attitude ($p = 0.000$).

Table (1): Percentage Distribution of the Studied Mothers according to their Socio-Demographic Characteristics (n=50)

Socio-demographic characteristics	n=50	
	No.	%
Age/ years		
20- < 30	26	52.0
30- < 45	21	42.0
≥45	3	6.0
Mean ±SD / year	31.88±7.153	
Residence		
Rural	35	70.0
Urban	15	30.0
Marital Status		
Married	49	98.0
Divorced	1	2.0
Educational level		
Primary education	12	24.0
Secondary education	24	48.0
University education	14	28.0
Occupation		
Working	12	24.0
Housewife	38	76.0
Number of children		
1-<3	30	60.0
3-<5	20	40.0

Table (2): Percentage Distribution of the Studied Mothers According to Family History of Autism & Chronic Illness (n=50)

Socio-demographic characteristics	No.	%
Family history of autism		
Yes	1	2.0
No	49	98.0
Parents' consanguinity		
Yes	8	16.0
No	42	84.0
Degree of relationship n= 8		
First	2	25.0
Second	6	75.0
Family history of chronic illness		
Positive	25	50.0
Negative	25	50.0
Affected family member n= 25		
Father	7	28.0
Grandfather/ grandmother	18	72.0
Type of chronic illness n=25		
Hypertension / Hypotension	11	44.0
Diabetes	11	44.0
Heart disease	3	12.0

Table (3): Percentage Distribution of the Studied Mothers' Knowledge about Autism (n=50)

Mothers' knowledge about autism	Complete correct answer		Incomplete correct answer		Don't know/ incorrect answer	
	No.	%	No.	%	No.	%
Meaning	7	14.0	17	34.0	26	52.0
Classification	8	16.0	23	46.0	19	38.0
Causes	3	6.0	21	42.0	26	52.0
Symptoms	6	12.0	22	44.0	22	44.0
Risk factors	4	8.0	12	24.0	34	68.0
Diagnosis	3	6.0	18	36.0	29	58.0
Common comorbid disorders	2	4.0	13	26.0	35	70.0
Complications	1	2.0	17	34.0	32	64.0

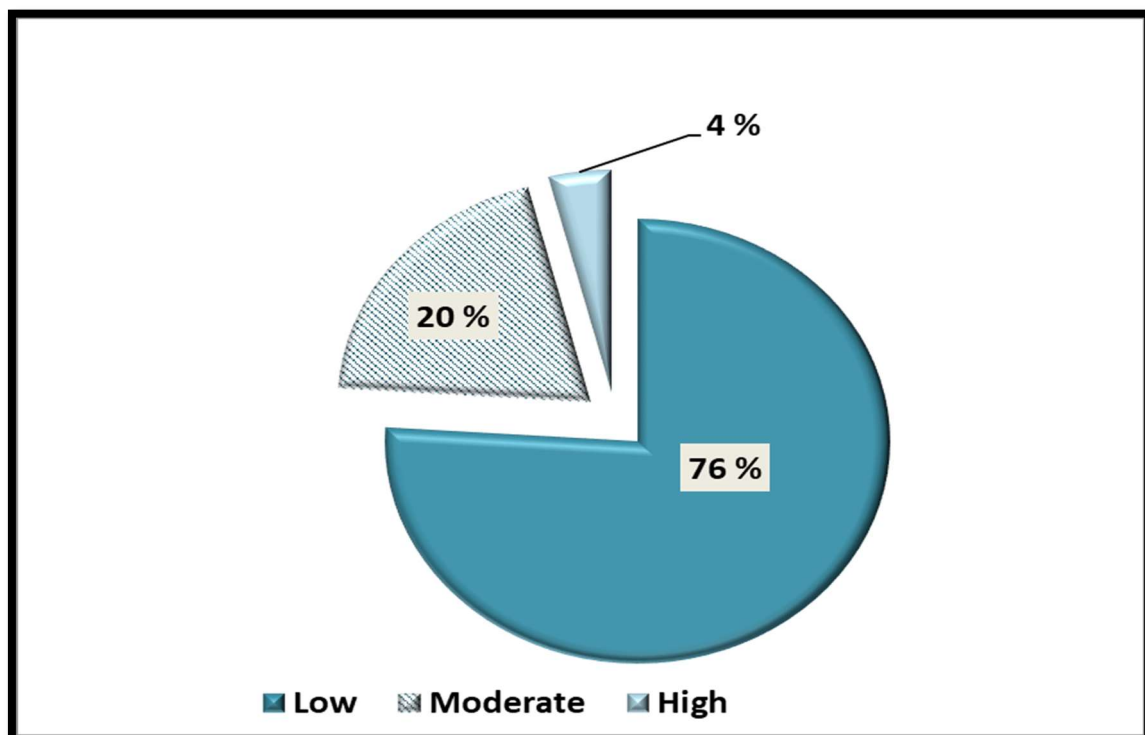
**Figure (1): Mothers' Total Level of Knowledge**

Table (4): Percentage Distribution of the Studied Mother's Attitude toward their Children with Autism

Mothers' attitude toward autism	Agree		Uncertain		Disagree	
	No.	%	No.	%	No.	%
Mothers can influence their autistic child	6	12.0	30	60.0	14	28.0
Autism improves by behavioral therapy	11	22.0	21	42.0	18	36.0
Negative effects of autism can be avoided with treatment	10	20.0	18	36.0	22	44.0
Autistic children cause anger for mothers	28	56.0	0	0.0	22	44.0
Autism should not cause excessive worry for mothers.	5	10.0	3	6.0	42	84.0
Mothers feel depressed thinking about autism	20	40.0	5	10.0	25	50.0
Autistic child training takes time/effort that affect my life	23	46.0	7	14.0	20	40.0
Caring for autistic child does not require extra effort	5	10.0	4	8.0	41	82.0
My other children are not jealous of their autistic sibling	6	12.0	17	34.0	27	54.0
Autistic child needs care from the whole family	22	44.0	8	16.0	20	40.0
Neighbor's children are willing to play with my autistic child	6	12.0	12	24.0	32	64.0
My relatives allow their children to interact with my autistic child.	7	14.0	22	44.0	21	42.0
I am not embarrassed to take my child in public	6	12.0	13	26.0	31	62.0
Lack of rehabilitation centers for autism bothers me	16	32.0	10	20.0	24	48.0
I feel upset when people pity my autistic child	26	52.0	3	6.0	21	42.0
Autism causes financial burdens.	19	38.0	7	14.0	24	48.0

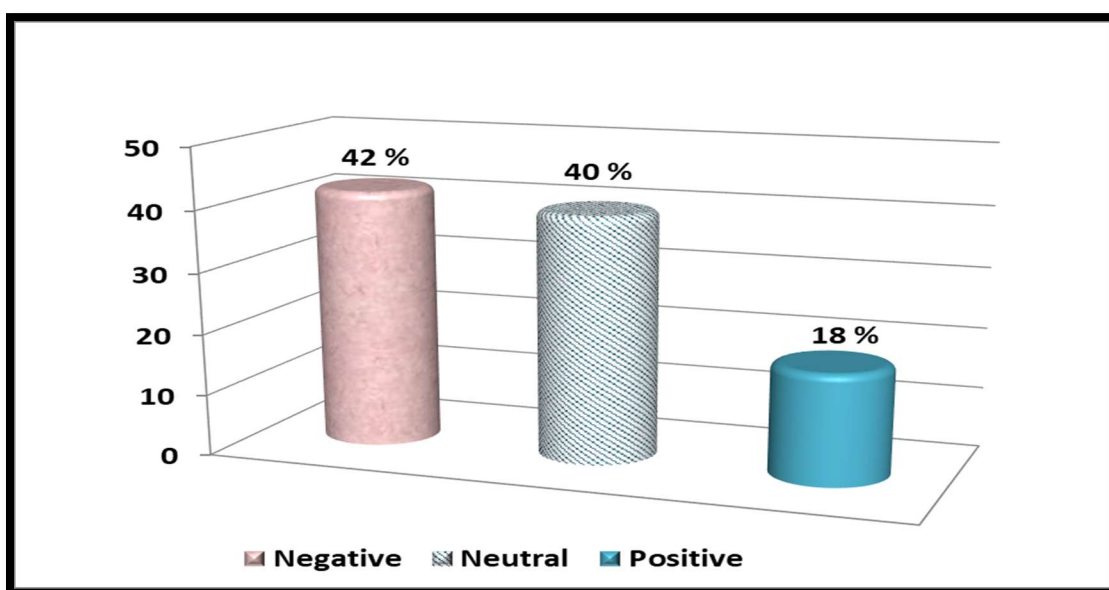
**Figure (2): Mothers' Total Attitude about Autism**

Table (5): Relation between Mothers' Total Attitude about Autism and their Socio-Demographic Characteristics

Mothers' socio-demographic characteristics	Total mothers' attitude
	Mean $\pm$ SD
Age/ years	
20<30	32.42 $\pm$ 5.651
30<45	54.38 $\pm$ 7.625
$\geq$ 45	74.67 $\pm$ 1.155
Test of sig (p-value)	102.514(0.000**)
Residence	
Rural	45.57 $\pm$ 14.946
Urban	40.93 $\pm$ 13.915
Test of sig (p-value)	1.052(0.310)
Marital Status	
Married	43.63 $\pm$ 14.287
Divorced	71.00 $\pm$ 0.0
Test of sig (p-value)	3.596(0.064)
Educational level	
Basic education	28.50 $\pm$ 0.905
Secondary education	41.21 $\pm$ 8.092
University education	62.71 $\pm$ 8.965
Test of sig (p-value)	73.182(0.000**)
Occupation	
Working	40.58 $\pm$ 14.607
Housewife	45.32 $\pm$ 14.686
Test of sig (p-value)	0.949(0.335)
Family history of autism	
Yes	76.00 $\pm$ 0.0
No	43.53 $\pm$ 14.067
Test of sig (p-value)	5.221(0.027*)

T- test/ ANOVA

* Statistically significant $p \leq 0.05$ ** Highly statistically significant $p \leq 0.001$

Table (6): Relation between Mothers' Total Knowledge and Total Attitude toward children with Autism Spectrum Disorder

Mothers' Attitude	Mothers' Total Knowledge						Chi-square test	
	Low		Moderate		High		X ²	P-value
	No.	%	No.	%	No.	%		
Negative	22	56.4	0	0.0	0	0.0	23.987	<0.001*
Neutral	16	41.0	4	44.4	0	0.0		
Positive	1	2.6	5	55.6	2	100.0		

Chi-square test, Exact Fisher test

* Statistically significance $p \leq 0.05$ ** Highly statistically significance $p \leq 0.001$ **Table (7): Correlation between Mothers' Total Knowledge and Mothers' Attitude**

Variables		Mothers' knowledge
Mothers' Attitude	r	0.946
	p- value	0.000**

Pearson Correlation Coefficient

* Statistically significant $p \leq 0.05$ ** Highly statistically significant $p \leq 0.001$

Discussion

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition defined by persistent difficulties in social communication and interaction alongside restricted and repetitive behaviors that appear early in childhood and vary in severity. Mothers' attitudes toward ASD significantly influence how they manage their child's condition, with positive attitudes supporting better development and negative perceptions potentially delaying intervention.

Additionally, higher levels of maternal knowledge are associated with more supportive attitudes and effective caregiving, highlighting the importance of education in improving outcomes (Ma et al., 2025). **Concerning mothers' knowledge regarding autism spectrum disorder**, the present study revealed that the minority of the studied mothers had a high level of knowledge **from the researcher perspective**, this may be attributed to the finding of the

current study that identified almost all of the studied mothers hadn't history of autism and the most of them hadn't parents' consanguinity. Nearly three quarters of the mothers lived in rural areas, about half of them their age ranged between $20 < 30$ years, and slightly half of the children were the first child in the family all of these factors affected mothers' knowledge **(den Houting, Nordahl-Hansen, & Fletcher-Watson, 2022)**.

On the same line, **Alyami et al. (2022)**, performed study entitled "Knowledge and attitudes toward autism spectrum disorder in Saudi Arabia" reported that more than two thirds of the studied sample had reported incorrect answers about the core features and causes of autism. In addition, a study of **Sameea, Abd El-Wahab, and Osman (2025)** was consistent with the current results as they studied "Mothers' Awareness and Knowledge of Autism Spectrum Disorder (ASD)" which found that more than two thirds of studied mothers had poor knowledge about autism prior to receiving structured education.

The current study clarified that most of the studied mothers had incorrect and don't know answer regarding the meaning, classification, causes and symptoms of autism spectrum disorder. **According to the researcher's point of view**, this may

be related to the complexity of autism spectrum disorder classification and the limited exposure of mothers to professional information explaining different forms of the disorder. These results can be explained by the provision of a well-designed educational booklet and using direct instructions to the studied mothers enhances their understanding by presenting accurate, organized and accessible information.

These findings were in the same direction with with **Kareem, Mohammed, Ra'aof, and Tiryag (2025)**, who conducted a study entitled "Parental Knowledge and Awareness of Autism Symptoms and Management Strategies" and illustrated that parents had inadequate knowledge regarding the definition and causes of autism spectrum disorder that was improved significantly post awareness program. Also, these findings agree with **AlAlmaei Asiri, et al. (2023)** who conducted a study entitled "Assessment of parental knowledge, awareness, and perception about autism spectrum disorders in Aseer region, Southwestern Saudi Arabia" and reported that many parents had limited knowledge about the classification and different presentations of autism.

As regards mothers' attitude about autism spectrum disorders of their

children. The current study revealed that more than one third of the studied mothers had negative attitude toward autism, while minority of them had positive attitude **from the researcher perspective**, this negative attitude may stem from stigma, lack of understanding, fear of social judgment, and emotional burden.

A study conducted by **ELHawat (2023)** was congruent with the current finding "Assessment of knowledge, attitude and practices of parents having children with autism" and clarifies that slightly more than three quarters of the parents had negative attitude about autism. Additionally, the present result was in harmony with **Köroğlu, Ataman, and Kösetaş, (2024)**, who in the study "A study on the awareness and attitudes of mothers with children aged 0–6 towards autism", they reported that parental had negative attitude which significantly improved after structured psycho-education.

As regards relation between mothers' knowledge and attitude about autism spectrum disorders of their children. There were statistically significant differences regarding mothers' total level of knowledge and attitude. **From the researcher perspective**, this may be attributed to the positive impact of increased knowledge on shaping mothers' attitudes, as better understanding of

autism spectrum disorder helps reduce misconceptions and promotes more supportive and adaptive responses toward their children.

A study conducted by, **Kaman, Ishak, and Muhammad (2023)** was congruent with the current finding "Knowledge, attitudes, and associated factors of caregivers towards children with autism spectrum disorder in East Coast Peninsular Malaysia" and clarifies that caregivers with good knowledge of autism spectrum disorder had positive attitudes toward children with the disorder.

Conclusion

It can be concluded that more than three quarters of the studied mothers had low level of knowledge about autism. In addition, more than one third of the studied mothers had negative attitude about autism. There was a highly statistically significant positive correlation between mothers' total knowledge and their attitude toward autism.

Recommendations

- 1.Improving mothers' knowledge through educational programs to promote their attitudes toward their children with autism spectrum disorder.
- 2.Implement school and community-based awareness programs to reduce bullying toward children with autism spectrum disorder and promote acceptance, inclusion, and

positive social interaction among peers.

3. Develop guidelines and standardized awareness protocols focused on caring of autistic children and their parents.

References

- AlAlmaei Asiri, W., Shati, A. A., Al-Qahtani, S., Al-Qahtani, Y. A., Aldarami, M. S., Alamri, F. D., ... & Esam Mahmood, S. (2023).** Assessment of parental knowledge, awareness, and perception about autism spectrum disorders in Aseer region, Southwestern Saudi Arabia. *International Journal of General Medicine*, 557-564.
<https://www.tandfonline.com/doi/full/10.2147/IJGM.S377521>
- André, T., Moreira, N., De Lucca, M., Dutra, H., Carlos, D., Fernandez-Garcia, A., & Nascimento, L. (2025).** Strategies used by the nursing team in the care of autistic children and adolescents: An integrative review. *Journal of Pediatric Nursing*, 82, e134–e141.
<https://doi.org/10.1016/j.pedn.2025.04.006>
- Al Aqel, A., Al Saed, S., Alsaber, A., & Al Bustan, S. (2026).** Evaluation of Parental Awareness, Attitudes, and Perceptions Regarding Autism Spectrum Disorders in Kuwait: A Cross-Sectional Analysis of the Impact of Social Awareness Initiatives on Stigmatization. *Journal of Autism and Developmental Disorders*, 1-13.
- Al-Juhaishi, H. Q. K., Jaber, O. A., Lami, F., Jasim, S., Nayeri, N. D., Sabet, M. S., & Al-Gburi, G. (2025).** Risk factors for low knowledge and negative attitudes among caregivers of children with autism spectrum disorder in Iraq: a multi-centre cross-sectional study. *Frontiers in Psychiatry*, 16, 1568467.
- Alyami, H., Naser, A., Alyami, M., Alharethi, S., & Alyami, A. (2022).** Knowledge and attitudes toward autism spectrum disorder in Saudi Arabia. *International Journal of Environmental Research and Public Health*, 19(6), 3648.
<https://www.mdpi.com/1660-4601/19/6/3648>.
- Ayoub, G. (2025).** Autism spectrum disorder as a multifactorial disorder: The interplay of genetic factors and inflammation. *International Journal of Molecular Sciences*, 26(13), 6483.
- Burak, N., Sarisaltik, A., Hidiroğlu, S., & Karavuş, M. (2021).** Autism Awareness of Mothers Scale (AAMS): A study of validity and reliability. *Turkish*

- Journal of Special Education Research and Practice*, 1–11.
<https://dergipark.org.tr/en/pub/trsped/issue/77407/1259103>.
- Den Houting, R., Nordahl-Hansen, A., & Fletcher-Watson, S. (2022).** Helping autistic children. In *The Wiley-Blackwell handbook of childhood social development* (pp. 729-746). Wiley-Blackwell, Wiley.
- ELHawat, F. (2023).** Assessment of knowledge, attitude and practices of parents having children with autism. *Helwan International Journal for Nursing Research and Practice*, 2(3), 233-259.
https://journals.ekb.eg/article_305660.html
- Ferenc, K., Byrka, K., & Król, M. E. (2023).** The spectrum of attitudes towards the spectrum of autism and its relationship to psychological distress in mothers of children with autism. *Autism*, 27(1), 54–64.
<https://journals.sagepub.com/doi/full/10.1177/13623613221081185>.
- Kaman, N., Ishak, A., & Muhammad, J. (2023).** Knowledge, attitudes, and associated factors of caregivers towards children with autism spectrum disorder in East Coast Peninsular Malaysia. *Peer J*, 11, e14919.
<https://peerj.com/articles/14919/>
- Kanamori, K., Suzuki, T., & Ota, C. (2024).** Parenting attitude towards children with autism spectrum disorders: The Japan environment and children's study. *BMJ Paediatrics Open*, 8(1), e002360.
<https://www.nature.com/articles/s41598-024-81343-9>
- Kareem, A. F., Mohammed, A., Ra'aouf, H., & Tiryag, A. (2025).** Parental knowledge and awareness of Autism Symptoms and Management Strategies. *Academia Open*, 10(1), 10-21070.
<https://doi.org/10.21070/acopen.10.2025.11508>
- Kasem, A. A., Alghazawi, W., Ahmad, H. K., Alkhamiseh, Z., & Al-Waked, W. F. (2025).** Jordanian mothers' knowledge and attitude toward caring for a child with autism spectrum disorder. *International Journal of Developmental Disabilities*, 1-9.
- Köroğlu, A. Y., Ataman, S. A., & Köşretaş, B. (2024).** A study on the awareness and attitudes of mothers with children aged 0–6 towards autism in terms of various variables. *International Journal of Developmental Disabilities*, 1-10.
- Ma, D., Luo, H., Wang, Y., Zhou, W., Lu, Y., Lv, B., ... & Hua, Y. (2025).** Knowledge, attitudes and willingness of caregivers of

- preterm infants toward Autism: A Cross-sectional study. *International Journal of Developmental Neuroscience*, 85(1), e10411.
- Male, I., Farr, W., Allard, A., Grahame, V., Maxwell, J., Reddy, V., ... & Parr, J. R. (2023).** Integrated care for autism assessment, diagnosis and intervention. *Paediatrics and Child Health*, 33(9), 277-284.
- Metwally, A., Salah El-Din, E., Sami, S., Abdelraouf, E., Sallam, S., Elsaied, A., ... & Zeid, D. (2025).** Mapping autism in Egypt: population-based insights into prevalence, risk determinants, and severity among children aged 1–12 years. *Molecular Autism*, 16(1), 32.
- Mohamed, S., & Mahmoud, N. (2017).** Knowledge and attitude of mothers and health care professionals related to autistic children. *Tanta Scientific Nursing Journal*, 12(1), 73–100.
- Parveen, Z., Nayab, B., & Mushtaq, T. (2026).** Parental Views on effectiveness of early behavioral therapies on social skills of children with Autism. *Behaviour*, 4(1).
- Sameea, A., Abd El-Wahab, E., & Osman, S. (2025).** Mothers' awareness and knowledge of Autism Spectrum Disorder (ASD): A Multi-Center Study in Qatar. *Sage Open Pediatrics*, 12, 30502225251348293.
- Sarisaltik, A., Hidiroğlu, S., & Karavuş, M. (2023).** Autism awareness of mothers' scale (AAMS): A study of validity and reliability. <https://dergipark.org.tr/en/pub/trsped/issue/77407/1259103>.
- Theodoratou, M., Katsarou, D. V., Mantsos, E., Megari, K., Denazi, E., Papadopoulou, S., & Efthymiou, E. (2026).** Developmental Processes, Comorbidities, and Quality of Life of Autism Spectrum Disorders: Clinical and Neuropsychological Perspectives. In *Dysphagia in Neurodevelopmental and Medical Disorders and Diseases: A Lifespan Approach* (403-428). IGI Global Scientific Publishing.
- Upreti, A., Labib, R., Luopa, N., & Maimaiti, R. (2026).** Autism spectrum disorder: An integrative review of etiology, risk stratification and future directions. *Brain*, 2, 3.
- Xiong, N., & Yu, Z. (2026).** Autism Spectrum Disorder in the Genomic Era: A Comprehensive Review of Etiology, Precision Diagnostics, Clinical Outcomes, and Emerging Gene-Editing Therapies. *Neuropsychiatric Disease and Treatment*, 1-1

Educational Needs of Adult Patients with Leukemia

Basma Ahmed^{1,2}, Nagwa Ragb³, Reda Abd EL salam⁴

¹Nurse Specualist at El Mahalla Fever Hospital, Egypt.

²Master Student of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

³Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

⁴Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Basma Ahmed @nursing.tanta.edu.eg

Email: Basma Ahmed

Abstract

Background: Leukemia is a malignant disorder affecting the blood and bone marrow that negatively influences patients' physical, psychological, and social well-being. **Aim:** This study aimed to assess the educational needs of adults patients with leukemia and evaluate their self-care practices to identify areas requiring continuous educational support. **Design:** A descriptive research design was utilized. **Setting:** The study was conducted at the Oncology and Hematology Department outpatient clinics and Tanta Cancer Institute. **Subjects:** A purposive sample of 100 adult patients with leukemia was included in the study. **Tools:** Two tools were used for data collection: **Tool I**, a structured interview questionnaire about knowledge needed about leukemia, and **Tool II**, a self-care knowledge assessment questionnaire. **Results:** The findings revealed that most patients had inadequate knowledge regarding leukemia and self-care practices upon admission. Although there was a statistically significant improvement in patients' scores after two weeks of hospitalization, many patients continued to demonstrate insufficient knowledge regarding disease and self-care practices. **Conclusion:** Adults patients with leukemia require regular assessment of their knowledge and self-care practices. **Recommendation:** Early identification of educational needs can help improve patients' understanding of their disease and enhance their ability to perform appropriate self-care.

Keywords: Adults patients, educational needs, Leukemia, self-care practices.

Introduction

Leukemia is a hematologic malignancy and one of the major types of blood disorders, characterized by the abnormal proliferation of white blood cells in the bone marrow and peripheral circulation. In adults, leukemia continues to be a significant contributor to cancer-related morbidity and mortality worldwide, with its incidence steadily increasing in both high-income and low-income countries (Arber et al., 2022). Recent global epidemiological reports underscore that adult patients with leukemia often face late diagnoses and endure aggressive treatment regimens, which add further burdens to their physical and emotional well-being (Siegel et al., 2023; Sung et al., 2021).

Leukemia is a multifactorial disease with no single identifiable cause in most cases; however, several risk factors have been associated with its development as genetic predisposition environmental exposures, previous exposure to chemotherapy or radiotherapy. In addition, some viral infections and immune system dysfunctions may

contribute to leukemogenesis (El-Zein et al., 2021).

Leukemia presents with a broad spectrum of clinical manifestations that can vary depending on the disease subtype and its progression. Common symptoms include persistent fatigue, unexplained fever, frequent infections, easy bruising or bleeding, bone or joint pain, swollen lymph nodes, and unintended weight loss (Hoffbrand & Moss, 2022).

Diagnosing leukemia typically involves a combination of clinical assessment, complete blood count (CBC) with differential, peripheral blood smear, and confirmatory tests such as bone marrow aspiration and biopsy. Advanced molecular and cytogenetic testing is also essential to determine the specific leukemia subtype and guide individualized treatment planning (Arber et al., 2022).

Treatment of leukemia in adults involves multiple therapeutic approaches, which vary depending on the specific subtype, disease stage, and individual patient factors. The primary treatment modalities include chemotherapy, targeted therapy,

immunotherapy, radiation therapy, and hematopoietic stem cell transplantation (HSCT) (**Dohner et al., 2022; Tallman & Wang, 2023**).

Adult patients diagnosed with leukemia often encounter significant educational challenges that hinder their ability to actively participate in care and decision-making. Due to the complexity of the disease and the intensity of treatment regimens, many patients lack a clear understanding of their condition, potential side effects, and the importance of self-care practices during and after therapy (**Charambous et al., 2023**).

Nursing management of patients with leukemia consists of assessment, planning, implementation, and evaluation. In relation to assessment, the level of knowledge and needed knowledge of patients should be evaluated, in addition to assessing the patients' self-care practices and their ability to provide self-care (**Tariman & Szubski, 2021**). Nurses should address the physical, cognitive, psychological, emotional, social, and behavioral aspects of patients through health education and appropriate nursing interventions to

improve their self-care abilities and overall quality of life (**Brant et al., 2023; Faiman, 2022; Maloney et al., 2022**).

Significance of the Study:

Leukemia is considered one of the most serious hematological malignancies that significantly affect patients' physical and psychological well-being. Despite advances in medical treatment, many patients still suffer from insufficient knowledge and inadequate self-care practices, which may negatively impact their health outcomes. Therefore, assessing the educational needs and self-care abilities of adult patients with leukemia is essential to identify existing gaps and provide appropriate nursing interventions.

Subjects and Method

Design:

Descriptive research design was used to conduct this study.

Study settings:

The study was conducted at the Hematology clinics at Tanta main University Hospital which affiliated to Ministry of Higher Education and scientific research and Tanta Cancer center which affiliated to Ministry of Health in Egypt.

Study subjects:

A convenient sample of adult patients with leukemia was selected from the previous mention setting, 50 adult patients from each setting.

Inclusion criteria of subjects:

- Age 21-60 years old.
- Both sexes.
- Conscious patients are able to communicate verbally.

Study tools:

Two tools were used in this study.

Tool (I): Structured interview questionnaire about knowledge needed about leukemia: it was developed by the researcher after reviewing the relevant literatures (Chapla et al., 2015; Keohane et al., 2019). It was used to assess patients' disease knowledge level and needed disease knowledge ,it consisted of three parts:

Part one: “Patients’ Bio-socio Characteristics”: such as age, gender, marital status, occupation, level of education and residence.

Part two: past and present history:

This part contained data related to past history as (previous hospitalization, surgeries) present history as (diagnosis, chronic

diseases, medical diseases, smoking and current medication).

Part three: Health and illness related needed knowledge about Leukemia and disease process:

It consisted of (42) multiple choice, (34) true /false questions to assess patients' knowledge disease such as (definition of leukemia, causes, risk factors types, clinical manifestations, laboratory investigation, diagnostic studies, treatment, and side effect of treatment) and (35) questions to assess patients' needed knowledge.

Tool (II): Self-care knowledge assessment questionnaire: This tool was developed by the researcher and was used to assess self-care practice of adult patients with leukemia it was consisted of (13) categories (Skin care, Eye care, Dental care, hair care, Bathing, Dressing/Grooming, control bleeding /prevent injuries, maintain adequate balanced diet, perform exercise, maintain physical, Social, Mental and Occupational health).

Ethical consideration:

An approval of Ethical Committee of Faculty of Nursing was obtained, code number 2023-6-262. Privacy and Confidentiality was maintained regarding data collection. Written

consent was obtained from every patient after explanation of the aim of the study. The nature of the study was not causing any harm or pain to the entire sample. The right to obtain or terminate participation at any time was respected.

An official permission was obtained to conduct this study from the faculty authorities and from the Manager of Tanta main University Hospital which affiliated to Ministry of Higher Education and scientific research and Tanta Cancer Institute which affiliated to Minister of Health in Egypt.

Content validity

All tools were tested for content validity by seven jury of experts in the field of Medical-Surgical Nursing at the Faculty of Nursing.

A pilot study:

The pilot study was conducted on 10% of patients before the actual study to test the applicability of the tools and to determine any obstacles that may be encountered during the period of data collection and needed modification was done. The pilot study sample was excluded from the study.

Reliability of the tool

Alpha Cronbach's test was used to test tool reliability and the estimated reliability. Tool (I): Part three=0.789
Tool (II) = 0.955.

Data collection

-Data were collected over a period of 6 months.

-Tools I and II were used to collect data from the studied patients. Data was collected individually at two different phases; upon admission and after two weeks of hospitalization. The researcher introduced herself after providing a clear explanation about the purpose and nature of the study. Tool, I consisted of three parts; the first part was concerned with assessing the bio-socio-demographic characteristics of the patients and was collected once upon admission. the second part to assess past and present patient's history. The third part was used to assess patients' knowledge and needed knowledge regarding leukemia and was collected twice, upon admission and after two weeks of hospitalization. Tool II was used to assess patients' knowledge related to self-care practices and was also applied at two phases; upon

admission and after two weeks of hospitalization.

Results

Table (1): Illustrates the socio-demographic characteristics of the studied patients with leukemia.

Regarding age, the highest percentage (44%) was among patients aged (21–<30) years, while the lowest (12%) was among those aged (30–<40) years. **Concerning sex**, more than half of the patients (62%) were males. **In terms of marital status**, nearly equal proportions were married (39%) and single (38%). **In relation to occupation**, the highest percentage (41%) was among others, while the lowest (9%) was not working. **As for educational level**, the highest percentage (30%) was highly educated, while the lowest (2%) was postgraduates. The majority of patients (75%) had insufficient income, and more than half (57%) were from rural areas.

Table (2): It shows that upon admission, the majority of patients (94%) had low knowledge levels, while none had high knowledge. After two weeks, as half of the patients (50%) had moderate

knowledge, while low knowledge decreased to (45%), and a small percentage (5%) reached high knowledge.

Figure (1): Illustrates that the majority of patients had a low level of disease-related knowledge upon admission, while after two weeks of hospitalization there was an improvement, with an increase in the proportion of patients with moderate knowledge and a slight rise in those with high knowledge levels. However, the overall knowledge level remained insufficient.

Table (3): Indicates that the majority of patients (98%) had a low level of self-care practices upon admission, while (2%) had a moderate level and none had a high level. After two weeks of hospitalization, (85%) had a low level and (15%) had a moderate level, while no patients had a high level of self-care practice.

Figure (2): Shows that the majority of patients had a low level of self-care practices upon admission, with only a very small proportion having a moderate level and none at a high level. After two weeks of hospitalization, there was a slight improvement in self-care practices,

reflected by an increase in the moderate level; however, most patients still remained at a low level, and no patients reached a high level.

Table (4): Reveals the highest needed priority upon admission was information about medical diagnosis and disease stage (94%), followed by discharge information (77%) and types of treatment (76%). The lowest priority was information about suitable nutritional plan (35%).

Table (5): Presents the distribution of leukemic patients' needed knowledge after two weeks of hospitalization. Compared to the time of admission, the priority of educational needs showed noticeable changes. The need for information about medical diagnosis and disease stage decreased to 85% certain needs increased as patients progressed through treatment and experienced its effects. These included information about side effects of treatments (70%), symptoms and side effects of the disease (58%), and controlling bleeding (58%).

Table (1): Distribution of studied leukemic patients according to socio-demographic characteristics (n = 100)

Socio-demographic characteristics		No.	%
Age	21 < 30	44	44
	30 < 40	12	12
	40 < 50	19	19
	50 year and more	25	25
Sex	Male	62	62
	female	38	38
Marital status	Single	38	38
	Married	39	39
	Divorced	13	13
	Widow	10	10
occupation	worker	27	27
	House wife	12	12
	Not work	9	9
	Retired	11	11
	another	41	41
Educational level	Illiterate	23	23
	Read and write	8	8
	Primary school	15	15
	Secondary school	12	12
	Highly educated	30	30
	Post graduated	2	2
Financial income	Sufficient	25	25
	insufficient	75	75
Place of residence	Rural	57	57
	Urban	43	43

Table (2): Distribution of the studied leukemic patients according to assessment of their disease knowledge upon admission and after 2 weeks of hospitalization (n = 100)

Health and disease-related knowledge assessment about leukemia	Upon admission		After 2 weeks of hospitalization	
	No.	%	No.	%
Overall				
Low (<50%)	94	94.0	45	45.0
Moderate (50% – <70%)	6	6.0	50	50.0
High (≥70%)	0	0.0	5	5.0

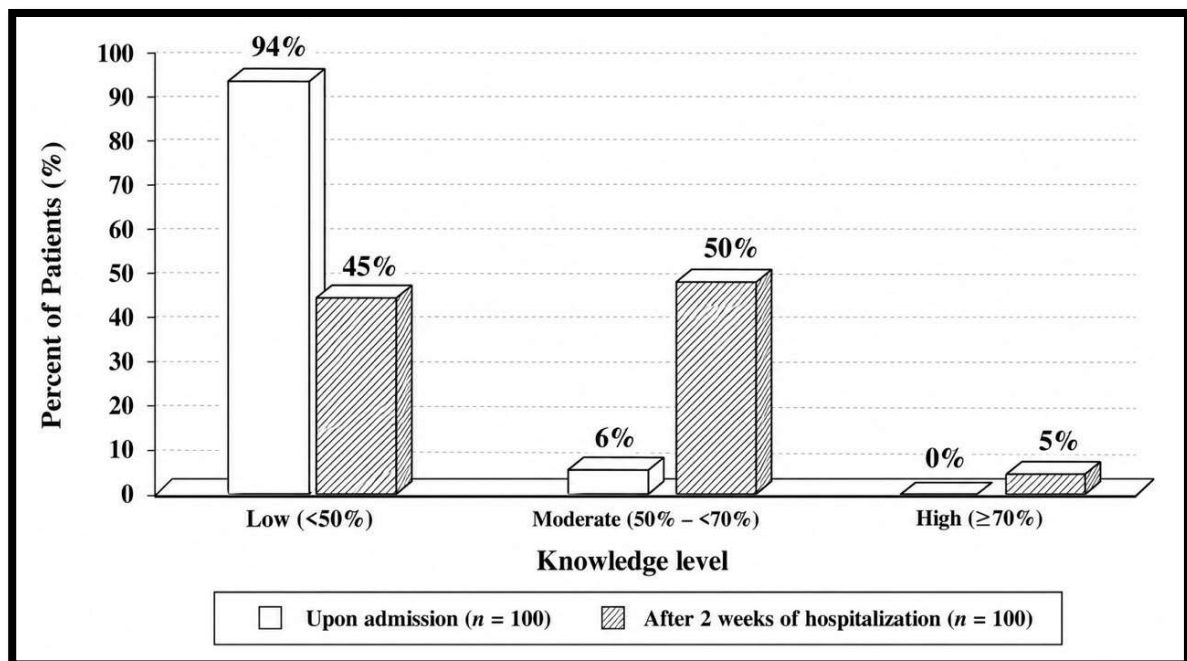


Figure (1): Distribution of the studied patients according to assessment of their disease knowledge upon admission and after two weeks of hospitalization (n=100)

Table (3): Distribution of the studied patients with leukemia according to total level of self- care practice upon admission and after 2 weeks of hospitalization (n=100)

Self-care practice level	On admission		After 2 weeks of hospitalization	
	No.	%	No.	%
Low (<50%)	98	98.0	85	85.0
Moderate (50% – <70%)	2	2.0	15	15.0
High (≥70%)	0	0.0	0	0.0

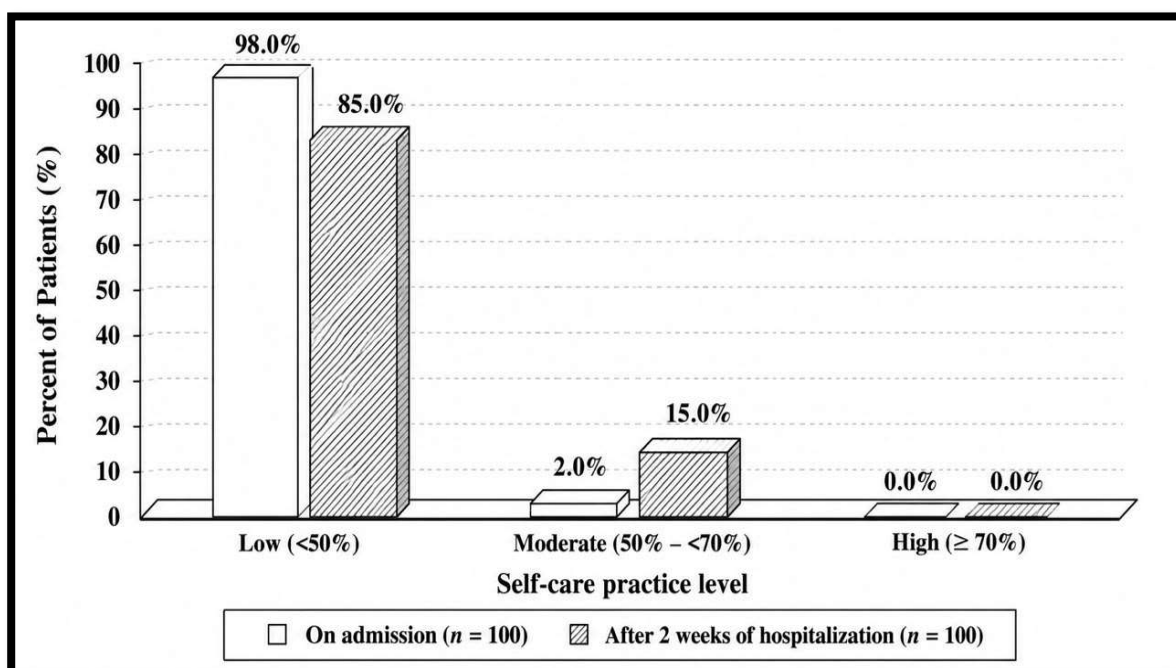


Figure (2): Distrubtion of the studied patients with leukemia according their level of self-care practice upon admission and after 2 weeks of hospitalization (n=100)

Table (4): Distribution of the studied patients with leukemia according to assessment of their needed knowledge upon admission (n=100)

Assessment of needed knowledge according to patients` priorities	No	%
Information about medical diagnosis and stage of disease.	94	94
Information about discharge.	77	77
Information about types of treatment.	76	76
Information about laboratory tests.	73	73
Information about controlling bleeding.	71	71
Information about hygienic self-care	66	66
Information about side effects of treatments.	55	55
Information about psychological support.	53	53
Information about symptoms +side effects of the disease	43	43
Information about suitable nutritional plan.	35	35

Table (5): Distribution of the studied patients with leukemia according to assessment of their needed knowledge after two weeks of hospitalization (n=100)

Assessment of needed knowledge according to patients` priorities	No	%
Information about medical diagnosis and stage of disease.	85	85
Information about discharge.	81	81
Information about psychological support.	77	77
Information about hygienic self-care	72	72
Information about side effects of treatments.	70	70
Information about laboratory tests.	68	68
Information about types of treatment.	64	64
Information about symptoms +side effects of the disease	58	58
Information about controlling bleeding.	58	58
Information about suitable nutritional plan.	54	54

Discussion:

In recent years, increasing attention has been directed toward the pivotal role of patient education in improving health outcomes, reducing complications, and enhancing quality of life. Proper knowledge and effective educational interventions are essential to promote treatment adherence, support psychological adjustment, and empower patients to manage their condition effectively **Charalambous et al. (2023)**

Therefore, this study aimed to assess the educational needs of adult patients with leukemia in order to identify knowledge gaps and improve patients' ability to perform appropriate self-care practices.

In the current study the finding of socio-demographic data indicated that the majority of patients were young adults, particularly those in their twenties, while a considerable proportion were older adults aged fifty years and above. This pattern may suggest that leukemia affects a wide age spectrum, with a noticeable concentration among younger individuals in this study. Similar findings were reported by **Siegel et al. (2023)**, who found that a large proportion of leukemia patients were within the productive age group.

In relation to sex, males constituted the greater proportion of the studied sample compared to females. This

predominance may be explained by increased occupational exposure and lifestyle-related risk factors among males. This result is consistent with the findings of **Siegel et al. (2023)**, who reported a higher incidence of leukemia among males. **Concerning marital status** in the present study, it was observed that the distribution of the studied patients across different marital categories showed no statistically significant difference, indicating that marital status had no apparent influence on the studied outcomes. From the researcher's point of view, this may be attributed to the fact that leukemia is primarily influenced by biological and clinical factors rather than social characteristics such as marital status. This finding was in agreement with previous research which reported that socio-demographic variables, including marital status, were not significantly associated with clinical outcomes among leukemia patients **Mousavi et al. (2022)**. On the other hand, **this result was inconsistent with** another study which highlighted that marital status may play a role in psychological well-being and coping among cancer patients. **Hermann et al. (2024); Ruiz-Rodríguez et al. (2022)**

Regarding to occupational status, the present study revealed that more than one quarter of the studied

patients were workers, while smaller proportions were housewives, retired, and not working. This may be explained by the fact that most patients were within the productive age group. This finding was supported by previous research which indicated that employment status was not significantly associated with disease prognosis among leukemia patients (DeSantis et al., 2024).

Concerning educational level, the present study showed that the highest proportion of the studied patients had low educational levels. This may reflect limited health literacy, which can negatively affect patients' understanding of their disease. This finding was **supported by previous research** which demonstrated that low educational level is associated with poor health literacy and decreased adherence to treatment (Charalambous et al., 2023). However, **in contrast to the current findings**, some studies have suggested that educational level may not always be a significant determinant of patients' knowledge or information acquisition. This may be explained by the increasing availability of diverse information sources, including healthcare professionals, internet-based resources, cancer information services, and social support

networks. Consequently, patients with different educational backgrounds may acquire comparable levels of disease-related information through alternative channels Reifegerste et al. (2023).

Additionally, financial income, the current study revealed that the majority of patients had insufficient income. This may be attributed to the high cost of treatment and long-term disease burden. **This finding was supported by** previous research which demonstrated that low-income patients experience higher financial toxicity and poorer health outcomes (Yabroff et al., 2023).

In relation to place of residence, the present study showed that more than half of the studied patients were from rural areas. This may lead to limited healthcare accessibility and awareness in rural settings. **This finding was supported by previous research** Singh et al. (2023) who reported that rural residence is associated with reduced access to healthcare services. **In terms of patients' knowledge regarding leukemia**, the findings of the present study revealed that most patients had a low level of knowledge upon admission, with none demonstrating a high level of understanding. This finding is **consistent with** Ön et al. (2025); El Habchi et al. (2024) who reported that newly diagnosed

leukemia patients often present with insufficient baseline knowledge due to limited prior education and reliance on non-professional sources of information. This indicates a substantial deficiency in baseline knowledge among patients at the time of hospital entry.

After two weeks of hospitalization, there was a shift in knowledge levels that was observed, as a considerable proportion of patients progressed to a moderate level of knowledge, and a small proportion achieved a high level. However, this improvement, a significant number of patients continued to exhibit low knowledge levels, indicating that the improvement was partial rather than optimal. This suggests that routine hospital exposure alone may not be sufficient to ensure adequate patient understanding, **as supported by Mousavi et al. (2022)**, who emphasized that passive information acquisition is insufficient without structured and patient-centered educational interventions.

The findings of the present study revealed that the majority of adult leukemia patients demonstrated low levels of practice regarding most self-care domains upon admission, particularly in areas such as dental care, hair care, and maintaining balanced nutrition. This may be attributed to the complex nature of

leukemia as a chronic and life-threatening disease, which often requires repeated hospital admissions and continuous medical interventions. Patients are frequently overwhelmed by the disease burden and its complications, which limits their ability to acquire adequate knowledge about self-care practices. Similar findings were reported in previous studies indicating that patients with hematological malignancies often have insufficient baseline knowledge regarding daily self-care activities due to the overwhelming physical and psychological stress associated with the disease (**Hassan et al., 2023**).

Following hospitalization, a slight improvement was observed, with an increase in the proportion of patients demonstrating moderate levels of knowledge across several domains, including eye care, control of bleeding and injury prevention, and nutrition. This change may be explained by the continuous interaction with healthcare professionals during hospitalization.

The present study demonstrated that patients' needs varied significantly between the time of admission and after hospitalization, and these variations can be effectively interpreted through **Maslow's hierarchy of needs**. On admission, patients expressed their

strongest concerns regarding basic and safety-related needs **This is align with recent evidence by Moghaddam et al. (2022)**, which reported that newly diagnosed cancer patients primarily focus on obtaining accurate information about their diagnosis and treatment, For example, almost all patients emphasized the importance of knowing the type and stage of their disease, and the great majority sought clear information about required investigations and treatment options. These findings reflect both safety needs, as patients sought security and reassurance, and a movement toward self-actualization, as they desired full awareness and involvement in their care. Similarly, the majority of patients reported the necessity of proper nutrition, hygienic self-care, and maintaining physical health and exercise, which correspond to physiological needs, the foundation of Maslow's model.

After 2 weeks of hospitalization, the overall percentages of needs changed, suggesting that some of the urgent physiological and safety needs had been partially addressed through the care provided. Nevertheless, other aspects such as psychological and social support, which were reported by more than half of the patients, remained highly significant. These findings align with

belongingness needs, emphasizing the patients' desire for connection, empathy, and support from their families and social environment during treatment. Additionally, concerns regarding maintaining occupational health, expressed by over half of the patients, indicated the importance of esteem needs, as patients sought to preserve their independence, role, and sense of self-worth despite illness-related limitations. **Moghaddam et al. (2022)** this shift in priorities from admission to post-hospitalization illustrates the dynamic nature of patients' needs and **is consistent with Maslow's concept** that once lower-level needs are partially satisfied, higher-order needs become more prominent. At first, survival and safety were the dominant priorities, but with time and medical support, psychological, social, and esteem needs emerged more strongly.

Conclusion

Based on the findings of the present study patients suffering from leukemia need more specific information about disease and self-care practices to fulfill the gap between theory & practices & improvement quality of life.

Recommendations

1-The basic high priority needed knowledge about disease and self-care practice should be given to

Leukemia patients upon admission to hospital.

2-The change in patients needed knowledge detects and continuous assessment of patient knowledge from admission to discharge from hospital.

3-Accessible resources should be available for each patient.

Future recommendations

Individualized patient educational implementation based on assessment of patient needed knowledge in multi-center studies & multidisciplinary approach.

References

- Arber, D., Orazi, A., Hasserjian, R. P., Borowitz, M., Calvo, K. R., Kvasnicka, H., Wang, S., ... Tefferi, A. (2022). International consensus classification of Myeloid Neoplasms and Acute Leukemias: Integrating morphologic, clinical, and genomic data. *Blood*, 140(11), 1200–1228.
<https://doi.org/10.1182/blood.2022015850>
- Brant, J., Wickham, R., Haas, B., & Eaton, L. (Eds.) (2023). Core Curriculum for Oncology Nursing (7th ed.). Oncology Nursing Society.
- Chapla, U., Chapalamadugu, U., Ojochenemi, D., & Chatakonda, R. (2015). Leukemia: Brief review on recent advancements in therapy and management. *Asian Journal of Research in Pharmaceutical Sciences and Biotechnology*, 3(1), 12–26. Retrieved from: <https://www.researchgate.net/publication/281278674>
- Charalambous, A., Wells, M., Campbell, P., Torrens, C., & Young, A. (2023). Health literacy and patient education in cancer care: Implications for practice. *European Journal of Oncology Nursing*, 63, 102258.
<https://doi.org/10.1016/j.ejon.2023.102258>
- DeSantis, C., Miller, K., Wagle, N., & Jemal, A. (2024). Cancer statistics for adults: Recent trends and disparities. *CA: A Cancer Journal for Clinicians*, 74(1), 17–48.
<https://doi.org/10.3322/caac.21820>
- Döhner, H., Wei, A., Appelbaum, F. R., Craddock, C., DiNardo, C. D., Dombret, H., ... Tien, H. (2022). Diagnosis and management of AML in adults: 2022 recommendations. *Blood*, 140(12), 1345–1377.
<https://doi.org/10.1182/blood.2022016867>
- El Habchi, M., Gazzaz, H., El Ouardi, A., El Aatik, Y., & Doghmi, K. (2024). Assessment of educational needs of patients in clinical hematology towards the implementation of a structured therapeutic education program. *The Open Public Health Journal*, 17, e18749445347980.

- <https://doi.org/10.2174/0118749445347980241113054601>
- El-Zein, R., Etzel, C., Cortes, J., & Kantarjian, H. (2021).** Epidemiology of hematologic malignancies in Arab populations. *Frontiers in Oncology*, 11, 674969. <https://doi.org/10.3389/fonc.2021.674969>
- Faiman, B. (2022).** Nursing management of hematologic malignancies. *Clinical Journal of Oncology Nursing*, 26(1), 45–52. <https://doi.org/10.1188/22.CJON.45-52>
- Hassan, R., Ali, M., & El-Sayed, S. (2023).** Knowledge and self-care practices among patients with hematological malignancies. *Asian Pacific Journal of Cancer Care*, 8(1), 33–40. <http://waocp.com/journal/index.php/apjcc/article/view/1086>
- Hermann, M., Goerling, U., Hearing, C., Mehnert-Theuerkauf, A., Hornemann, B., Hövel, P., ... & Ernst, J. (2024).** Social support, depression, and anxiety in cancer patient-relative dyads in early survivorship: An actor-partner interdependence modeling approach. *Psycho-Oncology*, 33(12), e70038. <https://doi.org/10.1002/pon.70038>
- Hoffbrand, A., & Moss, P. (2023).** Essential haematology. (8th ed.). Wiley-Blackwell.
- Keohane, E., Otto, C., & Walenga, J. (2019).** Rodak's hematology: Clinical principles and applications (6th ed., pp. 540–550). Elsevier Health Sciences.
- Maloney, S., Kennedy Sheldon, L., & Bergstrom, N. (2022).** Mosby's Oncology Nursing Advisor: A Comprehensive Guide to Clinical Practice (2nd ed.). Elsevier.
- Moghaddam, N., Coxon, H., Nabarro, S., Hardy, B., & Cox, K. (2022).** Unmet care needs in people living with cancer: A systematic review. *Psycho-Oncology*, 31(9), 1502–1510. <https://doi.org/10.1002/pon.5943>
- Mousavi, S., Saki, M., Mohammadipour, F., Gholami, M., Almasian, M., & Jafari Pour, F. (2022).** Experiences of cancer patients about seeking health information: A qualitative study. *Supportive Care in Cancer*, 30(9), 7697–7704. <https://doi.org/10.1007/s00520-022-07210-3>
- Ön, S., Güçsevgen, Z., Ellidokuz, H., & Öztıp, İ. (2025).** Level of knowledge and awareness of newly diagnosed cancer patients about cancer diagnosis. *Anatolian Journal of General Medical Research*, 35(1), 23–29. <https://doi.org/10.4274/anatoljmed.2024.92905>

- Ruiz-Rodríguez, I., Hombrados-Mendieta, I., Melguizo-Garín, A., & Martos-Méndez, M. (2022).** The importance of social support, optimism and resilience on the quality of life of cancer patients. *Frontiers in Psychology, 13*, 833176. <https://doi.org/10.3389/fpsyg.2022.833176>
- Siegel, R., Miller, K., Fuchs, H., & Jemal, A. (2023).** Cancer statistics, 2023. *CA: A Cancer Journal for Clinicians, 73*(1), 17–48. <https://doi.org/10.3322/caac.21763>
- Singh, G., Williams, S., Siahpush, M., & Mulhollen, A. (2023).** Socioeconomic and rural–urban disparities in cancer outcomes. *International Journal of Environmental Research and Public Health, 20*(4), 2981. <https://doi.org/10.3390/ijerph20042981>
- Sung, H., Ferlay, J., Siegel, R., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2021).** Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide. *CA: A Cancer Journal for Clinicians, 71*(3), 209–249. <https://doi.org/10.3322/caac.21660>
- Tallman, M., & Wang, E. (2023).** Acute myeloid leukemia: Updates on diagnosis and treatment. *Hematology/Oncology Clinics of North America, 37*(1), 1–18. <https://doi.org/10.1016/j.hoc.2022.08.001>
- Tariman, J., & Szubski, K. (2021).** The evolving role of nurses in leukemia care. *Seminars in Oncology Nursing, 37*(3), 151171. <https://doi.org/10.1016/j.soncn.2021.151171>
- Yabroff, K., Zhao, J., Han, X., & Zheng, Z. (2023).** Financial hardship among cancer survivors in the United States. *Journal of Clinical Oncology, 41*(3), 431–440. <https://doi.org/10.1200/JCO.22.01041>

Effect of Applying Cryotherapy on Incisional Wound Pain and Physiological Parameters among Patients Post Cardiothoracic Surgery

Safaa E. Ahmed¹, Dina S. Omar^{2,3}, Abd Alhady M. Taha⁴, Abeer F. Elfar⁵

¹Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University.

²Bachelor Degree in Nursing Science, Faculty of Nursing, Ain Shams University, Nurse Specialist, El Mahalla Ophthalmology Hospital.

³Master Student of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt.

⁴Professor of Cardiothoracic Surgery, Faculty of Medicine, Tanta University, Egypt.

⁵Lecturer of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Dina S. Omar

Email: dinafetoh38@gmail.

Abstract

Background: Management of post-cardiothoracic surgery pain is crucial; while pharmacological interventions are standard, non-pharmacological modalities like cryotherapy are gaining recognition for their potential to alleviate incisional pain and stabilize physiological responses without systemic side effects. **Aim:** Evaluate the effect of applying cryotherapy on incisional wound pain and physiological parameters among patients post cardiothoracic surgery. **Design:** A quasi- experimental research design was utilized. **Setting:** The study conducted at Cardiothoracic Intensive Care Unit of Tanta International Teaching Hospital in Tanta University Hospitals **Subject:** A purposive sampling of 80 critically ill patients aged from 21 to 60 years. **Tools:** Three tools were used in this study for data collection: **Tool I:** Cardiothoracic Patient's Assessment. It includes 2 parts as following: - **Part (1)** "Patient's socio-demographic characteristics Part (2): clinical data of studied patients **Tool II:** "Numerical pain rating scale" **Tool III:** Physiological Parameters Assessment. **Results:** The application of cryotherapy demonstrated a highly significant clinical and statistical efficacy ($p=0.000$) in reducing post-cardiothoracic surgery chest pain, where severe pain was completely eradicated (0%) in the study group post-intervention, while it persisted in up to 37.5% of the control group by the second post-operative day. Also, the intervention of cryotherapy provided highly effective role in stabilizing vital signs (heart rate, respiratory rate, MAP, and oxygen saturation) and reducing the dependency on pain medications with $p=0.000$. **Conclusions:** Implementation of Cryotherapy on Patients Post Cardiothoracic Surgery reducing Incisional Wound Pain. **Recommendations:** Additional research is needed to evaluate the effect of various non-pharmacological interventions on reducing Incisional Wound Pain and improving Physiological Parameters among Patients Post Cardiothoracic Surgery

Keywords: Cryotherapy, Cardiothoracic Surgery, Non-Pharmacological Intervention, Physiological Parameters, Postoperative Pain.

Introduction

Cardiothoracic surgery encompasses a diverse array of procedures targeting the heart, lungs, mediastinum, and other thoracic structures. These surgeries are often complex and invasive, necessitating meticulous surgical techniques and intensive postoperative care. Common indications for cardiothoracic surgery include coronary artery disease, valvular heart disease, congenital heart defects, thoracic malignancies, and end-stage lung disease (**Ashique et al., 2021**). In Egypt, cardiovascular diseases (CVDs) constitute the leading cause of morbidity and mortality, accounting for approximately 46% of all deaths and placing a profound clinical burden on the national healthcare system (World Health Organization [WHO], 2020). Consequently, the demand for complex cardiothoracic surgeries—such as coronary artery bypass grafting and valvular operations—has experienced a substantial and continuous escalation across major Egyptian university hospitals and specialized cardiac institutions (**Khedr et al., 2022; Sanad, 2019**). These surgical interventions, while essential for survival, inherently subject a vast cohort of Egyptian patients to severe post-operative

challenges, most notably intense incisional pain, which demands optimized nursing care and innovative non-pharmacological management.

Despite advancements in surgical techniques and perioperative care, postoperative pain remains a significant concern for patients undergoing cardiothoracic surgery. Incisional pain, originating from surgical wounds, is a predominant source of discomfort in the immediate postoperative period. Additionally, patients may experience pain related to chest tube placement, sternal instability, rib fractures, and other procedural factors. Inadequately managed pain can lead to prolonged hospital stays, delayed recovery, impaired respiratory function, and increased risk of complications (**Ptaszek et al., 2023**).

Traditionally, pain management in the postoperative setting relies heavily on pharmacological interventions, including opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), and adjuvant analgesics. While these medications are effective for many patients, they are associated with a host of adverse effects, including respiratory depression, sedation, nausea, constipation, and the risk of addiction or dependence.

Moreover, individual variations in drug metabolism and tolerance can complicate dosing and efficacy (**Bogale et al., 2022**).

Given the limitations and potential risks associated with pharmacological approaches, there is growing interest in non-pharmacological modalities for pain management in cardiothoracic surgery. These modalities may include regional anesthesia techniques, acupuncture, transcutaneous electrical nerve stimulation (TENS), relaxation therapies, and cold therapy (cryotherapy). Non-pharmacological interventions offer the potential to reduce reliance on opioids, minimize adverse effects, and improve overall patient satisfaction and outcomes (**Péus et al., 2022**).

Cryotherapy, or the therapeutic use of cold, has been employed for centuries to alleviate pain, reduce inflammation, and promote tissue healing. The application of cold induces vasoconstriction, decreases tissue metabolism, and inhibits nerve conduction, leading to analgesic effects (**Ibrahim et al., 2022**). Cryotherapy can be delivered through various modalities, including ice packs, cold compresses, cooling pads, and specialized devices (**Currie & Stewart, 2023**).

The efficacy of cryotherapy in pain management has been demonstrated across a range of clinical settings, including orthopedic surgery, sports medicine, dermatology, and postpartum care. In the context of acute musculoskeletal injuries, cryotherapy has been shown to reduce pain, swelling, and bruising, facilitating early mobilization and rehabilitation.

Moreover, cryotherapy has been proposed as an adjunctive therapy for chronic pain conditions, such as osteoarthritis and fibromyalgia, offering symptomatic relief and improving functional outcomes (**Woo et al., 2022**).

While cryotherapy has been widely studied and utilized in various clinical scenarios, its application in the context of cardiothoracic surgery remains relatively understudied. The rationale for employing cryotherapy in this population lies in its ability to mitigate incisional wound pain, chest wall discomfort, and inflammation, thereby complementing existing pain management strategies. By targeting peripheral nerves and sensory receptors, cryotherapy may offer rapid and effective pain relief without the systemic side effects associated with pharmacological agents (**Patel et al., 2021**).

Additionally, cryotherapy may exert beneficial effects on physiological parameters, such as heart rate, blood

pressure, respiratory rate, and oxygenation, which are crucial indicators of postoperative recovery and stability (**Verma et al., 2022**).

Post-operative pain remains a paramount challenge following cardiothoracic interventions, frequently leading to respiratory complications, delayed mobilization, and prolonged hospitalization. While pharmacological analgesia is standard practice, its associated side effects underscore the clinical imperative for adjuvant, non-pharmacological modalities. In this context, cryotherapy (cold therapy) has emerged as a highly effective, safe, and cost-effective intervention. The therapeutic mechanism of cryotherapy lies in its ability to induce localized vasoconstriction, reduce tissue metabolism, and slow nerve conduction velocity, thereby effectively elevating the pain threshold and mitigating localized inflammatory responses. Consequently, integrating cryotherapy into post-operative care protocols offers a promising pathway to significantly decrease pain intensity and enhance overall patient recovery outcomes (**Ptaszek et al., 2023**).

This study aims to provide valuable insights into the role of cryotherapy as a non-pharmacological adjunctive therapy for postoperative pain

management in cardiothoracic surgery. Ultimately, the findings of this research have the potential to enhance patient care, optimize recovery outcomes, and inform evidence-based practice in the field of cardiothoracic surgery and pain management.

Significance of the study:

Based on clinical observations, cardiothoracic surgery ICU still faces significant pain management problems post surgeries. Pain could not be reduced or relieved by pharmacological treatment alone. Application of superficial cold gel packs is an efficient technique for pain relief because it slows down the speed of nerve conduction which in turn lessens pain. Although some studies have explored cold applications, such as **Mohammadi et al. (2018)** who examined chest tube removal pain, and **Pishkarmofrad et al. (2016)** who evaluated localized thoracic pain, there is still limited research focusing specifically on incisional wound pain combined with physiological parameters. However, there is little research on the impact of using a cold gel pack on incisional pain in post-cardiothoracic surgery. Therefore, the purpose of the current study is to evaluate the effect of applying Cryotherapy on incisional wound pain and physiological

parameters among patients post cardiothoracic surgery.

Aim of the Study

The aim of this study is to:

Evaluate the effect of applying cryotherapy on incisional wound pain and physiological parameters among patients post cardiothoracic surgery.

Research Hypotheses:

H1- Patients who would receive cryotherapy post cardiothoracic surgery are expected to have less pain intensity than the control group.

H2- Patients who would receive cryotherapy post cardiothoracic surgery are expected to have improvement of physiological parameters than control group.

Subjects and Method

Research design:

A quasi- experimental research design was utilized in this study

Setting:

The study was conducted at Cardiothoracic Intensive Care Unit of Tanta International Teaching Hospital at Tanta University Hospitals which is affiliated to Ministry of Higher Education and Scientific Research. This unit is equipped with 9 bed capacity and includes advanced technology and manpower required for patients' care.

Subjects:

A purposive sample of 80 patients with cardiothoracic surgery was

selected from the previously mentioned setting. Based on Epidemiological Information Program (EPI info) and the total patients admitted per year according to review of Tanta University Hospital statistical health records in 2022 were 100 patients ⁽⁶⁾, and the sample size calculated as the follows: Z = confidence level 95%, d = Error proportion (0.05), P = population (50%). The Sample was divided into two equal groups, 40 patients in each group as follows:

Control group consisted of (40) patients who received routine nursing care by hospital nursing staff such as giving analgesic medications.

Study group consisted of (40) patients who received Cryotherapy by the researcher in addition to routine care and analgesia

Inclusion criteria:

The subjects were selected according to the following criteria:

- Adult patients (21 to 60 years), Both sexes, Hemodynamic stability
- Patients who are conscious and able to communicate.

Exclusion criteria

- Unconscious patients, Patients under effect of sedation, Ventilated patients.
- Raynaud disease, Patients have post-operative complications eg infection and bleeding.

Tools for data collection:

Three tools were used for data collection as the following:

Tool I: Cardiothoracic Patient's Assessment. This tool was developed by researcher after reviewing literature (Boling, 2019; Thompson-Brazill et al., 2020). It included 2 parts as follows:

Part (1) "Patient's socio-demographic characteristics": such as age, sex, marital status, occupation, level of education,

Part (2): Clinical data of studied patients such as current diagnosis, past medical history, previous hospital admission and previous opioid medication therapy.

Tool II: "Numerical pain rating scale" This scale was developed by McCaffery et al., 1994 to assess pain intensity in conscious patients. It consists of 10 points numerical scale with (0) representing no pain, (1–3) representing mild pain, (4–6) representing moderate pain, (7–9) demonstrating representing severe pain and (10) representing intolerable pain.

Tool III: Physiological Parameters Assessment:

It was developed by the researcher after reviewing the relevant literature (Berman et al., 2016; Peate & Wild, 2018; Zaccagnino & Nedeljkovic, 2017). It included pulse rate, mean

arterial pressure, respiratory rate, and oxygen saturation (SpO₂).

Physiological parameters were recorded and analyzed directly without an aggregate scoring system.

Method

1. Official Permission to carry out the study was obtained from the responsible authorities at the study setting.

2. Ethical consideration:

- a. Scientific Research Ethical Committee approval was obtained with code number (208/2/2023) from the Faculty of Nursing, Tanta University and the Scientific Ethics Committee of Faculty of Medicine with code number (36264MS80/2/23).
- b. Nature of the study didn't cause any harm or pain to the entire subjects.
- c. Informed consent was taken from every patient after explanation the aim of the study and including the right to withdrawal at any time.
- d. Confidentiality and anonymity were maintained by use of code number instead of name and privacy of the patients will be taken into consideration regarding data collection.

3. Three tools were used in this study, tool I and tool III were developed by the researcher after reviewing the relevant literature except tool II was developed by McCaffery et al. 1994.

4. The developed tools were tested for content validity by a jury of seven experts in the field of Critical Care and Emergency Nursing.

5. A pilot study was conducted on 10% of patients to test the feasibility and applicability of the tools and to determine any obstacles that may encounter during the period of data collection, accordingly, needed modification was done. Those patients were excluded from the study subjects.

6- Tool reliability: alpha Cranach's test was used based on standardized items is 0.86, 0.80 and 0.95 respectively for the tools I, II and III.

7. Patients who fulfill the inclusion criteria immediately on admission was assessed and divided into two equal groups, 40 patients in each group. The researcher started by control group first to prevent data contamination.

8- Data collection was carried out within 6 months from March 2023 to September 2023.

9- The present study was conducted through four phases as follows:

1. Assessment phase:

It was performed for all studied patients before the application of the superficial cold gel pack using the tool I & tool II as a pretest to determine patients who met the inclusion criteria and two establish baseline data.

2. Planning phase:

During this phase, goals and expected outcome criteria was formulated based on priorities during implementing cryotherapy as decreasing patient's total pain intensity mean score based on assessment phase.

3. Implementation phase:

Control group received routine care which included giving sedations and analgesic medication as ordered.

Study group received Cryotherapy as follows:

Baseline pain assessment was performed by the researchers before applying Cryotherapy. According to the manufacturer's recommendations, the cold gel pack was used for localized Cryotherapy. It was placed in the freezer for 30 to 40 minutes; after bringing it from the freezer, it was wrapped in a washcloth or towel, the researchers immediately put the cold gel pack over the median sternotomy incision of the patients for 20 minutes. The cold gel pack was left in place until the time to remove it, and the researchers remained beside each patient bed to confirm this. At the end of 20 minutes, the patients were instructed to make deep breathing exercises. After the exercises, patient's pain intensity and

physiological parameters were measured (**Pishkarmofrad et al., 2016**).

4. Evaluation phase:

- The studied patients were evaluated using tools II and III. The evaluation was done before and after using the Cryotherapy two times to evaluate its effect on the severity of pain and physiological parameters in post cardiothoracic surgery patients.

- The control group was evaluated using tools II and III. The evaluation was done before and after routine care according to the hospital two times to evaluate its effect on the severity of pain and physiological parameters in post cardiothoracic surgery patients.

Statistical analysis:

The collected data was organized, tabulated and statistically analyzed using SPSS software statistical computer package version 26. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison was done using Chi-square test (χ^2). For comparison between means of variables for two groups, independent samples T-test was used. For comparison between means for variables pre and post intervention in a group, paired samples T-test was used. Correlation between variables was evaluated using Pearson and Spearman's

correlation coefficient r . A significance was adopted at $P < 0.05$ for interpretation of results of tests of significance (). Also, a highly significance was adopted at $P < 0.01$ for interpretation of results of tests of significance (*).

Results

Table (1): Shows distribution of studied patients regarding their socio-demographic characteristics: It was observed that more than half (67.5% and 57.5%) of patients in both control and study group were aged between (50-60) years old. In relation to Gender: more than half (67.5% and 52.5%) of patients in both control and study group were male. As regards marital status: more than two thirds (72.5% and 82%) of patients in both control and study group were married respectively. Near half (42.5 and 45.0) of patients in both control and study group were read and write respectively. Regarding occupation: it was noticed that more than one third (35.0% and 42.5%) in both control and study group were manual work respectively.

Table (2): Represents distribution of the studied patients regarding to their clinical data. It was noticed that nearly half of patients (40%) in the control group were diagnosed as mitral valve replacement compared to (27.5%) in the study group. while

30% of the study group were diagnosed with Coronary Artery Bypass Grafting making it the most frequent diagnosis in study group.

Regarding Past medical history

70.00% of patients in the study group had hypertension, while the control group were had heart disease (67.5%). **As regards previous cardiothoracic surgeries:** A higher percentage of patients of control group (72.5%) have previous cardiothoracic surgeries, but in study group the higher percentage of patients (57.5%) have no previous cardiothoracic surgeries. **Also:** All patients (100%) in both groups received analgesics with no significance difference. **Regarding duration of chest tube:** More than half (55.0% and 62.5%) of patients in both groups had chest tube for duration less than 48 hrs. Concerning smoking history, it was noticed that half (50%) of patients in the control group were smoker compared to (35%) study group.

Table (3): Shows distribution of the studied patients regarding their pain severity before and after implementation of cryotherapy.

The results showed that on the first day post-operative, severe pain was prevalent among 100% of the control group, compared to 57% in the study group. Post-cryotherapy outcomes indicated a clinical improvement

within the study group, where 62.5% of study group had mild pain and 25% of patients reported complete absence of pain, there were statistically significant difference between both control and study group in the 1st and 2nd day post-operative after intervention p, **0.000***. while in the control group all patients (100%) suffered from severe pain before analgesics on the first day, which partially decreased after analgesics to 75% moderate and 22.5% severe pain. By the second day, pain levels rebounded before analgesics with 72.5% experiencing severe and 27.5% moderate pain, which modestly improved after analgesics to 50% moderate, 37.5% severe, and 12.5% mild pain, showing a statistically significant ($P < 0.05$) yet temporary relief on both days.

Table (4): Illustrate the mean scores of physiological parameters of the studied post-cardiothoracic surgery patients before and after implementation of cryotherapy. It was observed that the study group exhibited a highly significant reduction in analgesic medication frequency compared to the control group following the implementation of cryotherapy where ($p < 0.001$). This clinical result was consistently mirrored across all analyzed physiological parameters on the first and second post-operative days; the

study group achieved a significantly more pronounced stabilization and reduction in respiratory rate, heart rate, and mean arterial pressure (MAP) than the control group ($p=0.000$). Furthermore, a highly significant improvement in oxygen saturation levels was uniquely documented within the study group ($p<0.0001$), emphasizing the comprehensive physiological efficacy of the cryotherapy intervention over conventional care.

Table (5): Shows relation between socio-demographic characteristics of the studied patients and their pain severity after 2nd day of implementation of cryotherapy.

It was revealed that the majority of socio-demographic characteristics including age, gender, diagnosis, previous hospital admission, duration of chest tube, and smoking history showed no statistically significant relationship with pain severity after the second day of study in both groups ($p>0.05$). Conversely, the only statistically significant relation was observed within the study group regarding past medical history, specifically for patients with diabetes mellitus ($p=0.002 *$). This indicates that diabetes was the sole socio-demographic factor influencing the

variance in pain severity at this follow-up interval.

Table (1): Distribution of the studied cardiothoracic surgery patients regarding their socio-demographic characteristics

Characteristics	The studied patients (n=80)				χ^2 P
	Control group (n=40)		Study group (n=40)		
	No	%	No	%	
Age (in years)					
(20-<30)	0	0.0	2	5.0	3.284 0.350
(30-<40)	3	7.5	4	10.0	
(40-<50)	10	25.0	11	27.5	
(50-60)	27	67.5	23	57.5	
Range	(31-60)		(28-60)		t=0.700
Mean $\pm$ SD	52.20 $\pm$ 7.643		50.88 $\pm$ 9.219		P=0.486
Gender					
Male	27	67.5	21	52.5	FE
Female	13	32.5	19	47.5	0.254
Marital status					
Single	2	5.0	4	10.0	4.220
Married	29	72.5	33	82.5	
Divorced	2	5.0	1	2.5	0.239
Widow	7	17.5	2	5.0	
Educational level					
Illiterate	3	7.5	4	10.0	0.277 0.871
Read and write	17	42.5	18	45.0	
University/Higher	20	50.0	18	45.0	
Occupation					
House wife	11	27.5	5	12.5	2.874 0.411
Retired	6	15.0	7	17.5	
Manual work	14	35.0	17	42.5	
Employee	9	22.5	11	27.5	

FE: Fisher' Exact test

Table (2): Distribution of the studied cardiothoracic surgery patients regarding their clinical data

Clinical data	The studied patients (n=80)				χ^2 P
	Control group (n=40)		Study group (n=40)		
	No	%	No	%	
Diagnosis					3.439 0.487
AVR	5	12.5	11	27.5	
CABG	12	30.0	12	30.0	
Congenital	3	7.5	2	5.0	
MVR	16	40.0	11	27.5	
Thoracotomy	4	10.0	4	10.0	
Past medical history					6.189 0.013*
Diabetes mellitus	13	32.5	10	25.0	
Hypertension	23	57.5	28	70.0	
Kidney disease	0	0.0	4	10.0	
Heart disease	27	67.5	14	35.0	
Previous cardiothoracic surgeries					FE 0.012*
Yes	29	72.5	17	42.5	
No	11	27.5	23	57.5	
Medication					-
Analgesic	40	100.0	40	100.0	
Duration of chest tube (in hours)					FE 0.495
(<48)	22	55.0	25	62.5	
(≥48)	18	45.0	15	37.5	
Smoking history					FE 0.922
Smoker	20	50.0	14	35.0	
Non-smoker	20	50.0	26	65.0	

FE: Fisher' Exact test

* Significant at level $P < 0.05$.

Table (3): Distribution of the studied post-cardiothoracic surgery patients regarding their pain severity before and after implementation of cryotherapy

Chest pain severity	The studied patients (n=80)															
	Control group (n=40)								Study group (n=40)							
	1 st day				2 nd day				1 st day				2 nd day			
	Before		After		Before		After		Before		After		Before		After	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
No pain	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9	22.5	0	0.0	10	25.0
Mild	0	0.0	1	2.5	0	0.0	5	12.5	0	0.0	27	67.5	6	15.0	25	62.5
Moderate	0	0.0	30	75.0	11	27.5	20	50.0	17	42.5	4	10.0	24	60.0	5	12.5
Severe	40	100.0	9	22.5	29	72.5	15	37.5	23	57.5	0	0.0	10	25.0	0	0.0
χ^2 , P	64.16, 0.000*				84.09, 0.000*				110.91, 0.000*				112.82, 0.000*			
Range Mean $\pm$ SD	(9-10) 9.68 $\pm$ 0.47		(3-8) 5.65 $\pm$ 1.15		(8-10) 9.48 $\pm$ 0.64		(3-7) 5.13 $\pm$ 1.18		(9-10) 9.68 $\pm$ 0.47		(0-5) 1.70 $\pm$ 1.34		(8-10) 9.33 $\pm$ 0.66		(0-3) 1.05 $\pm$ 0.93	
t, P	20.55, 0.000*				20.48, 0.000*				35.40, 0.000*				45.91, 0.000*			
Control Vs Study t P			13.58 0.000*				16.36 0.000*									

* Significant at level $P < 0.05$.

Table (4): Mean scores of physiological parameters of the studied post-cardiothoracic surgery patients before and after implementation of cryotherapy

Variable	The studied patients (n=80) Range Mean ± SD							
	Control group (n=40)				Study group (n=40)			
	1 st day		2 nd day		1 st day		2 nd day	
	Before	After	Before	After	Before	After	Before	After
Frequency of medication	(3-3) 3.00±0.00	(2-3) 2.20±0.41	(3-3) 3.00±0.00	(2-3) 2.10±0.30	(3-3) 3.00±0.00	(0-2) 0.95±0.64	(3-3) 3.00±0.00	(0-1) 0.68±0.47
t, P	12.49, 0.000*		18.74, 0.000*		20.31, 0.000*		31.00, 0.000*	
Control Vs Study t, P		9.78, 0.000*		15.17, 0.000*				
Respiratory rate	(22-28) 24.30±1.14	(19-25) 21.53±1.36	(21-26) 23.50±1.32	(19-25) 21.30±1.62	(21-27) 23.83±1.28	(16-21) 18.70±1.64	(21-25) 23.45±1.18	(16-21) 18.63±1.51
t, P	9.91, 0.000*		6.66, 0.000*		15.61, 0.000*		15.92, 0.000*	
Control Vs Study t, P		7.09, 0.000*		7.21, 0.000*				
Heart rate	(112-133) 122.38±6.23	(108-129) 118.93±6.04	(113-131) 122.00±5.07	(106-127) 117.70±5.13	(100-130) 117.65±7.08	(85-109) 96.73±5.93	(100-126) 116.05±6.16	(81-106) 96.78±5.82
t, P	2.52, 0.014*		3.77, 0.000*		14.33, 0.000*		14.38, 0.000*	
Control Vs Study t, P		21.23, 0.000*		24.96, 0.000*				
Mean arterial pressure (MAP)	(98-127) 116.78±7.57	(98-124) 114.53±7.51	(99-124) 115.48±7.05	(99-122) 113.33±6.59	(103-130) 117.63±5.87	(10-105) 94.03±14.51	(103-123) 114.70±4.58	(83-105) 96.65±4.92
t, P	1.33, 0.186		1.41, 0.163		9.54, 0.000*		17.00, 0.000*	
Control Vs Study t, P		7.22, 0.000*		12.30, 0.000*				
Oxygen saturation	(90-98) 93.83±1.72	(93-98) 94.88±1.29	(90-96) 93.43±1.38	(92-97) 94.55±1.06	(88-96) 91.90±1.97	(92-99) 96.08±1.90	(89-95) 92.18±1.34	(93-99) 97.38±1.44
t, P	3.09, 0.003*		4.10, 0.000*		9.64, 0.000*		16.71, 0.000*	
Control Vs Study t, P		3.45, 0.001*		10.55, 0.000*				

* Significant at level P<0.05.

Table (5): Relation between socio-demographic and clinical characteristics of the studied cardiothoracic surgery patients and their pain severity after 2nd day of implementation of cryotherapy

Characteristics	The studied patients (n=80) pain severity Mean $\pm$ SD			
	Control group (n=40)	F/t P	Study group (n=40)	F/t P
Age (in years)				
(20-<30)	-		1.50 $\pm$ 0.707	
(30-<40)	5.67$\pm$0.58	1.058	2.00$\pm$0.816	1.915
(40-<50)	4.70 $\pm$ 1.34	0.357	0.91 $\pm$ 0.701	0.145
(50-60)	5.22 $\pm$ 1.16		0.91 $\pm$ 0.996	
Gender				
Male	5.26$\pm$1.13	1.076	1.05 $\pm$ 0.973	0.000
Female	4.85 $\pm$ 1.28	0.306	1.05 $\pm$ 0.911	0.987
Diagnosis				
AVR	5.40 $\pm$ 1.82		1.36 $\pm$ 0.924	
CABG	5.08 $\pm$ 0.79	1.036	0.67 $\pm$ 0.778	1.516
Congenital	4.00 $\pm$ 1.73	0.402	1.50 $\pm$ 0.707	0.219
MVR	5.13 $\pm$ 1.09		1.27 $\pm$ 1.104	
Thoracotomy	5.75$\pm$1.26		0.50 $\pm$ 0.577	
Past medical history				
Diabetes mellitus	4.77 $\pm$ 1.17		1.80 $\pm$ 0.919	
Hypertension	4.83 $\pm$ 1.11	3.709	1.00 $\pm$ 1.054	10.795
Kidney disease	-	0.062	0.50 $\pm$ 0.577	0.002*
Heart disease	5.33$\pm$1.14		0.93 $\pm$ 0.829	
Previous hospital admission				
Yes	5.28$\pm$1.25	1.755	0.88 $\pm$ 0.857	0.955
No	4.73 $\pm$ 0.91	0.193	1.17 $\pm$ 0.984	0.335
Duration of chest tube (in hours)				
(<48)	5.21$\pm$1.06	2.17	1.50$\pm$0.707	2.511
($\geq$ 48)	4.71 $\pm$ 0.81	0.143	1.05 $\pm$ 0.911	0.112
Smoking history				
Smoker	5.13$\pm$1.09	1.036	1.36$\pm$0.92	1.38
Non-smoker	5.08 $\pm$ 0.79	0.450	0.91 $\pm$ 0.996	0.143

* Significant at level $P < 0.05$.

Discussion

In relation to socio-demographic characteristics and clinical data.

The socio-demographic analysis of the studied population showed that more than half of the participants who underwent cardiothoracic surgery were aged 50-60 years. This is consistent with worldwide observations indicating that older people suffer more from coronary vascular disease (CVD). Aging is coupled with structural transformations within the heart and vasculature, for example, stiffening of the myocardium and decreased compliance of arteries. **Lobo and Fischer (2023)** further highlighted that the fundamental issue is not so much with increased population suffering from CVD, but with aging, the complications of surgeries also increase, thus there should be more focus on geriatric as follows in the post-operative care.

Moreover, more than half of the studied patients were male. This was the same line with **Smilowitz et al. (2020)** who claimed that there are more CVD patients among males because of the risk factors like testosterone, smoking and differences in cholesterol metabolism. Nevertheless, females having cardiothoracic surgery often are difficult to treat because of delayed diagnosis and smaller

coronary vessels due to less access to advanced medical care which makes them have worse outcomes (**Mazzeffi et al., 2020**).

One notable study analyzing data from the National Health and Nutrition Examination Survey (NHANES) in the United States investigated the associations between various occupational categories and the risk of cardiovascular diseases (CVD) as well as all-cause mortality. The findings revealed that individuals employed in physically demanding occupations—such as construction, manual labor, cleaning, and low-wage sales and service roles—had significantly higher risks of developing CVD and increased mortality rates compared to those in less physically stressful or more stable occupations within the same sectors (**NHANES, 2025**).

The study attributed these disparities to multiple factors, including chronic physical strain, psychosocial stress resulting from low job control, limited access to healthcare services, and the prevalence of unhealthy behaviors such as smoking and poor dietary habits. Additionally, irregular work schedules and shift work were identified as contributing factors that disrupt circadian rhythms and negatively affect cardiovascular health.

These findings underscore the importance of considering occupation as a key social determinant of health and suggest that workplace environment and job characteristics play a critical role in long-term health outcomes.

In relation to clinical data, it was pointed to that hypertension and heart disease are the most common comorbidities among the patients in the present study. **Bosco et al. (2021)** stated that one of the factors increasing the chances of perioperative complications such as arrhythmias and stroke is the existence of hypertension. Also, the control group had a bigger proportion of patients who had undergone cardiothoracic surgery previously. This is indicative of the more advanced stage of CVD that repeatedly requires surgical intervention (**Okkonen et al., 2021**). These findings reinforce the necessity for preoperative evaluations and focus measures to increase the effectiveness of the surgical intervention and recovery. The optimal duration for chest tube drainage following cardiac and thoracic surgeries, with varying findings depending on the surgical approach, patient characteristics, and institutional protocols. A randomized controlled trial by **Poulsen et al. (2023)** examined the effect of early

chest tube removal (on the day of surgery) versus removal on postoperative day one after adult cardiac surgery. The study found no significant difference in pain levels, respiratory function, or postoperative complications between the two groups, suggesting that chest tube removal within 24–48 hours may be safe under certain clinical conditions, such as low drainage volume and absence of air leak.

A systematic review by Mohammadi et al. (2021) also supported early removal, with several included studies recommending removal within 24–48 hours post-surgery if drainage is minimal (e.g., <100–200 mL over 8 hours). However, the authors also highlighted conflicting evidence, as some studies advocated for a more conservative approach, especially in complex cases or in patients with higher bleeding risk. In the context of enhanced recovery after cardiac surgery. **St-Onge et al. (2021)** reported that active clearance and proper management of chest tubes significantly reduced the incidence of complications such as pericardial and pleural effusions, which could otherwise prolong chest tube duration. Their findings support the idea that with improved protocols, shorter chest tube durations (<48 hours) can be safely achieved in most cases.

Regarding the influence of smoking, there is evidence to suggest that smoking status impacts postoperative recovery and pulmonary function. For example, **Molina et al. (2020)** noted that smokers had longer hospital stays and delayed recovery due to reduced lung function and higher complication rates. Although few studies directly linked smoking to prolonged chest tube duration after cardiac surgery, it is reasonable to infer that non-smokers, having better pulmonary outcomes, may require shorter drainage durations, consistent with our finding that 65% of the study group were non-smokers, compared to 50% smokers in the control group.

Effect of Cryotherapy on Pain Severity and physiological parameters.

Postoperative pain is one of the most challenging problems to manage due to its changeable nature. Furthermore, it adds to the risk of impeded movement, impaired lung function, and severe complications due to pain that is not managed at all. These challenges are made much easier by the application of targeted and advanced pain management techniques, such as the use of cryotherapy. Regarding chest pain severity. The study group reported a shift from a level of severe to mild pain within 48 hours of the

intervention. In support of the current study, the findings from **FROST (2021)** reported that intercostal cryoanalgesia was found to have a significant effect on pain control in patients undergoing minimally invasive cardiac surgeries. Also the results of the study indicate that the use of cryotherapy has advantages such as being non-invasive, having few to no side effects, and limiting the patient's need for opioid treatment. **Mazzeffi et al. (2020)**, the use of multi-modal pain management techniques that included cryotherapy reduced pain scores but also enhanced patients' satisfaction and functional recovery.

Physiological Parameter Improvements

The physiological parameters of the study group including the respiratory rate, heart rate, mean arterial pressure and oxygen saturation, showed significant improvements after the procedures involving cryotherapy. These results are in line with those reported by **Lee et al. (2020)** who saw improved stability of hemodynamics in patients put on optimized pain control. The decreases in heart rate and MAP seen in the present study indicate lower sympathetic activation which is normally high due to pain and stress. Improvements in respiratory rates are indicators of effective pain control

because patients are able to breathe more comfortably and minimize the chances of pulmonary complications like atelectasis. According to **Her et al. (2020)** effective analgesia is crucial when evaluating patients pre- and post-surgery of thoracic procedures. Also, studies indicate that the changes in oxygen saturation level show improvement in pulmonary function and reduction on hypoxemia, which are essential to recovery.

Changes in respiratory rate, heart rate, MAP, and oxygen saturation in the study group were significantly better compared to the control group. This means that cryotherapy not only relieves pain but also improves physiological stability. The same improvements were noted by **Lee et al. (2020)** who argue that effective pain management reduces the activation of the sympathetic nervous system, resulting in lower heart rates and stabilized blood pressure.

Compared to these studies, the improvements in respiratory rate and oxygen saturation demonstrate the role of cryotherapy in the prevention of pulmonary complications like atelectasis and hypoxemia. As pointed out by **Her et al. (2020)**, deeper breathing and exchange of oxygen are more critical for recovery of cardiothoracic surgery patients. Pain relief is

important because it enables these processes.

Decreasing frequency of drug usage in the study group substantiates the claim of cryotherapy effectiveness in pain management and avoidance of active pain treatment. **Smilowitz et al. (2020)** noted two important aspects of opiate usage: the negative effects such as respiratory depression and their over-dependence. The implications of these studies are that cryotherapy may be more beneficial than previously thought with respect to physiological changes and enhancing postoperative safety.

Part (III): Relation between clinical data of the studied patients and their severity of pain

Age and sex were the categorical factors that affected pain with respect to its severity. Younger patients claimed their pain levels to be higher, and this may be due to more pain sensitivity or higher activity levels than older patients (**Napan et al., 2020**). Male patients also reported higher baseline pain which was also noted to decline after the intervention greatly. This phenomenon concurs with **Andersson et al. (2020)** who reported gender-based differences in pain perception and treatment response alike

The most significant determinants of pain intensity and recuperation were age and gender. Younger patients

have reported a higher pain baseline which could be attributed to either a higher perception of pain, or greater activity in comparison to older patients. **Napan et al. (2020)** note similar patterns, explaining them with differences in physiology and psychology associated with age groups. There was also evidence of gender disparities with males having more pain but crying out less, leading to improved results. This confirms the findings of **Mazzeffi et al. (2020)** who pointed toward gender differences concerning pain and how they react to treatment.

According to diagnosis and past history.

The type of surgery as well as comorbid conditions had an additional effect on the patients. Patients who underwent AVR suffered the most pain, which is also in agreement with **Andersson et al. (2020)** who categorized AVR as a range IV procedure because of the high surgical stress involved. Other comorbidities like hypertension and diabetes resulted in delayed recovery and poor outcomes, indicating the need for more focused attention to these groups.

Identifying the factors that influence the intensity of chest pain after surgery is important in development of effective pain control methods and supporting rehabilitation after

cardiothoracic procedures. Whilst age, gender, diagnosis, number of previous admissions to the hospital, length of the chest tube, and smoking did not have a statistical significance. A discussion of these results widely available in other publications is provided by considering what it means for practice and patient treatment.

Identifiably the type of surgery together with the level of marital involvement were also contributory in differing levels of pain perceived. The patients with AVR experienced the most pain and this is expected because of the severe surgical injury sustained during the operation. Improved pain management outcomes were observed in married patients which may indicate the importance of social support for aid in recovery.

Differences in post-operative or even pre-operative pain across age groups were not significantly correlated with age-related barriers to pain perception and tolerance. This finding is contrary with **Smilowitz et al. (2020)**; **Napan et al. (2020)**, younger individuals are assumed to have higher sensitivity towards pain due to developments in sensorial nociceptive structures and a low tolerance towards pain stimulus. Accepting this, other literature disputes the impact of aging on

reported pain severity by concentrating on psychological and social aspects of pain coping mechanism and experience such as **Mazzeffi et al. (2020)**.

Moreover, it is worth noting that elderly may also over report pain facilitating feeling of weakness or not wanting to be a burden to caregivers do claim (**Lee et al., 2020**). In terms of the variables measured here, it is possible that any attempt on my part to control age-related differences in pain suffered left no significant differences as I found. Improving patient outcomes is an interesting area for further work due to whether pain management approaches need to be tailored to optimize recovery across different age groups.

The level of pain experienced by male and female patients was not found to be significantly different, **Her et al. (2020)** have pointed out that women are known to express high levels of pain after surgery compared to men due to biological and psychosocial reasons. This may be due that, differences in hormones, especially the effect of estrogen on pain mechanisms have been put forward as some of the reasons why there is high pain perception in women (**Andersson et al., 2020**).

On the other hand, **Vinod et al. (2020)** showed that male patients are mostly reported to have high pain

thresholds and thus are expected to report less pain due to sociocultural factors. It is a possibility, however, there is no evidence to suggest that these differences in gender have effects in post surgery nursing care because standard pain management is practiced (**Franey et al., 2020**). These results might suggest that there were no significant differences in this study because both men and women were well managed and thus reported the same levels of pain.

Participants of the study who underwent Aortic Valve Replacement (AVR), Coronary Artery Bypass Graft (CABG), congenital heart ailments, Mitral Valve Replacement (MVR), and thoracotomy was similar in terms of pain severity. This result implies that the specific type of surgical procedure may not be one of the strong contributors of post-operative pain severity when appropriate pain management techniques are applied.

Nonetheless, **Lee et al. (2020)** indicates that AVR and CABG surgeries have higher pain scores on the scale due to the greater degree of tissue trauma and longer recovery periods. The failure to note significant differences in this particular study may be due to the effectiveness of the pain management techniques put in place such as the use of multimodal

analgesia and other non-drug techniques including cryotherapy, which were implemented in the **FROST trial (2021)**.

While there were no statistically significant differences, the variability of the pain experienced within individuals should not be ignored. Individual patient factors, including psychological distress, self-reported pain level before surgery, and some surgical related complications may determine post-operative pain. Further research needs to delve into more specific aspects of the pain trajectories associated with different surgical techniques.

Medical History and Pain Rating

The analysis showed that past medical history, particularly heart disease, correlated with a greater severity of pain following surgery. Patients with heart disease stated that their pain severity was higher than those without heart disease. This observation goes hand in hand with research conducted by **Bosco et al. (2021)** which explored the cardiovascular diseases' precursors and noted that they enhance pain sensitivity, inflammation, and prolong recovery time.

Patients with heart disease have higher pain sensitivity which can be elucidated using a number of frameworks. Pain processing pathways altered by chronic

inflammation may explain increased sensitivity towards pain after surgical procedures (**Mayoral Rojals et al., 2022**). Above all heart disease patients may have independent diabetes or hypertension which can contribute to multi-organ failure and further worsen post-surgery recovery (**Mazzeffi et al., 2020**).

Past Hospitalizations and Pain Severity

Patients with previously admitted to the hospital and those without are reported to have no significant difference in the severity of incisional wound pain experienced during the study, which is contradictory to the argument made by **Franey et al. (2019)** that patients with prior hospitalization experience seem to have different pain expectations and coping strategies. Patients with prior exposure to a hospital may yield two opposite outcomes; one can be increased pain tolerance due to familiarity and comfort, while the other is having increased sensitivity towards pain due to anxiety of potential complications that may arise.

Vinod et al. (2020) argue that patients who have experienced prior surgical procedures are actively engaged in the control of pain, which explains the lack of significant differences in the reported pain. Factors such as standardization of

pain management arguments regardless of hospital admission leads to a decrease in variability of pain experienced.

Duration of Chest Tube and Pain Severity

After any surgery, the chest tube is often noted to be the main cause of pain and discomfort alongside the surgery itself. This is specially caused by mobility restrictions and inflammation of the tissue pleura. In this study, however, compared to those with chest tubes for under two days, there was no statistical difference in pain from those kept for 2 days or longer. This is different from the findings by **Smilowitz et al. (2020)**, who acknowledged a rise in pain and a slower recovery rate along with extended chest tube durations.

One possible reason for the no statistical difference is in my opinion that pain management strategies like cryotherapy still alleviate pain, regardless of the presence of chest tubes. Also, patient's posture, early mobilization and good pain management could have reduced the pain disparity among groups (**Andersson et al., 2020**).

Smoking History and Pain Severity

According to smokers and non-smokers, the study found no statistical significance in the level of pain suffered. This however contrasts

findings by **Napan et al. (2020)** that posit, smokers are highly likely to suffer severe pain post-surgery due to elevated systemic inflammation, incompetent oxygenation, and healing wounds.

It is established that tobacco consumption exacerbates microcirculation and causes tissue hypoxia as well as increased sensitivity towards nociception (**Lee et al., 2020**). While the absence of prominent differences within this study might imply that effective peri-operative measures such as nicotine withdrawal management and enhanced analgesia control resulted in elimination of anticipated differences in pain severity. The absence of long-term smoking cessation before surgery impacts pain outcome measures as well as potentially advantageous customized pain intervention methods for smokers deserve an attention in future studies.

Conclusion

Based on findings of the present study, it can be concluded that:

The study group showed greater improvement in physiological parameters including Respiratory rate, heart rate, MAP and Oxygen Saturation. Statistically significant differences existed on both Postoperative days.

A significant improvement was observed in the study group on the first and second post operative days following applying cryotherapy.

The study group showed a marked reduction in the use of analgesic medications, highlighting the role of cryotherapy in decreasing dependency on Pharmacological Pain management.

Recommendations

Based on the findings and conclusions of the present study, the following recommendations are formulated:

Integration of Non-Pharmacological Interventions: Incorporate cold therapy (cryotherapy) as a routine, non-pharmacological adjuvant to standard analgesic protocols for post-cardiothoracic surgery patients to alleviate incisional wound pain.

Continuous monitoring of physiological parameters during cryotherapy applications to ensure patient stability and capture objective recovery trends.

Integrate evidence-based, non-pharmacological pain management modalities, particularly cryotherapy, into undergraduate and postgraduate critical care and surgical nursing curricula.

Educate patients preoperatively about the benefits, safety, and sensations associated with postoperative cryotherapy to

minimize anxiety and enhance compliance.

References

- Andersson, C., Mérie, C., Jørgensen, M., Gislason, G. H., Torp-Pedersen, C., & Overgaard, C. (2020).** Association of β -blocker therapy with risks of adverse cardiovascular events and deaths in patients with ischemic heart disease undergoing noncardiac surgery: A Danish nationwide cohort study. *JAMA Internal Medicine*, 180(3), 336-44.
- Ashique, K., Kaliyadan, F., & Jayasree, P. (2021).** Cryotherapy: Tips and tricks. *Journal of Cutaneous and Aesthetic Surgery*, 14(2).
https://doi.org/10.4103/JCAS.JCAS_141_20
- Bogale, A., Teklehaymanot, T., Ali, J., Kassie, G., & Medhin, G. (2022).** The Recurrence of Cervical Precancerous Lesion Among HIV Positive and Negative Ethiopian Women After Cryotherapy: A Retrospective Cohort Study. *Cancer Control*, 29.
<https://doi.org/10.1177/10732748221129708>
- Bosco, E., Hsueh, L., McConeghy, K. W., Gravenstein, S., & Saade, E. (2021).** Major adverse cardiovascular event definitions used in observational analysis of

- administrative databases: A systematic review. *BMC Medical Research Methodology*, 21, 241.
- Chi, X., & Zhou, Y. (2025).** Associations of occupation categories with cardiovascular diseases and all-cause mortality: an analysis of NHANES 2005-2014. PubMed" /
- Currie, C., & Stewart, S. (2023).** The relationship of apparent diffusion coefficient values of renal cell carcinoma before and after cryotherapy ablation. *Radiography*, 29(3). <https://doi.org/10.1016/j.radi.2023.02.006>
- Franey, E. G., Kritz-Silverstein, D., Richard, E., Alcaraz, J. E., Nievergelt, C., Shaffer, R. A., et al. (2020).** Association of race and major adverse cardiac events (MACE): The Atherosclerosis Risk in Communities (ARIC) cohort. *Journal of Aging Research*, 2020, Article 7417242.
- FROST Trial Investigators. (2021).** Intercostal cryo nerve block in minimally invasive cardiac surgery: The prospective randomized FROST trial. *Pain Therapy*, 10, 1579-92.
- Graves, C., Jones, P., Smith, M., Taylor, K., & Johnson, R. (2021).** Multicenter quality improvement initiative to reduce chest tube duration after congenital heart surgery. *Pediatric Cardiology*, 42(5), 1102–1111.
- Her, A., Choi, B., Rha, S., Kim, Y., Choi, C., & Jeong, M. (2020).** The impact of angiotensin-converting-enzyme inhibitors versus angiotensin receptor blockers on 3-year clinical outcomes in patients with acute myocardial infarction without hypertension. *PLoS ONE*, 15, Article e0242314.
- Ibrahim, H., El Taieb, M., Nada, E., Kamal, E., & Hegazy, E. (2022).** Combined intralesional injection of tuberculin purified protein derivative plus cryotherapy versus each alone in the treatment of multiple common warts. *Dermatologic Therapy*, 35(4). <https://doi.org/10.1111/dth.15350>
- Khedr, S., El-Metwally, T., & Soliman, M. (2022).** Cardiovascular disease burden and healthcare utilization in Egyptian tertiary hospitals. *Egyptian Heart Journal*, 74(1), 32-41. <https://doi.org/10.1186/s43044-022-00270-x>
- Lee, Y., Park, S., Lee, S., Kim, Y., Kang, M., & Cho, S. (2020).** Lipid profiles and risk of major adverse cardiovascular events in CKD and diabetes: A nationwide population-based study. *PLoS ONE*, 15, Article e0231328.
- Lobo, S. A., & Fischer, S. (2023).** Cardiac risk assessment.

- StatPearls*. Treasure Island (FL): StatPearls Publishing.
- Mayoral, V., Charaja M, Casasola O, Montero A, Narvaez MA, Varrassi G. (2022).** New insights into the pharmacological management of postoperative pain. *Cureus*, 14(3), e22963.
- Mazzeffi, M., Holmes, S. D., Alejo, D., Fonner, C. E., Ghoreishi, M., Pasrija, C., et al. (2020).** Racial disparity in cardiac surgery risk and outcome: Report from a statewide quality initiative. *Annals of Thoracic Surgery*, 110(2), 531-36.
- Molina, J. P., Shokoohi, A., & Chang, S. H. (2020).** The impact of smoking status on pulmonary function and postoperative outcomes in cardiothoracic surgery patients. *The Journal of Thoracic and Cardiovascular Surgery*, 160(3), 742–750
- Napan, S., Kashinath, R., Orig, M., Kadri, S., & Khadra, S. (2020).** Racial difference in cardiovascular outcomes following percutaneous coronary intervention in a public health service patient population. *Journal of Invasive Cardiology*, 22(3), 168-73.
- Okkonen, M., Havulinna, A., Ukkola, O., Huikuri, H., Pietilä, A., Koukkunen, H., et al. (2021).** Risk factors for major adverse cardiovascular events after the first acute coronary syndrome. *Annals of Medicine*, 53(7), 817-23.
- Patel, P., Robinson, P., Baggott, C., Gibson, P., Ljungman, G., Massey, N., Sung, L. (2021).** Clinical practice guideline for the prevention of oral and oropharyngeal mucositis in pediatric cancer and hematopoietic stem cell transplant patients: 2021 update. In *European Journal of Cancer*, 154. <https://doi.org/10.1016/j.ejca.2021.05.013>
- Péus, D., Sellathurai, S., Newcomb, N., Tschopp, K., & Radeloff, A. (2022).** The Otoprotective Effect of Ear Cryotherapy: Systematic Review and Future Perspectives. In *Audiology Research*, 12(4). <https://doi.org/10.3390/audiolres12040038>
- Ptaszek, B., Podsiadlo, S., & Teległów, A. (2023).** Effect of whole-body cryotherapy treatments on blood morphology and blood rheology: red blood cell deformability, red blood cell aggregation in healthy subjects. *Clinical Hemorheology and Microcirculation*, 83(3). <https://doi.org/10.3233/CH-221658>
- Poulsen, M., El-Akkawi, A., Media, A., Hjørnet, N., Nielsen, D., & Modrau, I. (2023).** Timing of chest tube removal following adult cardiac surgery: A cluster

- randomized controlled trial. Scandinavian *Cardiovascular Journal*, 57(1), Article 2294681
- Sanad, M. (2019).** Clinical outcomes and volume of cardiothoracic surgeries in Egyptian university hospitals: A five-year retrospective analysis. *Egyptian Journal of Cardiothoracic Surgery*, 27(2), 85-92.
https://doi.org/10.4103/ejcts.ejcts_12_19
- Smilowitz, N., Gupta, N., Ramakrishna, H., Guo, Y., Berger, J., & Bangalore, S. (2020).** Perioperative major adverse cardiovascular and cerebrovascular events associated with noncardiac surgery. *JAMA Cardiology*, 5(2), 181-87.
- St-Onge, S., Ben Ali, W., Bouhout, I., Bouchard, D., Lamarche, Y., Demers, P., & Perrault, L. (2021).** Active clearance vs conventional management of chest tubes after cardiac surgery: a randomized controlled study. *Journal of Cardiothoracic Surgery*, 16(1), 1-9.
- The Joint Commission. (2023).** R3 report. Available at: <https://www.jointcommission.org/standards/r3-report/>.
- Verma, M., Singh, U., Kumari, R., Sachan, R., Sankhwar, P., & Solanki, V. (2022).** Randomized controlled study for comparison of efficacy and safety between thermocoagulation and cryotherapy in visual inspection with acetic acid positive cervical lesions. *Journal of Cancer Research and Therapeutics*, 18(3).
https://doi.org/10.4103/jcrt.jcrt_832_21
- Vinod, P., Kumar, S., Shetty, S., & Shantharam, V. (2020).** Evaluation of postoperative pain experience and the impact of prior surgical exposure on pain control strategies. *Indian Journal of Anaesthesia*, 64(8), 672–679.
- Vinod, P., Kann, T., Polaconda, S., Bello, A., Khayata, M., Munoz, F., et al. (2020).** The impact of admission serum creatinine on major adverse clinical events in ST-segment elevation myocardial infarction patients undergoing primary percutaneous coronary intervention. *Cardiology Research*, 12(3), 9-15.
- World Health Organization. (2020).** Noncommunicable diseases country profiles 2020: Egypt.
- World Health Organization.** <https://apps.who.int/iris/handle/10665/336660> World Health Organization. (2020). Noncommunicable diseases country profiles 2020: Egypt. *World Health Organization*.

<https://apps.who.int/iris/handle/10665/336660>

Woo, S., Lee, J., Millis, D., & Drum, M. (2022). Thermographic Evaluation of the Duration of Skin Cooling After Cryotherapy in Dogs Following Tibial Plateau Leveling Osteotomy Surgery. *Frontiers in Veterinary Science*, 9. <https://doi.org/10.3389/fvets.2022.784327>

Effect of Nursing Interventions on Early Identification and Management of Paroxysmal Sympathetic Hyperactivity of Patients with Traumatic Brain Injury

Rokia Ibrahim El Nagar¹, Shaimaa Abdelbast Abdelrazk Abdelrahman^{2,3}, Safaa Eid Said Ahmed⁴

¹Lecturer of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt.

²Nursing Specialist at Mahalla Al- Kubra Fever Hospital, ElGarbia Governorate, Egypt.

³Master Student of Critical Care and Emergency nursing, Faculty of Nursing, Tanta University, Egypt.

⁴Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Shaimaa Abdelbast Abdelrazk

Email: shaimaaelahry082@gmail.com

Abstract

Background: Early detection of Paroxysmal Sympathetic Hyperactivity in traumatic brain injury cases is essential to prevent complications and improve outcomes, with nurses playing a key frontline role in its timely identification and management. **Aim:** Evaluate the effect of nursing interventions on early detection and management of paroxysmal sympathetic hyperactivity of patients with traumatic brain injury. **Design and Setting:** Quasi-experimental research design was carried out in Traumatology and Emergency Medicine Intensive Care Unit and Surgical Intensive Care Unit of Tanta Emergency University Hospital which is affiliated with the Ministry of Higher Education and Scientific research. **Subjects:** A purposive sample of (100) critically ill patients ranging from 21 to 60 years. **Tools:** Three tools were utilized. **Tool (I):** Traumatic Brain Injury Patients' Assessment. **Tool (II):** Paroxysmal Sympathetic Hyperactivity Assessment Measure (PSH-AM). **Tool (III):** Modified Ashworth Scale. **Results:** Patients in the study group demonstrated statistically significant improvement in Glasgow coma scores and reduction in Paroxysmal Sympathetic Hyperactivity severity and lower modified a shworth scale score compared to the control group where P value <0.05. **Conclusions:** Application of nursing interventions was effective in early detection and management of Paroxysmal Sympathetic Hyperactivity among patients with traumatic brain injury. **Recommendations:** Provision of clear clinically wide lines and nursing protocols should be available regarding early detection and management of Paroxysmal Sympathetic Hyperactivity for brain injury patients.

Keywords: Clinical outcomes, Early Detection and Management, Nursing Interventions, Paroxysmal Sympathetic Hyperactivity, Traumatic Brain Injury.

Introduction

Traumatic brain injury (TBI) is a form of acquired brain injury that occurs when an abrupt external mechanical force disrupts the brain's normal function. It commonly results from falls, road traffic accidents, violence or sports-related injuries (**Joshua, Vijaya Kumar & Naidu, 2022**). Its impact may lead to temporary or permanent neurological dysfunction, with outcomes ranging from mild cognitive impairment to severe disability or death. Traumatic brain injury may consist of brain contusions, hemorrhage, edema, or axonal shearing, contingent upon the nature and severity of the trauma. These injuries can impair physical, sensory, emotional and cognitive functions, affecting memory, speech, coordination and behavior (**Johnstone, Mitrofanis & Stone, 2023**).

Traumatic brain injury is a significant global cause of disability and mortality. According to recent global estimates, approximately 69 million individuals sustain a TBI each year, with road traffic accidents accounting for the majority of cases (**Huang et al., 2024**). The incidence varies by region—North America has among the highest rates at approximately 1,299 cases per 100,000 people, while Africa and Asia experience growing burdens due to underreported injuries

and inadequate trauma systems (**Obasa, Olopade, Juliano & Olopade, 2024; World Health Organization, 2024**).

The clinical presentation of TBI ranges from subtle to life-threatening symptoms. In mild cases, individuals may experience headaches, confusion, dizziness, visual disturbances or short-term memory loss (**Hacioğlu & Tanriverdi, 2023**). Moderate to severe cases can involve seizures, prolonged unconsciousness, vomiting, speech difficulties, abnormal posturing or respiratory complications due to raised intracranial pressure. Over time, patients may develop lasting impairments in concentration, emotional control, language or coordination. The long-term consequences often include mood disorders, personality changes and post-traumatic epilepsy (**Markovic et al., 2025**).

Moreover, Paroxysmal sympathetic hyperactivity (PSH) may develop in certain cases of TBI which is a condition marked by hypertension, tachycardia, hyperthermia and dystonia that complicating recovery and requiring careful symptomatic management (**Sakai, Kitagawa, Suzuki, Toh & Yamamoto, 2022**). The loss of descending inhibitory control over autonomic centers in the medulla is believed to be the cause of

these symptoms, which frequently manifest in response to minimal stimuli, such as suctioning or repositioning. Essentially, PSH is a manifestation of an unregulated autonomic discharge that is the result of brain injury (**Panjaitan, Ginting, Rajagukguk, Sibagariang & Siahaan, 2025; Carozza et al., 2023**).

Paroxysmal Sympathetic Hyperactivity usually begins within the first week of injury, often between 5–7 days post-insult and episodes may recur several times a day, lasting from minutes to hours. It significantly affects recovery, increasing ICU stay duration, mechanical ventilation time and risk of nosocomial infections (**Xu, Zhang & Li, 2024**).

A 2024 editorial by **Nasa, Majeed and Juneja** in the Indian Journal of Critical Care Medicine noted that PSH occurs in 10–30% in patients with severe TBI and is often underdiagnosed due to overlapping symptoms with other conditions. The article emphasizes the need for standardized diagnostic criteria and careful clinical observation to avoid mismanagement and improve outcomes.

Paroxysmal sympathetic hyperactivity is characterized by sudden increases in respiratory rate, pulse rate, blood pressure, and temperature, as well as dystonic body

posture. These episodes may be misinterpreted as infection, seizures or drug withdrawal, delaying appropriate management (**Jafari et al., 2022**). The PSH-Assessment Measure (PSH-AM) is now frequently employed to facilitate diagnosis, and it is used to evaluate the frequency and intensity of symptoms. Effective management involves a multi-modal approach as identifying and minimizing triggers, using pharmacologic agents such as morphine, beta-blockers, gabapentin and clonidine and implementing environmental modifications like reducing noise and handling (**Qian, Min, Wang, Xu & Fang, 2022; Bhardwaj, Satapathy, Garg, Chawla & Jangra, 2021**).

Nurses are central to the identification, monitoring and management of PSH in patients with TBI. As frontline caregivers, they observe early signs of autonomic dysregulation and play a vital role in reporting changes to the healthcare team. Through accurate use of tools like PSH-AM, nurses help ensure timely diagnosis and appropriate interventions (**Rockwell, 2023**). Also, they are responsible for minimizing external stimuli, administering medications, documenting episode characteristics and educating families about the condition. Their involvement improves symptom

control, reduces patient distress and shortens ICU stays. Moreover, nurses contribute to interdisciplinary decision-making, rehabilitation planning and ongoing patient support (Podell et al., 2021).

Significance of study:

Paroxysmal Sympathetic Hyperactivity (PSH) remains poorly recognized due to inconsistent terminology and diagnostic ambiguity. Recent studies report that PSH affects a substantial proportion of TBI patients, contributing to prolonged ICU stays, increased morbidity and delayed neurological recovery (Rockwell, 2023; Bark et al., 2024). Early identification and standardized nursing interventions particularly those guided by tools like the PSH Assessment Measure (PSH-AM) are essential to mitigate secondary brain injury and improve patient outcomes (Heinze, 2023). Consequently, in order to evaluate the influence of nursing interventions on the early detection and management of paroxysmal sympathetic hyperactivity in TBI patients, it is imperative to conduct this investigation.

Aim of the study

The aim of this study is:

To evaluate the effect of nursing interventions on the early detection and management of paroxysmal

sympathetic hyperactivity in cases with traumatic brain injury.

Research Hypothesis

Patients with TBI who receive nursing interventions for early detection and management of paroxysmal sympathetic hyperactivity are expected to have significant improvements in levels of consciousness, a decrease in the frequency and severity of PSH episodes, as well as a lower modified Ashworth scale score compared to patients who receive routine care

Operational definition

Early detection of PSH: The identification of PSH signs and symptoms within the first 72 hours of onset using standardized assessment tools (PSH-AM) and continuous monitoring of vital signs by nurses.

Subjects and Method

Research Design:

The efficacy of nursing interventions in the early detection and management of paroxysmal sympathetic hyperactivity among TBI cases was assessed using a quasi-experimental study design.

This design was considered appropriate because randomization was not feasible in the clinical intensive care setting (Polit & Beck, 2021).

Settings:

The study was conducted at the Traumatology and Emergency

Medicine Intensive Care Unit and Surgical Intensive Care Unit of Tanta Emergency Hospital, which is affiliated with the Ministry of Higher Education and Scientific research. There were three wards with four beds in each, for a total of twelve beds.

Subject:

In accordance with the total population of traumatic brain injury patients admitted to the intensive care unit annually in 2023, a purposive sampling of (100) adult patients from the aforementioned setting that satisfy the inclusion and exclusion criteria established by the Epi-Info software statistical program. Nearly 120 patients admitted per year and the sample size will be calculated as the following:

$Z =$ confidence level 95% $P =$ population (40%), $d =$ Error proportion (0.05)

The adult cases will be divided into two groups, 50 cases in each group as follows:

Control group consisted of 50 patients who received routine nursing care as measuring vital signs and change position of the patients.

Study group was composed of 50 patients who received nursing interventions for the early identification and management of paroxysmal sympathetic hyperactivity.

The subjects were selected according to the following criteria:

- Newly admitted adult patients from 21 to 60 years., both sex,
- Patients with localized infection included the presence of signs and symptoms of Paroxysmal Sympathetic Hyperactivity despite infection treatment or the onset of PSH occurring more than 72 hours prior to infection.

Exclusion criteria

Rhabdomyolysis, dehydration, convulsions, pulmonary embolism, deep venous thrombosis, fever, or neuroleptic malignant syndrome, as well as infectious diseases (e.g., sepsis or pneumonia).

Tools of data collection:

The study employed three instruments to evaluate the impact of nursing interventions on the early detection and management of paroxysmal sympathetic hyperactivity in patients with TBI.

Tool I: Traumatic Brain Injury Patients Assessment Tool:

This tool was developed by the researcher after reviewing related literature (Jafari et al., 2022; Chowdhury, Chen, Hu, Badjatia & Podell, 2024). It consisted of three parts as follows:

Part (a): Patient's Demographic characteristics: such as age, sex.

Part (b): Patient's clinical data:

It encompassed an evaluation of the patient's past medical history, surgical history, associated injuries, complete blood cell count, blood, urine, or sputum cultures for infection, and current medication for the treatment and prevention of PSH, including morphine, fentanyl, and β -blockers. Adrenergic antagonists.

Part (c) Assessment level of consciousness by Glasgow coma scale:

The Glasgow Coma Scale (GCS), was developed by **Teasdale and Jennett (1974)**, to evaluate the level of cognizance of patients. It encompassed three domains: verbal response, motor response, and eye-opening response.

Scoring system:

The total GCS values range from 3 to 15, with 3 representing the lowest and 15 representing the greatest.

Tool II: Paroxysmal Sympathetic Hyperactivity Assessment Measure (PSH-AM).

This tool was developed by **Baguley et al. (2014)** and adopted by the researcher; it consisted of two parts:

Part (a): Clinical Feature Scale (CFS): This part was used to assess presence and severity of clinical features.

-The diagnostic criteria used to define PSH were more than one episode of at least four of the following features:

- Fever, defined as body temperature $>38.3^{\circ}\text{C}$,
- Hypertension, defined as systolic blood pressure $>160\text{ mmHg}$ or $>140\text{ mmHg}$ if the patient was being treated with a beta-blocker,
- Diaphoresis,
- Tachypnea, defined as respiratory rate $>25\text{ breaths/min}$,
- Tachycardia, which is defined as a heart rate exceeding 120 beats per minute or 100 beats per minute if the patient is receiving a beta-blocker as prescribed.
- Posturing (either spontaneous or change in posturing), rigidity, or spasticity.

Scoring system:

Clinical characteristics were assessed and rated from 0 to 3. Subsequently, a severity score was determined by summing the Clinical Feature Scale for the six features (0 = nil; 1–6 = mild; ≥ 13 = severe; 7–12 = moderate).

Part (b): Diagnosis likelihood tool

(DLT): The purpose of this study was to evaluate the presence of clinical parameters that were compatible, such as the frequency, duration, paroxysms, and simultaneity of hypersympathetic episodes. Additionally, allodynia (excluding alternative causes), antecedent cause and precipitating factors (noxious or non-noxious stimuli such as pain, urinary retention, or repositioning and

endotracheal tube suctioning), and response to treatment were evaluated. All items that are present are allocated a score of one, while those that are absent are assigned a score of zero.

Total Scoring system of PSH-AM

- The probability of PSH was determined by summing the two scores (CFS+DLT) (<8 = unlikely; 8–16 = possible; ≥17 = probable).

Tool III: Modified Ashworth Scale:

This tool was developed by **Ansari et al. (2008)** to assess muscle spasticity and tone as follows:

- 0: No increase in muscle tone
- 1: A slight increase in muscle tone, accompanied by a capture and release motion or minimal resistance at the end of the range of motion when an affected part(s) is moved in flexion or extension.
- 1: Slight increase in muscle tone, manifested as a catch, followed by minimal resistance through the remainder (less than half) of the range of motion
- 2: A marked increase in muscle tone throughout most of the range of motion, but affected part(s) are still easily moved
- 3: Considerable increase in muscle tone, passive movement difficult
- 4: Affected part(s) rigid in flexion or extension

Scoring system

The Modified Ashworth Scale has a score range between 0 to 4. This

means there are five possible points to assign, the higher the score that is assigned to a particular muscle, the more severe the progression of spasticity is for it.

Methods

1. **An Official Permission** was gained from the responsible authorities at the Faculty of Nursing, Tanta University to the director of Traumatology and Emergency and Surgical Intensive Care Unit in Tanta Emergency University Hospital.

2. Ethical consideration:

- a. Approval of The Scientific Research Ethics Committee of Faculty of Nursing was obtained with code (884-6-2024)
- b. The study's nature did not result in any harm or pain to the complete subject population.
- c. Consent was taken from first relative of the family members of the patients, if the patient was unconscious after explanation the aim of the study and including the right to withdrawal at any time.
- d. The privacy of the patients was considered during the data collection process, and confidentiality and anonymity were maintained by utilizing a code number instead of a name.

3. The study **tool (I)** was developed by researcher except part c was developed by **Teasdale and Jennett (1974)**, **tool (II)** was

developed by **Baguley et al. (2014)** and **tool III** was developed by **Ansari et al. (2008)**.

4. A jury of five experts in the fields of Critical Care and Emergency Medicine and Nursing evaluated the content validity of the instruments that were developed.

5. **A pilot study:** 10% of patients (10 patients) were subjected to the tools in order to evaluate their efficacy and applicability, as well as to identify any potential impediments that may arise during the data collection process. Consequently, the requisite modifications were executed. Those patients did not constitute the study subjects.

6. **Reliability tools:** Tool I was 0.892, tool II was 0.951, tool III was 0.761 respectively, all were tested for reliability by Cronbach's alpha test.

7. **Duration of data collection:** Data collection for the present study was collected over a period of 6 months from the beginning of December 2024 to the end of May 2025.

The current study was involved through four phases assessment, planning, implementation, and evaluation phase as follows:

1-Assessment phase:

-The researcher employed a primary assessment on the first day of admission for all patients in the aforementioned setting to establish baseline data using **all study tools**.

-The assessment included a comprehensive evaluation of the patient's level of consciousness, presence and severity of clinical features and muscle spasticity and tone

2- Planning phase:

The data from the assessment phase and the anticipated outcomes criteria that were established during the planning of patient care, which include the expected outcomes, are the foundation of this phase, such as:

- Maintaining baseline vital signs.
- Decreasing incidence of PSH features
- Decreasing frequency of episodes and duration of PSH.
- Decreasing muscle rigidity or spasticity

3- Implementation phase:

Control group received routine care as measuring vital signs and changing position of the patients.

Study group received nursing interventions for early identification and management of paroxysmal sympathetic hyperactivity as follows:

(1) Before starting intervention for PSH:

-The researcher assessed baseline vital signs (heart rate, blood pressure, respiratory rate, oxygen saturation, and body temperature).

-Also, assessed the presence of PSH manifestations such as tachycardia, hypertension, hyperthermia,

diaphoresis, posturing, dystonia, or agitation

(2) The researcher performed Paroxysmal sympathetic hyperactivity nursing interventions as the following:

(A) Eliminate external stimuli through:

Limit visitors by allowing only 1–2 visitors at a time, depending on the patient's tolerance and encouraged family to visit during designated hours to prevent overstimulation.

Minimizing light exposure through:

-Dimmed overhead lights or switch them off if not needed.

-Close curtains or Provide eye masks and used task lighting directed only at the specific area of working on and then turned lights back down immediately after completing care.

(B) Avoid any unnecessary procedures or tests that can cause discomfort, pain or worsen symptoms of the patient through:

-The researcher combined vital signs, repositioning, hygiene, and other care activities into one session to reduce repeated stimulation and encouraged nurses to do that.

-The researcher selected non-invasive monitoring techniques (e.g., pulse oximetry instead of arterial blood gases when appropriate.

-Avoid repeated venipuncture by maintaining IV access when necessary.

-Used pre-medication (analgesics, sedatives) if ordered for painful procedures

(C) Maintain normal temperature (suggested goal > 36.1 ° to < 38.3 °C) Fever management through

-Regularly checked the patient's temperature (oral, axillary) every two hours and more frequently during episodes of PSH.

-Applied cooling compresses (forehead, axilla, groin, or behind the neck) and used tepid sponging if fever is sustained if persistent fever (>38.3 °C) and monitored patient closely for shivering and treated with medications if prescribed.

-Ensure light bed linens and clothing and remove excess blankets.

-Provided adequate fluids (oral, enteral, or IV as ordered) to prevent dehydration from fever.

-Administered antipyretics (e.g., acetaminophen) as prescribed as physician order.

(D) Blood pressure management

-Blood pressure was monitored every hour for the first 8 hours until normal blood pressure was achieved, and then every 2 hours.

-Antihypertensive medication was administered if the blood pressure remains elevated as prescribed as physician order.

-Pharmacologic Interventions as prescribed.

-The researcher kept the patient's head slightly elevated (30–45°) to reduce intracranial pressure and avoided prolonged supine positioning if not contraindicated.

(E) Fluid and electrolyte management

- Every hour, the researcher monitored intake (oral, enteral, and IV), output (catheter or urinal/bedpan measurement) and recognized insensible fluid losses (sweating, fever, tachypnea) which are common in PSH episodes.
- Assessed dehydration risk due to sweating, fever, and tachypnea.
- Used an intravenous infusion pump to administer IV fluids at a moderate or sluggish rate as prescribed.

(F) Maintain muscle spasticity and tone through:

1) passive range of motion

-Performed gently and slowly, 2–3 times per joint, at least once per shift or as tolerated.

-Supported the joint during movement to prevent strain and stopped if the patient showed signs of pain, spasticity, or worsening PSH symptoms.

(2) Position

- Repositioned the patient at least every 2 hours (if tolerated).
- Elevated the head of bed (30–45°), if not contraindicated and used pillows, or rolls to maintain neutral alignment and support weak limbs.

- Avoid positions such as prolonged supine positioning that cause discomfort or trigger PSH episodes.

- Ensure pressure relief for bony prominences (heels, elbows, sacrum) and elevated limbs when needed to reduce swelling.

- Gradually increased mobility as vital signs stabilized such as seated or standing at a tilt table.

(G) Pharmacologic agents to treat PSH

- a. Administered prescribed medications as ordered.
- b. Recorded medication dose, route, frequency, and time of administration.
- c. Monitored for adverse effects including hypotension, bradycardia, respiratory depression, and excessive sedation

Evaluation phase:

Patient of both groups was evaluated by using tool II, tools Tool I part c, III and IV three times on admission, at the end of 1st weeks and at the end of 2nd week.

Statistical analysis:

We used suitable statistical tests to arrange, tabulate, and evaluate all of the data we collected. Statistical tests for relationships and significance were included in the data analysis in SPSS version 21, which included the Chi-square test (X^2), linear correlation coefficient (r), and matrix correlation (P value). The data was also utilized

to calculate percentages, frequencies, and standard deviations (Sullivan, 2023).

Results

Table (1): Shows distribution of the studied patients regarding their socio-demographic characteristics.

It was observed that nearly half (46%) of the control group and more than half (60%) of the study group aged between (21-<30) years old with the mean age of 36.32 ± 12.136 and 31.14 ± 10.386 years respectively.

Regarding gender, it was found that more than two third (76%) of the control group and the majority (82%) of the study group were males respectively.

Table (2): Shows distribution of the studied patients regarding their clinical data.

It was observed that the most frequent past medical history was cardiovascular disorders, accounting for 24% and 14% in the control and study groups respectively, followed by endocrine disorders 20% and 12%.

Regarding surgical history, more than half (60%) of the control group and 68% of the study group had no previous surgery.

Concerning associated injuries, facial injury represented the highest percentage among the control and study groups (76% and 56%) respectively, followed by extremity injuries (66% and 56%) while chest

injuries were also common, affecting 54% of the control group and 60% of the study group. **Concerning current medication** for the treatment and prevention of PSH, Dormicum was the most commonly used drug, given to 42% of the control group and 40% of the study group with no statistical significant difference between both groups regarding their lab culture.

Table (3): Demonstrates distribution of studied patients regarding total Glasgow coma scale throughout the study periods.

The results shows that there were statistically significant differences among the control and study group regarding total levels of consciousness on admission, 1st week and 2nd week respectively $P = 0.000$. Also, the findings reveal a statistically significant difference in the study group concerning mean scores of consciousness level with $P = 0.000$.

Table (4): Reveals distribution of the studied patients regarding severity clinical feature scale (CFS) throughout the study period.

This table represents that there was a statistically significant difference in the control and study group regarding severity of CFS throughout the study period ($P = 0.000$). Moreover, there was a statistically significant difference between the control and study groups across the time points,

where $P = 0.047$, 0.000 , and 0.000 respectively.

Table (5): Reveals distribution of studied patients regarding incidence of paroxysmal sympathetic hyperactivity (PSH) throughout the study period.

This table shows that in the control group, the highest percentage was for probable PSH, representing 72.0% at admission, 74.0% at the 1st week, and 66.0% at the 2nd week, with a statistically significant difference where ($P = 0.000$). while the study group, probable PSH was accounting for 56.0% at admission then decreased to 28.0% at the 1st week and 14% at 2nd week, with a highly statistically significant difference where ($P = 0.000$). Moreover, the findings demonstrated a highly statistically significant difference between both the control and study groups regarding PSH levels on admission, 1st week and 2nd week with $P = 0.023$, 0.000 , and 0.000 respectively.

Table (6): Reveals distribution of studied patients according to modified Ashworth scale throughout the study period.

This table represents that there was a statistically significant difference among patients in the control group in relation to the right and left side muscle tone before and after intervention on admission, 1st week

and 2nd week where values = (0.000 and 0.002) respectively. Also, highly statistically significant differences were observed regarding the right and left side muscle tone among patients in the study group before and after intervention on admission, 1st week and 2nd week where values = (0.000 and 0.000) respectively.

Table (7): Presents the relation between socio-demographic characteristics of the studied patients and their paroxysmal sympathetic hyperactivity (PSH) scores throughout the study period.

The table shows that the highest mean scores of paroxysmal sympathetic hyperactivity (PSH) were seen in the control group with age group (50-60) where the mean $\pm$ SD was 19.00 ± 6.749 on 2nd week compared to 5.00 ± 2.000 of the study group on 2nd week. Also, the highest mean scores of paroxysmal sympathetic hyperactivity (PSH) were seen in the control group with female gender group where the mean $\pm$ SD was 20.75 ± 5.379 on 2nd week compared to 4.89 ± 4.014 of the study group on 2nd week. Also, this table shows that statistically significant difference was seen in the mean scores of paroxysmal sympathetic hyperactivity (PSH) and gender among the control group at the 2nd week as $P = 0.022$.

Table (8): Shows the correlation between total Glasgow coma score

(GCS) of the studied patients and severity of clinical feature score (CFS), diagnosis likelihood tool (DLT), paroxysmal sympathetic hyperactivity (PSH) and modified Ashworth scale throughout the study period.

This table illustrates that there was a significant negative correlation was observed among the control and study group regarding total Glasgow coma score (GCS) and clinical feature score (CFS), diagnosis likelihood tool (DLT), paroxysmal sympathetic hyperactivity (PSH) and modified Ashworth scale with their right and left sides on admission, at 1st week and 2nd week with P value <0.05 respectively.

Table (1): Distribution of the studied patients regarding their socio-demographic characteristics

Characteristics	The studied traumatic patients (n=100)				χ^2 P
	Control group (n=50)		Study group (n=50)		
	No	%	No	%	
Age (in years)					
(21-<30)	23	46.0	30	60.0	5.023 0.170
(30-<40)	10	20.0	9	18.0	
(40-<50)	7	14.0	8	16.0	
(50-60)	10	20.0	3	6.0	
Range	(21-58)		(21-59)		t=1.293
Mean ± SD	36.32±12.136		31.14±10.386		P=0.124
Gender					
Male	38	76.0	41	82.0	FE
Female	12	24.0	9	18.0	0.624

FE: Fisher' Exact test

Table (2): Distribution of the studied patients regarding their clinical data

Clinical data	The studied traumatic patients (n=100)				χ^2 P
	Control group (n=50)		Study group (n=50)		
	No	%	No	%	
Past medical history					
cardiovascular disorders	12	24.0	7	14.0	0.318 0.573
Hepatic disorders	1	2.0	3	6.0	
Renal disorders	5	10.0	3	6.0	
Respiratory disease	3	6.0	1	2.0	
Neurological disorders	5	10.0	2	4.0	
Endocrine disorders	10	20.0	6	12.0	
Surgical history					
None	30	60.0	34	68.0	8.774 0.118
Cholecystectomy	6	12.0	4	8.0	
Gastroduodenal surgery	0	0.0	2	4.0	
Bile duct surgery	6	12.0	1	2.0	
Hepatic surgery	0	0.0	1	2.0	
Others	8	16.0	8	16.0	
Associated injuries					
Facial injury	38	76.0	28	56.0	0.111 0.739
Skull fracture	16	32.0	11	22.0	
Thoracolumbar fracture	3	6.0	10	20.0	
Chest	27	54.0	30	60.0	
Abdomen	16	32.0	20	40.0	
Extremity	33	66.0	28	56.0	
Combined	0	0.0	2	4.0	
Current medication for the treatment and prevention of PSH					
Fentanyl	11	22.0	14	28.0	0.503 0.778
Dormicum	21	42.0	20	40.0	
Tiratam	18	36.0	16	32.0	

Table (3): Distribution of studied patients regarding total Glasgow coma scale throughout the study periods

Total Consciousness level	The studied traumatic patients (n=100)													
	Control group (n=50)						χ^2 P	Study group (n=50)						χ^2 P
	On admission		At 1 st week		At 2 nd week			On admission		At 1 st week		At 2 nd week		
	No	%	No	%	No	%		No	%	No	%	No	%	
Unconscious	39	78.0	36	72.0	34	68.0	20.603 0.000*	43	86.0	31	62.0	20	40.0	32.479 0.000*
Semi-conscious	11	22.0	13	26.0	6	12.0		7	14.0	17	34.0	19	38.0	
Conscious	0	0.0	1	2.0	10	20.0		0	0.0	2	4.0	11	22.0	
Range	(3-12)		(3-13)		(3-15)		F=1.379	(3-12)		(3-13)		(3-15)		F=17.733
Mean ± SD	6.50±2.597		6.86±2.807		7.54±3.965		P=0.255	5.52±2.314		7.36±2.912		9.22±3.888		P=0.000*
Control Vs Study t P	1.992 0.049*		0.874 0.384		1.934 0.056									

(3-8) Unconscious

(9-12) Semi-conscious

(13-15) Conscious

* Statistically significant level at P<0.05

Table (4): Distribution of the studied patients regarding severity clinical feature scale (CFS) throughout the study period

Severity CFS	The studied traumatic patients (n=100)													
	Control group (n=50)							Study group (n=50)						
	On admission		At 1 st week		At 2 nd week		χ^2 P	On admission		At 1 st week		At 2 nd week		χ^2 P
	No	%	No	%	No	%		No	%	No	%	No	%	
Nil	0	0.0	0	0.0	1	2.0	24.590 0.000*	2	4.0	5	10.0	19	38.0	42.395 0.000*
Mild	4	8.0	6	12.0	14	28.0		14	28.0	23	46.0	21	42.0	
Moderate	39	78.0	41	82.0	21	42.0		27	54.0	22	44.0	9	18.0	
Sever	7	14.0	3	6.0	14	28.0		7	14.0	0	0.0	1	2.0	
Range	(5-15)		(4-15)		(0-16)		1.540	(0-15)		(0-12)		(0-13)		34.320
Mean $\pm$ SD	10.00 $\pm$ 2.304		9.08 $\pm$ 2.346		8.94 $\pm$ 4.635		0.218	8.84 $\pm$ 3.365		5.76 $\pm$ 3.444		43.00 $\pm$ 3.758		0.000*
Control Vs Study	2.012		5.634		7.039									
t	0.047*		0.000*		0.000*									
P														

Nil (0)

Mild (1-6)

Moderate (7-12)

Sever ($\geq$ 13)

* Statistically significant level at P<0.05.

Table (5): Distribution of studied patients regarding incidence of paroxysmal sympathetic hyperactivity (PSH) throughout the study period

PSH level	The studied traumatic patients (n=100)													
	Control group (n=50)							Study group (n=50)						
	On admission		At 1 st week		At 2 nd week		χ^2 P	On admission		At 1 st week		At 2 nd week		χ^2 P
	No	%	No	%	No	%		No	%	No	%	No	%	
Unlikely	0	0.0	0	0.0	10	20.0	24.958 0.000*	3	6.0	15	30.0	36	72.0	56.049 0.000*
Possible	14	28.0	13	26.0	7	14.0		19	38.0	21	42.0	7	14.0	
Probable	36	72.0	37	74.0	33	66.0		28	56.0	14	28.0	7	14.0	
Range	(10-26)		(10-26)		(3-26)		F=1.931	(2-25)		(2-23)		(1-23)		F=32.023
Mean $\pm$ SD	18.44 $\pm$ 3.418		18.12 $\pm$ 3.526		16.56 $\pm$ 7.382		P=0.149	16.36 $\pm$ 5.375		11.56 $\pm$ 5.953		6.88 $\pm$ 6.397		P=0.000*
Control Vs	2.309		6.704		7.007									
Study	0.023*		0.000*		0.000*									
t														
P														

(<8) Unlikely

(8-16) Possible

(>17) Probable

* Statistically significant level at P<0.05.

Table (6): Distribution of studied patients according to modified Ashworth scale throughout the study period

Modified Ashworth scale	The studied traumatic patients (n=100)													
	Control group (n=50)						χ^2 P	Study group (n=50)						χ^2 P
	On admission		At 1 st week		At 2 nd week			On admission		At 1 st week		At 2 nd week		
	No	%	No	%	No	%		No	%	No	%	No	%	
Right														
No increase in muscle tone	5	10.0	4	8.0	15	30.0	28.727 0.000*	6	12.0	21	42.0	39	78.0	58.690 0.000*
Slight increase in muscle tone	10	20.0	20	40.0	7	14.0		16	32.0	15	30.0	2	4.0	
Marked increase in muscle tone	16	32.0	17	34.0	14	28.0		11	22.0	10	20.0	6	12.0	
Considerable increase in muscle tone	11	22.0	8	16.0	4	8.0		10	20.0	3	6.0	1	2.0	
Affected part rigid in flexion or extension	8	16.0	1	2.0	10	20.0		7	14.0	1	2.0	2	4.0	
Left														
No increase in muscle tone	10	20.0	8	16.0	14	28.0	23.915 0.002*	7	14.0	23	46.0	38	76.0	47.071 0.000*
Slight increase in muscle tone	7	14.0	16	32.0	9	18.0		15	30.0	15	30.0	6	12.0	
Marked increase in muscle tone	18	36.0	15	30.0	6	12.0		13	26.0	7	14.0	2	4.0	
Considerable increase in muscle tone	12	24.0	11	22.0	13	26.0		9	18.0	4	8.0	3	6.0	
Affected part rigid in flexion or extension	3	6.0	0	0.0	8	16.0		6	12.0	1	2.0	1	2.0	

* Statistically significant level at P<0.05

Table (7): Relation between socio-demographic characteristics of the studied patients and their paroxysmal sympathetic hyperactivity (PSH) throughout the study period

Characteristics	The studied traumatic patients (n=100) Paroxysmal sympathetic hyperactivity (PSH)					
	Control group (n=50)			Study group (n=50)		
	On admission	At 1 st week	At 2 nd week	On admission	At 1 st week	At 2 nd week
Age (in years)						
(21-<30)	17.91±3.103	17.96±3.140	16.39±6.926	15.57±5.829	11.37±6.589	7.07±7.172
(30-<40)	18.70±4.620	18.30±4.029	16.50±8.383	16.78±5.094	9.89±5.819	6.22±6.685
(40-<50)	17.71±3.498	16.14±3.436	13.71±8.712	16.63±3.420	12.75±3.919	7.63±4.274
(50-60)	19.90±2.644	19.70±3.683	19.00±6.749	22.33±2.517	15.33±3.055	5.00±2.000
F, P	0.910, 0.444	1.469, 0.235	0.702, 0.556	1.525, 0.221	0.743, 0.532	0.154, 0.926
Gender						
Male	17.95±3.556	17.71±3.727	15.24±7.488	16.10±5.171	11.73±6.025	7.32±6.769
Female	20.00±2.449	19.42±2.503	20.75±5.379	17.56±6.425	10.78±5.890	4.89±4.014
t, P	3.455, 0.069	2.187, 0.146	5.560, 0.022*	0.538, 0.467	0.186, 0.668	1.065, 0.307

* Statistically significant level at P<0.05

Table (8): Correlation between total Glasgow coma score of the studied patients and severity clinical feature score (CFS), diagnosis likelihood tool (DLT), paroxysmal sympathetic hyperactivity (PSH) and modified Ashworth scale throughout the study period

		The studied traumatic patients (n=100)					
		Glasgow coma score					
		Control group (n=50)			Study group (n=50)		
		On admission	At 1 st week	At 2 nd week	On admission	At 1 st week	At 2 nd week
-Severity clinical feature score (CFS)	r	-0.392	-0.627	-0.824	-0.524	-0.498	-0.388
	P	0.005**	0.000**	0.000**	0.000**	0.000**	0.005**
-Diagnosis likelihood tool (DLT)	r	-0.174	-0.313	-0.752	-0.448	-0.354	-0.378
	P	0.228	0.027*	0.000**	0.001**	0.012*	0.007**
-Paroxysmal sympathetic hyperactivity (PSH)	r	-0.333	-0.547	-0.814	-0.516	-0.450	-0.392
	P	0.018*	0.000**	0.000**	0.000**	0.001**	0.005**
-Modified Ashworth scale (right side)	r	-0.418	-0.518	-0.670	-0.518	-0.478	-0.426
	P	0.003**	0.000**	0.000**	0.000**	0.000**	0.002**
-Modified Ashworth scale (left side)	r	-0.314	-0.538	-0.690	-0.427	-0.480	-0.372
	P	0.027*	0.000**	0.000**	0.002**	0.000**	0.008**

r: Pearson' correlation coefficient

* Statistically significant level at P<0.05

** Statistically highly significant level at P<0.01

Discussion

Nursing interventions significantly facilitate the early detection of paroxysmal sympathetic hyperactivity (PSH) in patients with traumatic brain injury through the use of standardized instruments, continual vital sign monitoring, and structured evaluations, such as the clinical feature scale and diagnosis likelihood tool (Heinze, 2023).

Regarding age, the current investigation revealed that more than half of the study group and more than half of the control group were between the ages of 21 and 30. This age distribution may reflect the higher risk of traumatic brain injury and associated complications, such as PSH, among younger adults who are generally believed to have a more intact and reactive autonomic nervous system. Contemporary evidence supports that a preserved autonomic nervous system is a prerequisite for the manifestation of the sympathetic surges seen in PSH, whereas older adults or those with pre-existing autonomic dysfunction may exhibit a diminished or absent PSH response following a similar insult (Nancy et al., 2025).

This result was supported by a study performed by Althaqafi, Almanie, Almasoud, and Baarmah (2025), who investigated the "Clinical characteristics, diagnostic challenges,

and outcome of paroxysmal sympathetic hyperactivity in cases." It was discovered that nearly half of the sample under investigation was between the ages of 20 and 30, primarily due to traffic accidents and high-energy trauma. Meanwhile, this result disagreed with the study performed by Totikov, Boltzmann, Schmidt and Rollnik (2019), who conducted an analysis of the "the functional prognosis of early neurological rehabilitation patients is influenced by paroxysmal sympathetic hyperactivity (PSH)" and determined that nearly two-thirds of both groups were between the ages of 49 and 66.

In relation gender of the studied patients, the majority of the study group and more than two-thirds of the control group were male. As men are typically more exposed to high-risk activities and accidents, this may account for the higher frequency of TBI among them. A recent meta-analysis and comprehensive review by Chequer de Souza, Dobson, Lee, and Letson (2024) in the study "Epidemiology and outcomes of brain trauma in rural and urban populations found that the incidence of brain injury is significantly higher in males accounted for two-thirds, regardless of geographical location.

On the opposite side, these results were incongruent with Chen et al.

(2024), found that more than half of the participants were female, according to their study of "Bispectral Index Monitoring in the Nursing of Patients with Paroxysmal Sympathetic Hyperactivity."

Concerning past medical history, the results of the current study indicated that cardiovascular disorders were the most prevalent, as reported by over one-third of participants in both the control and study groups. This may be due to individuals with cardiovascular disorders being at increased risk of traumatic brain injury due to cardiovascular conditions such as arrhythmias, heart failure, orthostatic hypotension and ischemic heart disease may cause dizziness, syncope and impaired balance, thereby increasing the likelihood of falls, which are a leading cause of traumatic brain injury (Izzy et al., 2023; Lampert et al., 2024; Matsoukas et al., 2025).

These findings were in the same line with Kibria, Bragina, Trofimov and Bragin (2025), the report indicated that the risk of incident hypertension, coronary artery disease, and myocardial infarction is twofold higher for individuals with moderate-to-severe TBI that persists for a minimum of ten years. On the other hand, the findings of the current study were different from what was reported

by Hawryluk et al. (2020) who found that more than one quarter of patients had hypertension.

Regarding the total Glasgow Coma Scale scores, the current study exhibited that the total levels of consciousness on admission, the first week, and the second week differed statistically significantly between the control and study groups of patients. Additionally, the results indicate a statistically significant difference in the total mean scores of consciousness level among the study group. This progressive enhancement suggests that early identification and targeted management of PSH may positively influence neurological recovery. Because PSH involves episodic sympathetic surges that elevate metabolic demand and intracranial pressure, effective control of its manifestations may support stabilization and gradual improvement in GCS scores over time (Panjaitan et al., 2025).

This finding was consistent with Marek, Czosnyka, Lavinio and Smielewski (2025) who demonstrated that PSH play an important role in influencing fluctuations in consciousness during the acute and sub-acute phases of TBI and early identification and targeted management of PSH have been associated with stabilization of physiological parameters and more

favorable neurological trajectories. Conversely, **Qian, Min, Wang, Xu and Fang (2022)** who demonstrated that high incidence of PSH after TBI and its association with lower admission GCS but also noted the heterogeneity and limited consensus in the literature about its exact mechanisms and clinical impact.

Regarding clinical feature scale (CFS), these findings suggest that patients in the study group experienced more pronounced improvements or stabilization in key autonomic and motor responses during the follow-up period. The significant changes in parameters such as posturing and sweating are particularly noteworthy, as these features often reflect the severity of neurological dysfunction and the patient's autonomic stability (**Wang et al., 2025**).

This finding was similar to **Xu et al. (2024)**, who reported that episodes of sympathetic over activity are common and clinically significant features in patients with brain injury. Additionally, they emphasized the importance of systematic monitoring of these clinical signs for timely intervention, risk reduction, and improved management of cases with severe brain injuries.

Regarding severity clinical feature scale (CFS), the present study determined that the control and study

groups exhibited a statistically significant difference in the severity of CFS before and after the intervention throughout the study period. Additionally, there was a statistically significant difference between the control and study groups at each time point. Both groups might improve spontaneously over time due to natural recovery processes, while differential effects of rehabilitation or targeted interventions can produce larger shifts in the study group. This dynamic is consistent with broader longitudinal observations that many clinical features and functional measures post-TBI vary significantly across acute and sub-acute phases (**Andelic et al., 2021**).

Similarly, **Wang et al. (2025)** reported that interventions targeting autonomic regulation led to reductions in heart rate, blood pressure, posturing and sweating, as captured by the CFS, indicating the tool's sensitivity to treatment effects.

Regarding incidence of paroxysmal sympathetic hyperactivity (PSH), the present study found that differences in PSH incidence between the control and study groups which likely to reflect a combination of factors. paroxysmal sympathetic hyperactivity naturally peaks within the first week after brain injury and then gradually declines. The study group's higher and more significant

prevalence suggests that interventions or closer monitoring enhanced detection or influenced autonomic responses (Qian et al., 2022). This finding was in accordance with Richard et al. (2023), who reported that PSH typically appears early after neurologic insult, peaks within the first week and declines over time, which aligns with finding higher rates at admission and the first week.

Concerning muscle spasticity and tone by modified Ashworth scale scores, the results of this study demonstrated a statistically significant difference in the tone of the right and left sides of patients in the control group before and after the intervention during the first week, second week, and admission. Furthermore, the right and left side muscle tone of patients in the study group were found to be highly statistically significant both before and after the intervention on admission, in the first and second weeks. This pattern indicates that the applied intervention in the study group was more effective in reducing spasticity and improving muscle tone symmetry (Xu et al., 2024).

This finding was consistent with Nancy, Khowaja and Khowaja (2025) who reported that conventional management leads to gradual spasticity reduction as routine rehabilitation measures (positioning,

passive stretching, range-of-motion exercises and standard physiotherapy) can produce progressive reductions in spasticity over time, as reflected by declining Modified Ashworth Scale scores.

Regarding relation between socio-demographic characteristics of the studied patients and their paroxysmal sympathetic hyperactivity (PSH) scores, the study results indicated that the highest mean scores of paroxysmal sympathetic hyperactivity (PSH) were seen in the control and study group with age group (50-60) on 2nd week. As age-related autonomic nervous system changes impair sympathetic regulation after brain injury. As people age, the balance between sympathetic and parasympathetic control becomes less stable, which can lead to exaggerated responses to stress and reduced ability to modulate sympathetic outflow following brain injury. This physiological alteration may predispose older patients to more intense or prolonged PSH episodes compared with younger individuals (Qian et al., 2022).

These results were supported by Bhardwaj et al. (2021) who demonstrated a significant association between patient age and PSH incidence, with higher rates observed in specific age groups, particularly

middle-aged and older adults. **In contrast** to the present findings, **Qian et al. (2022)** demonstrated that paroxysmal sympathetic hyperactivity (PSH) is more common in younger individuals who have sustained a brain injury. This challenges the assumption that older age intrinsically predisposes patients to higher PSH severity and suggests that chronological age alone is not a reliable determinant of PSH expression.

Also, the highest mean scores of paroxysmal sympathetic hyperactivity (PSH) were seen in the control and study group with female gender group on 2nd week with statistically significant difference was seen in the mean scores of paroxysmal sympathetic hyperactivity (PSH) and gender among the control group at the 2nd week. This might because hormonal and structural differences between males and females including effects of sex hormones on autonomic function may influence sympathetic reactivity after neurological injury (**Dearing, 2022**). This finding was the same line with **Seligowski et al. (2021)** who reported that women tend to exhibit higher sympathetic biomarkers, such as elevated heart rate and altered heart rate variability, compared with men following trauma exposure, suggesting enhanced sympathetic reactivity in females

under stress conditions. Conversely, **Li, Yang, Yu, Zhang and Tang (2024)** suggested differences in autonomic responses between males and females after brain injury and indicates that gender may not significantly influence paroxysmal sympathetic hyperactivity (PSH) outcomes or severity. Also, demographic characteristics including gender did not differ significantly between PSH and non-PSH groups (**Totikov, Boltzmann, Schmidt & Rollnik, 2019**).

Concerning relation between socio-demographic characteristics of the studied patients and their modified Ashworth scale scores (Right and left side), the highest mean scores for modified Ashworth scale were seen in the both studied groups with age group (50-60) on admission, 1st week and 2nd week. As older adults with traumatic brain injury exhibit reduced neuroplasticity and slower motor recovery, making them more vulnerable to persistent spasticity, particularly in the context of paroxysmal sympathetic hyperactivity and its recurrent sympathetic surges (**Bernier, Roy & Leblond, 2022; Rabinstein, 2024**). Similarly, this result aligned with **Yin et al. (2025)** reported that PSH episodes cause repeated sympathetic surges and posturing. Older adults have less autonomic resilience,

making them more prone to sustained hypertonia.

Also, the highest mean scores for modified Ashworth scale were seen in both studied groups with female gender group on admission, 1st week and 2nd week with statistically significant difference at the 2nd week. As Women in the 40–60 age range often experience declining estrogen levels, which affects muscle mass, tendon elasticity, collagen turnover and pain sensitivity. These changes increase passive resistance to movement, which the Modified Ashworth Scale captures as higher tone (Sipilä & Narici, 2021; Li & Francisco, 2021). These results aligned with Critchlow, Hiam, Williams, Scott, and Lamon (2023) who reported that postmenopausal women have reduced muscle mass and strength compared to premenopausal women, likely due to decreased estrogen levels affecting skeletal muscle structure and function.

Conversely, these results contradicted study by Zheng, Lei, Yang, Huang and Zhang (2020) showed the relations with age is not universally reported as stronger in older adults that younger age has been significantly associated with PSH incidence in adult brain injury.

Concerning correlation between total GCS of the studied patients

and severity of CFS, DLT, PSH and modified Ashworth scale throughout the study period. This study illustrated that there was a significant negative relation observed among the control and study group regarding total GCS and CFS, DLT, PSH and modified Ashworth scale with their right and left sides on admission, at 1st week and 2nd week. Because lower GCS scores represent more profound neural network disruption affecting consciousness, autonomic regulation and motor control, patients with lower GCS typically exhibit higher severity scores on measures such as the CFS, DLT, PSH scales and assessments of spasticity like the Modified Ashworth Scale (MAS), thereby producing significant negative correlations between total GCS and these severity measures throughout the acute and sub-acute phases of injury (Qian et al., 2022).

Similarly, et al. (2025) who confirmed significant inverse correlations between GCS and other severity indices in traumatic brain injury contexts, indicating that as GCS decreases, indicators of clinical and physiologic injury severity increase. This confirms why, across admission and subsequent weeks, patients with lower total GCS typically show higher CFS, DLT, PSH and muscle tone abnormalities

such as increased Modified Ashworth Scale scores, leading to significant negative relationships in longitudinal studies.

Conclusion

The findings of the present study indicate that the implementation of nursing interventions significantly improved the early detection and management of Paroxysmal Sympathetic Hyperactivity (PSH) in patients with Traumatic Brain Injury (TBI). The severity and frequency of PSH episodes were reduced, and cases exhibited improved physiological stabilization.

Recommendations

Based on the findings of the current study, it can be recommended that:

- Standardized protocols for early detection and management of PSH should be present in ICU.
- Paroxysmal Sympathetic Hyperactivity Assessment Measure (PSH-AM) should be implemented into routine ICU assessment and documentation.
- Conduct regular training sessions on PSH recognition, causes, and complications as well as management should be delivered through workshops, seminars, conferences and group discussions.
- Implement simulation-based drills for rapid response to PSH episodes.

- Perform multicenter and randomized controlled studies on PSH management strategies.

Limitations of the study:

This study had some limitations as follows:

- Family-related factors and environmental conditions in the intensive care unit, such as noise level, staff workload, or variability in nursing practice, may have influenced the occurrence of PSH episodes and patient responses to the intervention.

References

- Althaqafi, W., Almanie, W., Almasoud, S.D., & Baarmah, D. (2025). Clinical characteristics, diagnostic challenges, and outcome of paroxysmal sympathetic hyperactivity in pediatric patients: A retrospective cohort study in a tertiary hospital setting. *BMC Neurology*, 25(1), 179.
- Andelic, N., Røe, C., Brunborg, C., Zeldovich, M., Løvstad, M., Løke, D., ... & Von Steinbuechel, N. (2021). Frequency of fatigue and its changes in the first 6 months after traumatic brain injury: Results from the CENTER-TBI study. *Journal of Neurology*, 268(1), 61–73.
- Ansari, N., Naghdi, S., Younesian, P., & Shayeghan, M. (2008). Inter- and intrarater reliability of

- the Modified Ashworth Scale in patients with knee extensor poststroke spasticity. *Physiotherapy Theory and Practice*, 24(3), 205-13.
- Baguley, I., Perkes, I., & Fernandez-Ortega, J. (2014).** Consensus Working Group. Paroxysmal sympathetic hyperactivity after acquired brain injury: Consensus on conceptual definition, nomenclature, and diagnostic criteria. *J Neurotrauma*, 31(17), 1515–1520.
- Bark, D., Boman, M., Depreitere, B., Wright, D. W., Lewén, A., Enblad, P., Hånell, A., & Rostami, E. (2024).** Refining outcome prediction after traumatic brain injury with machine learning algorithms. *Scientific Reports*, 14(1), 8036.
- Bernier, A., Aubuchon, O., Huynh, L. K., Dupont, D., Séguin, M., Beaudoin, C., & Beauchamp, M. (2024).** Paroxysmal sympathetic hyperactivity: A common consequence of traumatic brain injury. *Autonomic Neuroscience: Basic and Clinical*, 257, 103238.
- Bhardwaj, A., Satapathy, G., Garg, A., Chawla, V., & Jangra, K. (2021).** Incidence of paroxysmal sympathetic hyperactivity after traumatic brain injury in a tertiary care ICU: A retrospective cohort study. *Journal of Neuroanaesthesiology and Critical Care*, 8(03), 187-191.
- Carozza, R. B., Mohanty, D., Wolf, M. S., Martin, E. anderson, J., & Pagano, L. (2023).** Paroxysmal sympathetic hyperactivity: Development of a pediatric clinical practice guideline. *Hospital Pediatrics*, 13(12), e402-e410.
- Chen, Y., Huang, W., Li, S., Dong, L., Zhang, H., Shao, Q., ... & Chen, L. (2024).** Bispectral index monitoring in the nursing of patients with Paroxysmal Sympathetic Hyperactivity. *Journal of Craniofacial Surgery*, 35(5), e444-e447.
- Chequer de Souza, J., Dobson, G. P., Lee, C., & Letson, H. (2024).** Epidemiology and outcomes of brain trauma in rural and urban populations: A systematic review and meta-analysis. *Brain Injury*, 38(12), 953-976.
- Chowdhury, S., Chen, L., Hu, P., Badjatia, N., & Podell, J. (2024).** Group-based trajectory modeling identifies distinct patterns of sympathetic hyperactivity following traumatic brain injury. *Neurocritical Care*, 42(3), 985–995.
- Critchlow, A., Hiam, D., Williams, R., Scott, D., & Lamon, S. (2023).** The role of estrogen in female skeletal muscle aging: A systematic review. *Maturitas*, 178, Article

107844.
<https://doi.org/10.1016/j.maturitas.2023.107844>
- Dearing, C. (2022).** Sex differences in autonomic responses to stress: Ovarian hormone modulation of corticolimbic pathways. *American Journal of Physiology-Endocrinology and Metabolism*, 323(1), E20–E35.
- Hacıoğlu, A., & Tanrıverdi, F. (2023).** Traumatic Brain-Injury-Induced Hypopituitarism: Clinical Management and New Perspectives. *Endocrinology Research & Practice*, 27(3).
- Hawryluk, G. W., Rubiano, A., Totten, A., O'Reilly, C., Ullman, J. S., Bratton, S. L., ... & Ghajar, J. (2020).** Guidelines for the management of severe traumatic brain injury: 2020 update of the decompressive craniectomy recommendations. *Neurosurgery*, 87(3), 427-434.
- Heinze, R. (2023).** A Mixed Pedagogy in Educating Acute Care Nurse Practitioner Students on Paroxysmal Sympathetic Hyperactivity (Doctoral Dissertation, The University of Arizona). ProQuest Dissertations Publishing.
- Huang, X., Ma, S., Jiang, X. H., Song, R., Li, M., Zhang, J., ... & Li, H. (2024).** Causes and global, regional and national burdens of traumatic brain injury from 1990 to 2019. *Chinese Journal of Traumatology*, 27(06), 311-322.
- Izzy, S., Chen, P. M., Tahir, Z., Grashow, R., Radmanesh, F., Cote, D. J., ... & Taylor, H. A. (2023).** Association of traumatic brain injury with the risk of developing chronic cardiovascular disease. *The Lancet Neurology*, 22(10), 959-970.
- Jafari, A., Shah, M., Mirmoeeni, S., Hassani, M., Nazari, S., Fielder, T., ... & Seifi, A. (2022).** Paroxysmal sympathetic hyperactivity during traumatic brain injury. *Clinical Neurology and Neurosurgery*, 212, 107081.
- Johnstone, D. M., Mitrofanis, J., & Stone, J. (2023).** The brain's weakness in the face of trauma: How head trauma causes the destruction of the brain. *Frontiers in Neuroscience*, 17, 1141568.
- Kaurani, P., de Marchi Apolaro, A., Kunchala, K., Maini, S., Rges, H., Isaac, A., ... & Nazir, Z. (2024).** Advances in Neurorehabilitation: Strategies and Outcomes for Traumatic Brain Injury Recovery. *Cureus*, 16(6), e62242. <https://doi.org/10.7759/cureus.62242>.
- Kibria, F., Bragina, O., Trofimov, A., & Bragin, D. (2025).** Bidirectional interplay between traumatic brain injury and

- cardiovascular dysfunction in athletes. *Journal of Clinical Medicine*, 14(21), 7712.
- Li, X., Yang, X., Yu, T., Zhang, T., & Tang, Y. (2024).** Paroxysmal sympathetic hyper excitability after brain injury: A clinical analysis of case series. *Medicine*, 103(20), e35375.
- Marek, A., Czosnyka, M., Lavinio, A., & Smielewski, P. (2025).** Heart variability rate and cerebral autoregulation in patients with traumatic brain injury complicated by paroxysmal sympathetic hyperactivity. *Neurocritical Care*, 42, 864–877.
- Markovic, K., Djuricic, G., Milojkovic, D., Banovac, D., Davidovic, K., Vasin, D., ... & Milic, N. (2025).** Computed tomography findings of children under 3 years of age with Mild Traumatic Brain Injury (TBI) and No Neurological Focal Signs. *Journal of Clinical Medicine*, 14(8), 2728.
- Matsoukas, S., Inzerillo, S., Boylan, A., Reid, P. C., Margetis, K., & Camara, D. (2025).** Outcomes following traumatic brain injury in patients with pre-injury antiplatelets versus anticoagulants: A systematic review and meta-analysis. *Neurosurgical Review*, 48(1), 622.
- Nancy, F., Khowaja, A., & Khowaja, P. (2025).** Paroxysmal sympathetic hyperactivity: A common consequence of traumatic brain injury. *Autonomic Neuroscience*, 257, 103238.
- Nasa, P., Majeed, N., & Juneja, D. (2024).** Paroxysmal Sympathetic Hyperactivity after Traumatic Brain Injury: Current understanding and therapeutic options. *Indian Journal of Critical Care Medicine: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine*, 28(2), 97–99.
- Obasa, A., Olopade, F., Juliano, S. L., & Olopade, J. (2024).** Traumatic brain injury or traumatic brain disease: A scientific commentary. *Brain Multiphysics*, 100092.
- Panjaitan, J., Ginting, L., Rajagukguk, M., Sibagariang, D. B., & Siahaan, A. (2025).** Paroxysmal sympathetic hyperactivity: Current update on diagnosis, treatments and outcomes. *Surgical Neurology International*, 16, 163.
- Podell, J., Miller, S., Jaffa, M., Pajoumand, M., Armahizer, M., Chen, H., ... & Badjatia, N. (2021).** Admission features associated with paroxysmal sympathetic hyperactivity after traumatic brain injury: A case-

- control study. *Critical Care Medicine*, 49(10), e989-e1000.
- Polit, D., & Beck, C. (2021).** Nursing research: Generating and assessing evidence for nursing practice (11th ed.). Wolters Kluwer.
- Qian, J., Min, X., Wang, F., Xu, Y., & Fang, W. (2022).** Paroxysmal sympathetic hyperactivity in adult patients with brain injury: A systematic review and meta-analysis. *World Neurosurgery*, 166, 212-219.
- Rockwell, R. (2023).** Improving traumatic brain injury outcomes: Early identification and management of paroxysmal sympathetic hyperactivity. *Integrative Journal of Nursing and Medicine*, 4(3), 1–10.
- Sakai, K., Kitagawa, T., Suzuki, K., Toh, K., & Yamamoto, J. (2022).** Paroxysmal sympathetic hyperactivity following acute diffuse brain swelling due to traumatic brain injury: A case report with good clinical outcome. *Egyptian Journal of Neurosurgery*, 37(1), 7.
- Seligowski, A., Steuber, E., Hinrichs, R., Reda, M., Wiltshire, C., Wanna, C., ... & Jovanovic, T. (2021).** A prospective examination of sex differences in posttraumatic autonomic functioning. *Neurobiology of Stress*, 15, 100384.
- Sipilä, S., & Narici, M. (2021).** Estrogen and the regulation of muscle strength, tendon properties, and collagen metabolism in women. *Frontiers in Physiology*, 11, 596947.
- Sullivan, L. M. (2023)** *Essentials of biostatistics in public health*. 4th edition. Jones and Bartlet Learning, Burlington.
- Teasdale, G. & Jennett, B. (1974).** Assessment of coma and impaired consciousness. A practical scale. *Lancet*. 13; 2(7872), 81-4.
- Totikov, A., Boltzmann, M., Schmidt, S. B., & Rollnik, J. D. (2019).** The impact of paroxysmal sympathetic hyperactivity (PSH) on functional outcomes in patients undergoing early neurological rehabilitation: A case-control study. *BMC Neurology*, 19(1), 162.
- Vadan, I., Grad, D., Strilciuc, S., Stefanescu, E., Verisezan Rosu, O., Michalak, M., Blesneag, A. V., & Muresanu, D. (2025).** Glasgow Coma Scale Score at Admission in Traumatic Brain Injury Patients: A multicenter observational analysis. *Journal of Clinical Medicine*, 14(15).
- Wang, Y., Zhang, X., Li, J., & Chen, W. (2025).** Heart rate variability and cerebral autoregulation in patients with

traumatic brain injury with
paroxysmal sympathetic
hyperactivity syndrome.
Neurocritical Care, 42, 864–877.

World Health Organization. (2024).

Over 1 in 3 people are affected by
neurological conditions, the
leading cause of illness and
disability worldwide.

Xu, S., Zhang, Q., & Li, C. (2024).

Paroxysmal sympathetic
hyperactivity after acquired brain
injury: An integrative review of
diagnostic and management
challenges. *Neurology and
Therapy*, 13(1), 11-20.

Zheng, R. Z., Lei, Z. Q., Yang, R.,

**Huang, G. H., & Zhang, G.
(2020).** Identification and
management of paroxysmal
sympathetic hyperactivity after
traumatic brain injury. *Frontiers in
Neurology*, 11, 81.

Effect of an Educational Bundle on Bridging the Gap of Knowledge and Perceived Barriers regarding Oncofertility among Maternity and Oncology Nurses

Ola Abdel-Wahab Afifi Araby¹, Enas Ibrahim Abbas Badr², Mona Abo Bakr Abd Ellatif³ & Nesma Abd-Elaziz Ibrahim EL Desoky⁴

¹Assistant Professor of Obstetrics and Gynecology Nursing, Faculty of Nursing, Benha University.

²Lecturer of Maternal and Newborn Health Nursing, Faculty of Nursing, Helwan University.

³Assistant Professor of Community Health Nursing, Faculty of Nursing, Ain Shams University.

⁴Lecturer of Obstetrics and Gynecology Nursing, Faculty of Nursing, Benha University.

Corresponding author: Nesma Abd-Elaziz Ibrahim EL Desoky.

Email: nesma.ibrahim@fnur.bu.edu.eg

Abstract

Background: The goal of oncofertility is to lessen the negative effects of cancer treatment on women 's reproductive system and fertility. **Aim:** The aim of this research was to evaluate effect of the educational bundle on bridging the gap of knowledge and perceived barriers regarding oncofertility among maternity and oncology nurses. **Research design:** One group "pre/post-test" was used in a quasi-experimental research design. **Setting:** The research was carried out at Benha University Hospital's obstetrics and gynecological and oncology departments. **Subjects:** A convenient sample of 125 nurses who are currently employed in obstetrics and gynecology and oncology departments was gathered for six months. **Tools of data collection:** There were two tools: A structured self-administered questionnaire and Oncofertility Barriers Scale (OBS). **Results:** There was a highly significant difference between the pre- and post-intervention phases regarding knowledge and perceived barriers toward oncofertility. Furthermore, a negative correlation was observed between knowledge and perceived barriers in both the pre- and post-intervention phases, with highly significant statistical differences. **Conclusion:** There was a remarkable improvement in nurses' knowledge and perceived barriers toward oncofertility following the implementation of the educational bundle. **Recommendations:** Incorporate oncofertility training programs into nursing education curricula to guarantee nurses' enhanced perceptions and sustained knowledge.

Keywords: Educational Bundle, Knowledge, Perceived Barriers, Oncofertility.

Introduction

Oncofertility which combines oncology with reproductive medicine, aims to maintain fertility in individuals whose cancer treatments (radiation, chemotherapy, surgery, or more recent medicines) may impair their ability to conceive. Maintaining fertility becomes a crucial aspect of survivorship care as cancer survival rates rise globally (**Edris et al., 2025**).

Fertility preservation improves the quality of life and emotional well-being of cancer survivors by enabling them to have biological children in the future, particularly those who were diagnosed during their reproductive years. Additionally, there is a rising emphasis on incorporating fertility considerations into treatment planning as worldwide health and gynecologist organizations recognize oncofertility as a normal component of cancer therapy (**Sharma & Ghosh, 2025**).

The primary objectives of oncofertility are to guarantee that cases receive prompt counseling regarding fertility risks and options for preservation, to make suitable preservation methods (medical or surgical) accessible, and to incorporate fertility-preservation into multidisciplinary cancer care so that cases can make educated choices. Oncofertility also aims to close care

gaps, evaluate survivors' long-term fertility results, and increase and standardize services worldwide (**Mansi et al., 2025**).

Adult women and men of reproductive age, as well as children and teenagers who might receive gonadotoxic cancer treatments, benefit from oncofertility services. Ovarian tissue cryopreservation, ovarian suppression, egg freezing, and embryo freezing are possibilities for women; sperm banking and testicular tissue preservation are options for males (**Pirooznia et al., 2025**). When regular gamete cryopreservation isn't feasible for prepubescent youngsters (boys or girls), tissue cryopreservation (ovarian or testicular) offers a promising (though occasionally still experimental) option for future fertility (**Goldenberg, 2025**).

To increase the likelihood of maintaining reproductive potential, fertility preservation measures should be started as soon as feasible, ideally before beginning any cancer therapy. Fertility preservation is more likely to be successful in the long run in younger individuals, such as adolescents, young adults, and children, because they frequently have better reproductive cell reserves (**International Journal of Clinical Oncology, 2025**).

Oncologists, reproductive endocrinologists (fertility specialists), and maternity & oncology nurses are among the medical professionals directly involved in cancer care who have an obligation to discuss fertility preservation as soon as possible, preferably at the time of diagnosis and prior to starting gonadotoxic therapy. This guarantees that cases can make knowledgeable choices without jeopardizing the timeframe for their cancer treatment (**Almuhanna et al., 2024**).

The widespread use of oncofertility is hampered by a number of issues, despite its obvious advantages. These include low case awareness, inadequate counseling by oncology teams (many cases claim they never had a conversation about reproductive health), limited access to fertility-preservation services in many areas, high costs or a lack of insurance or financial support, time constraints prior to urgent cancer therapy, and ethical or cultural issues surrounding fertility preservation. Furthermore, the gonadotoxic hazards of some more recent cancer treatments (such as those for hematologic malignancies) may be unclear, making decision-making more difficult (**Hussien et al., 2025**). In the field of oncofertility, educational bundles are essential for

improving nurses' knowledge, self-assurance, and clinical preparedness. These programs increase nurses' knowledge of reproductive concerns, choices for preservation, and the value of prompt counseling (**Kim et al., 2023**). Additionally, educational interventions raise nurses' awareness of obstacles that prevent the implementation of fertility-preservation services, such as inadequate training, a lack of institutional protocols, cultural sensitivity concerns, and time constraints. This helps nurses advocate for better workflows, improve interprofessional communication, and provide cases with better support. In the end, a well-crafted instructional bundle ensures that more cases receive adequate fertility counseling as part of comprehensive cancer care by bridging the gap between evidence-based oncofertility guidelines and real clinical practice (**Seymour et al., 2024**).

In oncofertility, nurses are crucial because they frequently act as the initial point of contact, identify cases who are at risk, educate cases about choices for preserving fertility, arrange referrals to fertility specialists, and give continuous emotional support during cancer treatment. The nurse's role in counseling and advocacy is crucial to

ensuring cases have the chance to preserve fertility because many cases may not be aware of the hazards to their fertility following cancer therapy. This role becomes particularly crucial in situations where resources are scarce and awareness is poor (**Hussien et al., 2025**).

Significance of the research:

Breast cancer continues to be the most frequent cancer among women worldwide, making for 11.6% of all newly diagnosed cases (**Bray et al., 2024**). According to recent data, the prevalence of breast cancer in Egypt is considerably greater, accounting for 34.9% of all female cancer cases. Liver cancer (13.2%), non-Hodgkin lymphoma (5.4%), ovarian cancer (4.0%), and colorectal cancer (3.9%) are other prevalent cancers among Egyptian women (**International Agency for Research on Cancer (IARC), 2024**).

Chemotherapy and pelvic radiation are two cancer treatments that can seriously impair ovarian function, lower ovarian reserve and cause early ovarian insufficiency. Because of this, many female cancer survivors have reduced fertility and future chances of becoming pregnant. For women who want to maintain motherhood, cancer treatment poses a serious risk to their ability to conceive. Therefore, providing

preservation methods and early oncofertility counseling are crucial aspects of cancer care for women of reproductive age (**Rodriguez-Wallberg et al., 2023**).

Egypt's uptake Despite rising demand for fertility-preservation treatments, fewer women with cancer are undergoing fertility-preservation operations, and studies show that over 40% of cancer cases of reproductive age do not receive fertility counseling (**Mousa et al., 2025**). This disparity emphasizes how important it is for nurses, particularly maternity and cancer nurses, to start timely conversations about fertility and direct cases to the right resources. Improving nurses' expertise greatly lowers obstacles associated with false information, restricted access, and low case awareness. Therefore, reducing the information gap and improving cancer cases' fertility treatment requires nurses to be empowered through structured education (**Sindi et al., 2025**).

Aim of the study

The study aimed to evaluate effect of the educational bundle on bridging the gap of knowledge and perceived barriers regarding oncofertility among maternity and oncology nurses.

Research hypotheses:

H1: The nurses will have improved knowledge regarding oncofertility after implementing the educational bundle than before.

H2: The nurses will have lower perceived barriers regarding oncofertility after implementing the educational bundle than before.

Operational definitions

Perceived barriers regarding oncofertility, these are the quantifiable barriers that nurses feel prevent them from discussing, starting, or offering cancer cases oncofertility-related care. Nurses' self-reported answers on a structured questionnaire are used to evaluate these obstacles, which may include (but are not limited to) low confidence, lack of knowledge, time constraints, inadequate institutional support, unclear referral pathways, a lack of resources, ethical concerns and case-related factors.

An educational bundle about oncofertility is an organized, research-based collection of educational resources and instructional techniques intended to give nurses a thorough understanding of the condition. To improve comprehension and facilitate well-informed decision-making, this package incorporates a variety of instructional elements, including lectures, visual aids, written

instructions, and case studies. The Educational Bundle's primary dimensions are instructional, behavioral/skill, affective, and cognitive.

Subjects and method**Research Design:**

The aim of this research was accomplished by using a quasi-experimental research design (one group "pre/posttest").

Research Setting:

The research was carried out in the oncology and obstetrics and gynecology departments of Benha University Hospitals in the Qaliobya governorate of Egypt. This hospital was selected because it serves all cases from Benha, its suburbs, and towns, as well as those from other cultural origins, independent of their social qualities.

Subjects:

Sample type and size: A convenient sample of (125) nurses who are already working in obstetrics & gynecological and oncology departments were recruited in the study.

Tools of data collection:

Two tools were used for data collection:

Tool I: A structured self-administered questionnaire. After examining relevant literature, researchers constructed it and

translated it into Arabic. There were three parts to it:

Part (1): Personal characteristics of studied nurses: It included six items: age, place of residence, educational qualifications, department, years of experience, and attending any educational courses regarding oncofertility.

Part (2): Nurses' knowledge questionnaire: Researchers designed it to assess nurses' knowledge of oncofertility after reviewing pertinent literature (Ghaemi et al., 2024; AlFayyad, 2025; Njiru et al., 2024). 26 multiple-choice questions (MCQs) were included, such as the definition of oncofertility, the main goal of fertility preservation in cancer cases, indications for fertility preservation in cancer cases, the significance of case education regarding oncofertility, etc.

Scoring system:

Every question had a "1" for the right response and a "0" for the wrong or "I don't know" response. The sum of the answers to each question was used to get the overall knowledge score, which varied from 0 to 26. Better knowledge was reflected in better scores. **The total knowledge score was classified as the following:**

-Good knowledge: 75% to 100% = 20 – 26 score.

-Average knowledge: 50% to <75% = 13-19 score.

-Poor knowledge: < 50% = 0-12 score.

Tool II: Oncofertility Barriers Scale (OBS). It was adopted from Huang et al. (2022) and used to assess obstacles to oncofertility care among nurses who provide care for cancer cases. Fertility risk (3 items), cancer case stereotypes (3 items), lack of knowledge and education (8 items), rigid thinking about oncofertility care (7 items), insufficient support (4 items), and interrupted oncofertility treatment (2 items) are the six dimensions covered by its 27 items.

Scoring system:

A 3-point Likert scale was used to rate each item's response: 2 for "agree," 1 for "uncertain," and 0 for "disagree". Higher scale scores were linked to nurses' self-perceived difficulty in providing oncofertility treatment, with the total score ranging from 0 to 54.

The total barriers score was classified as the following:

-High barriers level: 75% to 100% = 41-54 score.

-Moderate barriers level: 60% to 75% = 33-40 score.

-Low barriers level: < 60% = 0-32 score.

Tools validity:

Three jury experts from Benha University's obstetrics & gynecological nursing, community nursing departments and oncology medicine assessed the validity of the questionnaires to make sure they were clear, pertinent, thorough, and useful. Sentences have to be modified somewhat. The tools were regarded as valid by the experts.

Tools reliability:

Cronbach's Alpha coefficient test was used to assess the tools' reliability, and the results showed that the research tools' internal consistency was as follows:

Ethical consideration:

Tools	Cronbach's alpha value
Tool I: Nurses' knowledge questionnaire.	Internal consistency ($\alpha=0.88$).
Tool II: Oncofertility Barriers scale (OBS).	Internal consistency ($\alpha=0.91$).

Before beginning the study, the following ethical considerations were taken into account: The scientific research ethical committee of Benha University's nursing department granted the research approval for completion (REC-OBSN-P150). For the study to be completed, official approval was required from the chosen research settings. Prior to using the tools, the researchers

gained the trust and confidence of the nurses by outlining the aim and significance of the research. Nurses gave their formal agreement to participate in the research, and confidentiality was guaranteed. There were no dangers to the nurses' physical, social, or psychological well-being during the study. To protect the privacy of the participating nurses, all data collection tools were burnt following statistical analysis. Human rights were respected and no immoral words were included in the study tools. The nurses could leave the study at any moment.

Pilot study:

10% of the total sample size (13 nurses) participated in the pilot study to test the tools' clarity, objectivity, feasibility, and applicability as well as to identify potential roadblocks and issues that could impede data collection and identify any issues unique to the statements' clarity and question sequence. Estimating the amount of time required for data gathering was also helpful. Based on the pilot results, no modifications were made. Thus, the research comprised the pilot sample.

Field work:

The research took six months to complete, starting at the beginning of February 2026 and ending at the end of July 2026. The researchers visited

the setting twice a week (Mondays and Wednesdays) from 9:00 a.m. to 2:00 p.m. until the predefined sample size was reached. preparatory phase, interviewing phase, needs assessment phase, planning and design phase, implementation phase, development phase, evaluation phase and reinforcement phase were the eight phases used to carry out the current research.

Preparatory phase:

The researchers reviewed relevant local and worldwide literature about the research subject during the preparatory phase, which is the initial phase of the research. This assisted the researchers in understanding the scope and gravity of the issue and directed them at setting up the necessary tools for gathering data. Three Benha University specialists in obstetrics and gynecological nursing, community nursing and oncology medicine received the instruments, and the jury's findings were completed.

Interviewing phase:

In this phase, the nurses were interviewed and evaluated in the oncology or obstetric and gynecological departments' lecture halls. The researchers greeted the nurses, introduced themselves, explained the purpose and specifications of the research, gave them all the details regarding the

quantity and frequency of educational sessions to ensure their adherence to interventions, and obtained signed consent to take part in the research at the start of the interview.

Needs assessment phase:

Finding nurses' current knowledge gaps and barriers about oncofertility is the main goal of the needs assessment phase. In order to assess nurses' knowledge and perceived barriers regarding the preservation of reproductive technologies for cancer cases, baseline data were gathered during this phase via questionnaires, interviews, or focus cohorts. To identify the crucial subject areas that need to be covered, current research, clinical procedures, and educational standards were examined. The instructional bundle's design was informed by the phase's findings, which guarantee that it addresses the most pertinent learning needs.

Planning and design phase:

The researchers set specific goals and selected the most appropriate elements to be included in the instructional bundle based on the findings from the need assessment phase. This involves choosing evidence-based materials that collectively improve knowledge of oncofertility, such as lectures, visual aids, and printed booklets. At this point, careful preparation guarantees

that the intervention is well-organized and in line with the needs that have been recognized. The number of sessions, their contents, various teaching strategies and educational materials were identified.

Since the nature of the work in this department requires a lot of time and effort from nurses during their shifts, researchers worked with the nurses to schedule educational sessions at the department's lecture hall during their free time or after their shift.

Development phase:

During the development phase, the planned content is used to create or improve the educational materials. This entails creating accurate and clear presentations, videos, infographics, and quick-reference manuals. To guarantee scientific accuracy and clinical relevance, the contents are reviewed by subject-matter specialists. A small sample of nurses participated in a pilot test to assess the materials' efficacy, usability, and clarity. In order to ensure that the final educational bundle is polished and successful, feedback from this testing is used to make the required adjustments.

Implementation phase:

Following the conclusion of the need assessment phase, the educational bundle was implemented over the course of three scheduled sessions

spread over three consecutive weeks (one session per week). Each session lasted between fifty and sixty minutes, depending on their performance and feedback. The nurses were split up into 12 small groups of "10–11 nurses/group" by the researchers.

The target group of nurses receives the educational bundle during this phase through organized learning sessions. These could be in-person workshops, or hybrid forms that incorporate many teaching modalities. Through lectures, demonstrations, and interactive activities that promote involvement, nurses were exposed to the subject matter. To encourage continued learning, printed and digital educational materials were made available. This phase sought to transform the prepared material into engaging learning opportunities for participants.

Nurses were introduced to the topics of the first session at the outset. Feedback regarding the previous session and the new session's goals kicked off the next one. A brief period of time was set aside at the conclusion of each session to allow nurses to clarify any misunderstandings and ask questions. The following session's timing was communicated to each nurse.

To accomplish its objectives, a variety of instructional techniques and resources were employed, such as a modified lecture, cohort discussions, brainstorming, problem solving, PowerPoint presentations, video films, and a booklet that was given to every nurse who was recruited from the first session.

The first session, dubbed "the introductory session," included an overview of women's cancer, including the reasons why its prevalence has increased in recent decades, prevention strategies, and early detection techniques.

The second session, covered "Oncofertility," including its definition, main goal, indication, significance, impact of cancer treatment on fertility, options for female, male, girl, and boy fertility preservation, the healthcare professional in charge of starting counseling, the ideal time for counseling, topics to be covered during fertility counseling, and the role of nurses in oncofertility care.

The third session covered the main barriers to conducting oncofertility counseling in the protocol of care for women with cancer and strategies for overcoming them.

Evaluation phase:

The educational bundle's effect was evaluated using the identical pretest methodology (Tools I & II). Two

weeks following the most recent educational session, a post-test was administered. This stage made sure the educational intervention produced the desired results.

Reinforcement Phase:

To aid in the long-term retention of the learned material, additional techniques were employed during the reinforcing phase. Refresher courses, quick review modules, or revised recommendations were given to nurses. Weeks or months following implementation, a reinforcement phase was done to assess the sustainability of the information. This phase was designed to support ongoing professional development in the field of oncofertility, minimize knowledge deterioration and reinforce learning.

Statistical analysis:

Before being entered into a computer, the data was checked. Using the proper statistical techniques and procedures, the gathered data was arranged, coded, processed, and examined. SPSS version 25.0, the Statistical Package for Social Sciences, was utilized. Means, standard deviations, and frequencies and percentages were examples of descriptive statistics. The research hypothesis was tested using inferential statistics, such as the Chi-square test. The relationship between the total scores of the research

variables was examined using the correlation coefficient. A statistically significant difference was indicated by a p-value > 0.05 , a statistically significant difference was shown by a p-value ≤ 0.05 , and a highly statistically significant difference was indicated by a p-value $P < 0.001$ for all statistical tests.

Limitations:

Only a limited number of studies about maternity and oncology nurses' knowledge and barriers regarding oncofertility.

Results

Table (1): reveals that 48.8% of the nurses in the study were between the ages of 35 - < 45, with a mean age of 33.98 ± 6.53 . Regarding their educational qualifications, 72.0% of them work in the obstetrics and gynecology department, and 67.2% of them graduated from nursing technical institute. Furthermore, 56.0% of them were rural residents. Additionally, with a mean of 8.04 ± 3.52 years, 70.4% of them had five to ten years of experience. Additionally, all of them (100.0%) did not take any oncofertility education classes.

Table (2): shows that there was a highly statistically significant difference ($p \leq 0.001$) between the post-intervention phase and pre-intervention phase findings for every

item of the nurses' knowledge of oncofertility.

Figure (1): shows that throughout the pre-intervention and post-intervention phases, 27.2% and 76.0% of the nurses in the study had good knowledge about oncofertility, respectively.

Table (3): explains that there was a very statistically significant difference ($p \leq 0.001$) between the results of the post-intervention phase and the pre-intervention phase with respect to all items of the perceived barriers linked to lack of information and education among the participant nurses.

Table (4): explains that, for every item of the nurses' perceived barriers associated to rigid thinking about oncofertility treatment, there was a highly statistically significant difference between the post-intervention phase and pre-intervention phase results ($p \leq 0.001$).

Table (5): explains that, for every item of the nurses' perceived barriers linked to cancer case stereotypes, there was a highly statistically significant difference between the results of the post-intervention phase and the pre-intervention phase ($p \leq 0.001$).

Table (6): explains that there was a highly statistically significant difference ($p \leq 0.001$) between the post-intervention phase and pre-

intervention phase results for all items of the nurses' perceived barriers related to fertility risk

Table (7): explains that there was a highly statistically significant difference ($p \leq 0.001$) between the post-intervention phase and pre-intervention phase results for every item of the perceived barriers due to insufficient support among the nurses.

Table (8): explains that, for every item of the nurses' perceived barriers to interrupted oncofertility care, there was a highly statistically significant difference between the results of the post-intervention phase and the pre-intervention phase ($p \leq 0.001$).

Figure (2): demonstrates that, at the pre-intervention and post-intervention phases, 10.4% and 50.4% of the nurses in the study had low perceived barriers to oncofertility, respectively.

Table (9): explains that the total knowledge and perceived barriers scores of the nurses under study had a highly significant negative correlation at both the pre-intervention and post-intervention phases ($P \leq 0.001$).

Table (1): Distribution of the studied nurses according to their personal characteristics (n=125)

Personal characteristics	No	%
Age in (years)		
< 25	8	6.4
25 - < 35	50	40.0
35 - < 45	61	48.8
≥ 45	6	4.8
Mean ± SD = 33.98±6.53		
Residence		
Rural	70	56.0
Urban	55	44.0
Educational qualifications		
Nursing technical institute	84	67.2
Bachelor of science in nursing	35	28.0
Postgraduate studies	6	4.8
Department		
Obstetrics and gynecology department	90	72.0
Oncology department	35	28.0
Years of experience		
< 5	25	20.0
5 - 10	88	70.4
> 10	12	9.6
Mean ± SD = 8.04±3.52		
Attending any educational courses regarding oncofertility		
Yes	0	0.0
No	125	100.0

Table (2): Distribution of the studied nurses according to knowledge regarding oncofertility at pre and post -intervention phases (n=125)

Knowledge items	Pre-intervention				Post-intervention				X ²	P-value
	Correct answer		Incorrect answer		Correct answer		Incorrect answer			
	No	%	No	%	No	%	No	%		
Definition of Oncofertility	98	78.4	27	21.6	125	100.0	0	0.0	30.26	0.000**
Main goal of fertility preservation in cancer cases	82	65.6	43	34.4	119	95.2	6	4.8	34.75	0.000**
Indication for fertility preservation in cancer cases	71	56.8	54	43.2	120	96.0	5	4.0	53.26	0.000**
Importance of case education about Oncofertility	65	52.0	60	48.0	118	94.4	7	5.6	57.27	0.000**
Conditions that require fertility preservation outside of cancer	25	20.0	100	80.0	88	70.4	37	29.6	64.09	0.000**
Cancer treatment which is most likely to affect fertility in both men and women	89	71.2	36	28.8	122	97.6	3	2.4	33.08	0.000**
Hormone that mainly affected by chemotherapy leading to infertility	20	16.0	105	84.0	79	63.2	46	36.8	58.21	0.000**
Age cohort benefits most from fertility preservation counseling	67	53.6	58	46.4	113	90.4	12	9.6	41.98	0.000**
When should fertility preservation be discussed with cancer cases?	34	27.2	91	72.8	98	78.4	27	21.6	65.74	0.000**
When are ovum or sperm banking recommended?	26	20.8	99	79.2	117	93.6	8	6.4	135.30	0.000**
Methods of fertility preservation	54	43.2	71	56.8	121	96.8	4	3.2	85.50	0.000**
Fertility preservation option for female cases	43	34.4	82	65.6	123	98.4	2	1.6	114.74	0.000**
Fertility preservation option that is suitable for prepubertal girls	15	12.0	110	88.0	90	72.0	35	28.0	92.36	0.000**
Fertility preservation option for male cases	40	32.0	85	68.0	120	96.0	5	4.0	111.11	0.000**
Fertility preservation option that is suitable for prepubertal boys	13	10.4	112	89.6	90	72.0	35	28.0	97.89	0.000**

** Highly statistically significance P-value ≤ 0.001 .

Contiue, Table (2): Distribution of the studied nurses according to knowledge regarding oncofertility at pre and post -intervention phases (n=125)

Knowledge items	Pre-intervention				Post-intervention				X ²	P-value
	Correct answer		Incorrect answer		Correct answer		Incorrect answer			
	No	%	No	%	No	%	No	%		
Drugs that may help protect ovaries during chemotherapy	11	8.8	114	91.2	87	69.6	38	30.4	96.93	0.000**
Healthcare professional responsible for initiating discussions about fertility preservation	91	72.8	34	27.2	125	100.0	0	0.0	39.35	0.000**
Healthcare provider responsible for explaining medical risks and options of fertility preservation in detail	80	64.0	45	36.0	125	100.0	0	0.0	54.87	0.000**
Factors that may limit a case’s ability to access fertility preservation services	75	60.0	50	40.0	123	98.4	2	1.6	55.94	0.000**
Main barrier to discuss fertility preservation in oncology settings	73	58.4	52	41.6	122	97.6	3	2.4	55.96	0.000**
Best time for nurses to provide fertility-related information to cases	52	41.6	73	58.4	125	100.0	0	0.0	103.10	0.000**
Topics should be discussed during fertility counseling	44	35.2	81	64.8	120	96.0	5	4.0	102.38	0.000**
Average time needed to complete oocyte freezing before cancer treatment	20	16.0	105	84.0	85	68.0	40	32.0	69.37	0.000**
Most important ethical issue related to fertility preservation	46	36.8	79	63.2	115	92.0	10	8.0	83.06	0.000**
Psychological benefit of oncofertility counseling	92	73.6	33	26.4	125	100.0	0	0.0	38.01	0.000**
Role of nurses in Oncofertility care	55	44.0	70	56.0	125	100.0	0	0.0	97.22	0.000**

** Highly statistically significance P-value ≤ 0.001 .

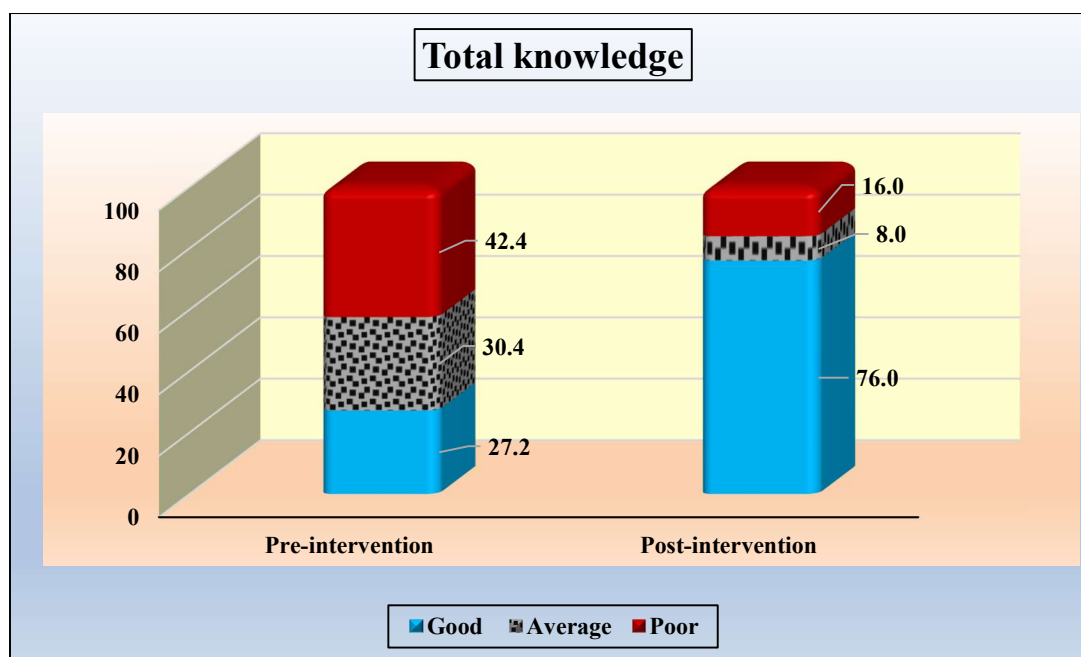


Figure (1): Distribution of studied nurses according to total knowledge score regarding Oncofertility at pre- and post-intervention phases (n=125)

Table (3): Distribution of studied nurses according to perceived barriers related to lack of information and education at pre and post-intervention phases (n=125)

Items	Pre-intervention						Post-intervention						X ²	P-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree			
	No	%	No	%	No	%	No	%	No	%	No	%		
I feel I do not understand the information about oncofertility.	39	31.2	61	48.8	25	20.0	0	0.0	3	2.4	122	97.6	155.5	0.000**
I am not sure who should perform the initial assessment for oncofertility.	24	19.2	83	66.4	18	14.4	0	0.0	5	4.0	120	96.0	168.5	0.000**
I am not clear on the referral process for oncofertility preservation.	31	24.8	77	61.6	17	13.6	15	12.0	11	8.8	99	79.2	113.0	0.000**
I feel that I am not able to assess the case’s fertility needs.	40	32.0	65	52.0	20	16.0	24	19.2	15	12.0	86	68.8	76.34	0.000**
I am not aware of the channels that assist cases in seeking fertility.	51	40.8	62	49.6	12	9.6	21	16.8	22	17.6	82	65.6	83.67	0.000**
I believe there is too little on-the-job training for oncofertility.	56	44.8	48	38.4	21	16.8	17	13.6	50	40.0	58	46.4	38.20	0.000**
I feel cases do not understand the information about oncofertility.	60	48.0	30	24.0	35	28.0	25	20.0	10	8.0	90	72.0	48.61	0.000**
I feel there is a lack of specific information about oncofertility	69	55.2	42	33.6	14	11.2	15	12.0	33	26.4	77	61.6	79.41	0.000**

**A Highly statistically significant $p \leq 0.001$

Table (4): Distribution of studied nurses according to perceived barriers related to rigid thinking toward oncofertility care at pre and post-intervention phases (n=125)

Items	Pre-intervention						Post-intervention						X ²	P-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree			
	No	%	No	%	No	%	No	%	No	%	No	%		
I feel cases with cancer metastasis should not talk about fertility issues.	41	32.8	58	46.4	26	20.8	11	8.8	35	28.0	79	63.2	49.74	0.000**
I don't feel it is appropriate to talk about fertility issues to cases with treatment-induced menopause.	38	30.4	55	44.0	32	25.6	15	12.0	22	17.6	88	70.4	50.25	0.000**
I feel that older cases have a lower desire to preserve fertility.	72	57.6	35	28.0	18	14.4	27	21.6	30	24.0	68	54.4	49.90	0.000**
I believe that the need to assess fertility protection can only be performed by a physician.	94	75.2	20	16.0	11	8.8	15	12.0	15	12.0	95	76.0	124.54	0.000**
I feel that fertility preservation should only be considered after the case's conditions become stable after treatment.	99	79.2	20	16.0	6	4.8	18	14.4	21	16.8	86	68.8	125.66	0.000**
I feel cases with children have a lower desire to preserve fertility.	125	100.0	0	0.0	0	0.0	33	26.4	40	32.0	52	41.6	145.57	0.000**
I feel that proactive assessment of case fertility needs increases case anxiety.	64	51.2	40	32.0	21	16.8	0	0.0	5	4.0	120	96.0	160.73	0.000**

**A Highly statistically significant $p \leq 0.001$

Table (5): Distribution of studied nurses according to perceived barriers related to cancer case stereotypes at pre and post-intervention phases (n=125)

Items	Pre-intervention						Post-intervention						X ²	P-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree			
	No	%	No	%	No	%	No	%	No	%	No	%		
I feel that the strength of cancer cases to take care of themselves is worse than that of the average person.	100	80.0	25	20.0	0	0.0	11	8.8	54	43.2	60	48.0	142.00	0.000**
I feel that the body condition of cancer cases after pregnancy is worse than that of the average person.	125	100.0	0	0.0	0	0.0	35	28.0	50	40.0	40	32.0	140.62	0.000**
I feel that the strength of cancer cases to take care of their children is worse than that of the average person.	120	96.0	5	4.0	0	0.0	32	25.6	51	40.8	42	33.6	130.73	0.000**

**A Highly statistically significant $p \leq 0.001$.

Table (6): Distribution of studied nurses according to barriers related to fertility risk at pre and post-intervention phases (n=125)

Items	Pre-intervention						Post-intervention						X ²	P-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree			
	No	%	No	%	No	%	No	%	No	%	No	%		
I feel that fertility preservation (such as oocyte retrieval surgery) can delay the case’s cancer treatment.	40	32.0	78	62.4	7	5.6	12	9.6	30	24.0	83	66.4	100.58	0.000**
I believe that fertility-preserving measures before chemotherapy put cases at risk.	25	20.0	90	72.0	10	8.0	10	8.0	20	16.0	95	76.0	119.78	0.000**
I feel it is dangerous to have a child after cancer treatment.	125	100.0	0	0.0	0	0.0	20	16.0	35	28.0	70	56.0	181.03	0.000**

**A Highly statistically significant $p \leq 0.001$

Table (7): Distribution of studied nurses according to perceived barriers related to insufficient support at pre and post-intervention phases (n=125)

Items	Pre-intervention						Post-intervention						X ²	P-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree			
	No	%	No	%	No	%	No	%	No	%	No	%		
I feel most family members do not support the fertility decisions of cancer cases.	100	80.0	20	16.0	5	4.0	25	20.0	70	56.0	30	24.0	90.63	0.000**
I feel the cost of fertility preservation is too high.	33	26.4	88	70.4	4	3.2	0	0.0	105	84.0	20	16.0	45.16	0.000**
I don't feel there is enough information for cancer cases to make birth decisions.	43	34.4	72	57.6	10	8.0	25	20.0	34	27.2	66	52.8	59.65	0.000**
I don't think there is a tracking system for cancer cases who want to give birth.	125	100.0	0	0.0	0	0.0	16	12.8	94	75.2	15	12.0	193.26	0.000**

A Highly statistically significant $p \leq 0.001$ **Table (8): Distribution of studied nurses according to perceived barriers related to interrupted oncofertility care at pre and post-intervention phases (n=125)

Items	Pre-intervention						Post-intervention						X ²	P-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree			
	No	%	No	%	No	%	No	%	No	%	No	%		
I will not pay attention to the decision of cases after referral for oncofertility.	34	27.2	84	67.2	7	5.6	15	12.0	35	28.0	75	60.0	53.12	0.000**
I have no access to the information on the birth decision of the case after treatment	61	48.8	48	38.4	16	12.8	7	5.6	96	76.8	22	17.6	57.30	0.000**

**A Highly statistically significant $p \leq 0.001$

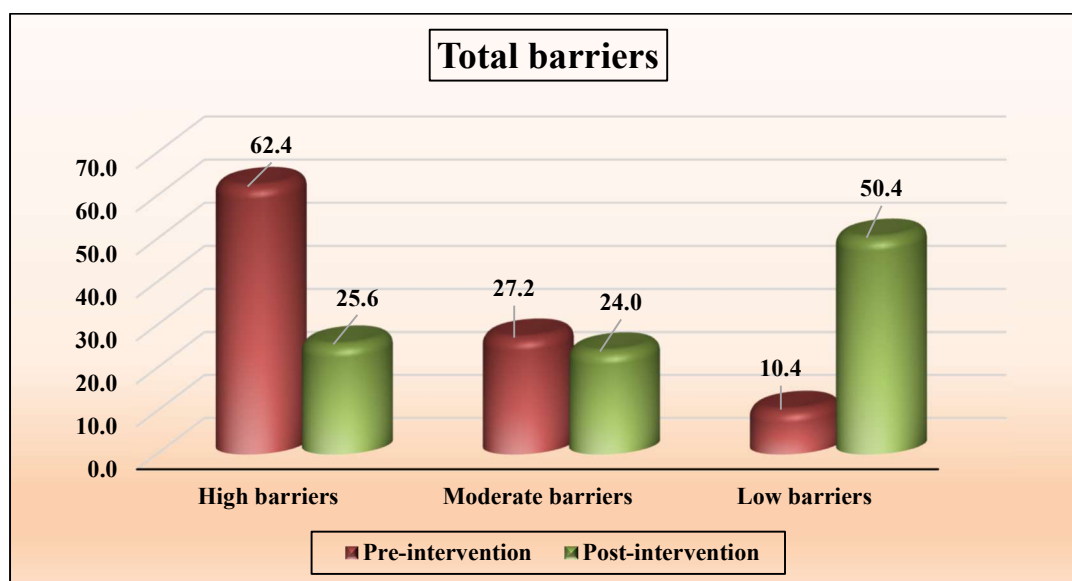


Figure (2): Distribution of studied nurses regarding total perceived barriers score toward oncofertility at pre and post-intervention phases (n=125)

Table (9): Correlation between total knowledge and perceived barriers scores of the studied nurses at pre and post-intervention phases (n=125)

Variables	Total knowledge score			
	Pre-intervention		Post-intervention	
	r	P-value	r	P-value
Total perceived barriers score	- 0.558	0.000**	- 0.724	0.000**

**A Highly statistically significant $p \leq 0.001$

Discussion

Fertility preservation treatments which give female cancer cases the chance to protect their reproductive potential despite the difficulties of cancer therapy, have become an essential part of all-encompassing cancer care (**Hussien et al., 2025**).

With a mean age of 33.98 ± 6.53 years, the study's findings revealed that less than half of the nurses in the sample were between the ages of 35 - < 45. Less than three quarters of them work in the obstetrics and gynecology department, whereas more than two-thirds of them have degrees from nursing technical institutes. Furthermore, about more than half of them were rural residents. Additionally, with a mean of 8.04 ± 3.52 years, less than three quarters of them had five to ten years of experience. Additionally, none of them took any classes on oncofertility.

Regarding oncofertility knowledge, the current study's findings showed that there was a highly statistically significant difference between the post-intervention phase and pre-intervention phase results for every item pertaining to the nurses' oncofertility knowledge. Less than one-third and more than three-quarters of the nurses in the study had good knowledge about oncofertility at the pre- and post-intervention

phases, respectively, according to the total knowledge score. This could be because of the instructional bundle's interactive features, which probably increased nurses' interest in and drive to learn. In addition to being pertinent to clinical practice, promote involvement and aid in memory recall.

The results of this study were consistent with those of **Zhang et al. (2021)**, who found statistically significant gains in overall knowledge ($P < 0.01$). Furthermore, **Takeuchi et al. (2018)** showed that knowledge scores rose between pre- and immediate post-program periods ($p < 0.01$) and between pre- and 6-month post-program periods ($p < 0.01$). This outcome was consistent with the findings of **Ono et al. (2023)**, who demonstrated a substantial increase in the overall knowledge score from the pre-test to the post-test ($p < 0.01$). Additionally, **Mansour and Hassan (2021)** discovered that the total knowledge score about fertility preservation improved statistically significantly from 8.2 ± 3.1 pre-intervention to 12.3 ± 5.4 post-intervention, with a very significant difference ($P=0.001$). The current findings' concordance with other study supports the efficacy of educational programs in raising nurses' awareness of oncofertility.

Our study revealed that there was a highly statistically significant difference between the results of the post-intervention phase and the pre-intervention phase in relation to all items of the perceived barriers of the studied nurses, including lack of information and education, rigid thinking toward oncofertility care, cancer case stereotypes, fertility risk, and insufficient support. Minority and over half of the nurses under study had low perceived barriers to oncofertility at the pre-intervention and post-intervention phases, respectively, according to the overall perceived barriers score. This could be attributed to the educational bundle's ability to change nurses' attitudes and perceptions regarding oncofertility care. Nurses' confidence and desire to discuss fertility with cancer cases can be increased by addressing myths, preconceptions, and informational gaps through education.

The current study's findings were in line with those of **Hu et al. (2025)**, who discovered that 45.54% of respondents had a score of at least three on the oncofertility barrier scale. Interestingly, 27.42% of participants reported hurdles across all six areas of the scale, and 85% of individuals indicated significant levels of barriers in at least one domain. "Stereotype of cancer cases"

was the most frequently mentioned barrier (71%). Significantly higher barriers were reported by nurses without fertility training, those who did not read fertility-related guidelines, and those who worked in departments without such guidelines (all $p < 0.05$). Oncofertility obstacles are very common among nurses.

Furthermore, **Alfayyad et al. (2025)** discovered that oncology nurses reported encountering several barriers while delivering fertility advice and having inadequate knowledge of FP. The new findings' congruence with other studies demonstrate that nurses' high perceived barriers are largely caused by a lack of institutional guidelines and training. In order to reduce these obstacles and enhance the standard of oncofertility treatment given to cancer cases, educational programs are crucial.

Furthermore, **El hajj et al. (2025)** noted that although fertility preservation is acknowledged as a crucial aspect of gynecologic oncology therapy, there are still large gaps in knowledge, referrals, and integration into multidisciplinary care. Improving case access and results requires standardizing care pathways, strengthening cooperation between oncology and reproductive teams, and improving provider education.

Furthermore, **Han et al. (2025)** noted that the implementation of FP shared decision-making among female cancer cases requires a strategic approach that takes facilitators and impediments into account. Additionally, **Mansour and Hassan (2021)** found that there was a highly significant rise in the average score of confidence, self-awareness, external barriers, time, and perceived treatment barriers after the intervention compared to before ($p < 0.001$).

The current research's findings were consistent with those of **Dorfman et al. (2024)** who showed that although providers were worried about their cases' preservation costs, their worries had little influence on whether or not they recommended interested female YAs to reproductive specialists. Concerns over disparities in the use of fertility preservation for female and racially/ethnically minority young adults, which were made worse by the high out-of-pocket expenses, were voiced by oncology providers. Additionally, the current results were consistent with those of **Lin et al. (2025)** who demonstrated that FP shared decision-making among chinese reproductive-aged women with gynecological cancer may be impacted by a number of issues, such as inadequate and delayed

information, disjointed referral mechanisms, psychological distress, financial concerns, and sociocultural factors. Enhancing case participation, promoting preference-sensitive decision-making, and lowering decisional conflict may be facilitated by multidisciplinary team involvement, nursing assistance, and culturally appropriate decision aids. These results suggest that creating individualized, culturally aware decision aids, optimizing multidisciplinary routes, and including structured counseling processes could all lead to more case-centered fertility treatment.

Other research **Polavarapu et al. (2025)** showed that improving FP care for breast cancer survivors requires a multi-level strategy that includes automated referral systems, improved provider education on FP, and targeted governmental interventions to address financial constraints. These tactics could guarantee fair access to FP care and enhance case results

Furthermore, **Huang et al. (2025)** made it clear that there are still barriers preventing cases from obtaining these treatments. Fertility specialists can work together and lobby in a variety of ways to guarantee that people with iatrogenic infertility receive access to FP. Physician lobbying in the political

arena can assist push for FP coverage for cases at risk for iatrogenic infertility, regardless of whether the state has active law or no written policy.

The findings of our research were corroborated by **Glazer and Schulte (2022)**, who demonstrated that FP decisions take place within the case, parent, and healthcare provider triad and are impacted by elements like parent attitudes, case maturity, and healthcare provider knowledge. Cost and resource constraints restrict cases from accessing adequate fertility information and referrals, but decision tools and health care provider education can encourage the occurrence of developmentally appropriate fertility conversations.

Our results showed a highly significant statistical negative correlation between the total knowledge and perceived barriers scores of the nurses under research at both the pre-intervention and post-intervention phases ($P \leq 0.001$). Our research's findings were corroborated by **Villarreal-Garza et al. (2021)**, which demonstrated how important it is to advance doctors' understanding and support laws that remove obstacles to universal access to fertility. Similarly, the current research's findings concurred with those of **Ali et al. (2024)**, who noted that improving FP service in the

future would need resolving these concerns through providing aid for FP procedures, boosting FP knowledge dispersion, and creating age-appropriate FP-related teaching materials. This result illustrates how well the educational bundle works to close the gap between maternity and cancer nurses' perceived barriers and knowledge gaps.

Overall, the results of this study highlight the usefulness of educational bundle in raising nurses' knowledge of oncofertility and lowering perceived barriers. Educating nurses strengthens their position as important proponents of fertility preservation, which eventually leads to more thorough and all-encompassing cancer care.

Conclusion

The findings of the research demonstrated a remarkable improvement in nurses' knowledge and perceived barriers toward oncofertility following the implementation of the educational bundle with a highly statistically significant differences between the pre- and post-intervention phases, indicating the significant effect of the educational bundle. Furthermore, a negative correlation was observed between knowledge and perceived barriers in both the pre- and post-intervention phases, with highly significant statistical differences.

This suggests that as nurses' knowledge about oncofertility increases, perceived barriers became decreased. Consequently, the aim of the study was successfully achieved, and research hypotheses were clearly supported

Recommendations

Based on the research findings it was recommended that:

- Incorporate oncofertility training programs into nursing education curricula to guarantee nurses' enhanced perceptions and sustained knowledge.

- Create standardized clinical guidelines for nurses regarding the principles, indications, benefits, and barriers of oncofertility as a cancer treatment option.

- Promote regular competency evaluations to gauge nurses' knowledge and preparedness to advise cancer women on alternatives for preserving their fertility.

Examine whether better knowledge and perception result in better clinical counseling and decision-making for women with cancer.

Encourage interdisciplinary cooperation between oncologists, gynecologists, nurses, and reproductive specialists to improve communication and bolster the use of fertility preservation methods for cancer-stricken women.

Further research:

- Carry out additional extensive research to investigate the long-term impacts of educational interventions on nurses' clinical counseling and oncofertility expertise.

- Evaluate how well various teaching strategies (e-learning, workshops, simulation-based training) improve nurses' comprehension of oncofertility.

- Future research should examine how well certain educational programs work to remove barriers to oncofertility and encourage nurses to participate in oncofertility care.

- Improvement of the training programs that ultimately improve the quality and accessibility of oncofertility care for women with cancer.

Acknowledgments:

The researchers are grateful to the nurses who contributed their valuable time to the current research. Additionally, the researchers would like to thank the director of Benha University hospitals, the head of the obstetrics and gynecological department, and the jury committee for their support.

Reference

Alfayyad, I., Yaqub, M., & Altannir, M. (2025). Insights into the knowledge and barriers of oncofertility among oncology nurses in Saudi Arabia. *Journal of Cancer*

Education: The Official Journal of the American Association for Cancer Education, 10, 1007/s13187-025-02670-7. Advance Online Publication.
<https://doi.org/10.1007/s13187-025-02670-7>

Ali, A., Lee, Y., Alias, H., & Zainuddin, A. (2024). Fertility preservation in Malaysian pediatric cohort: A survey of healthcare providers' knowledge, practice, attitude, perceptions and barriers. *Frontiers in Pediatrics*, 12. <https://doi.org/10.3389/fped.2024.1419515>

Almuhanna, A., AlTarrah, H., Alali, H., Chamdine, O., Azam, F., & Alamoudi, M. (2024). Fertility preservation, knowledge and practice among oncologists in Saudi Arabia. *Advances in Reproductive Sciences & Reproductive Health & Infertility*, 4, 112. <https://doi.org/10.29011/ARRHI-112.100012>

Bray, F., Laversanne, M., Sung, H., Ferlay, J., Siegel, R. L., Soerjomataram, I., & Jemal, A. (2024). Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians*, 74(3), 229–263. <https://doi.org/10.3322/caac.21834>.

Dorfman, C., Stalls, J., Shelby, R., Arthur, S., Acharya, K., Davidson, B., & Greenup, R. (2024). Impact of financial costs on patients' fertility preservation decisions: An examination of qualitative data from female young adults with cancer and oncology providers. *Journal of Adolescent and Young Adult Oncology*, 13(3), 502-513.

Edris, F., Alenezi, I., Alshaikh, A., AlFarrah, N., Ali, J., Hashim, S., & Nassar, J. (2025). Updates on preservation of female fertility in cancer patients: A systematic review and meta-analysis. *Bahrain Medical Bulletin*, 47(1),1-8.

El hajj, H., Tran, P., Collin-Bund, V., Azais, H., Babin, G., Margueritte, F., & Grysole, C. (2025). Fertility preservation in Gynecologic Oncology: Evaluating knowledge, practices, and barriers among French Healthcare Providers. *International Journal of Gynecological Cancer*. <https://doi.org/10.1016/j.ijgc.2025.102782>

Ghaemi, M., Rokhzadi, I., Dashtkoohi, M., Doosti, M., Rezaeinejad, M., Shariat, M., & Fakehi, M. (2024). Knowledge, attitudes, and practices of healthcare providers among women oncofertility in Iran: A cross-sectional study. *BMC Cancer*, 24(1), 1044.

- Glazer, T., & Schulte, F. (2022).** Barriers to oncofertility care among female adolescent cancer patients in Canada. *Current Oncology*, 29(3), 1583-1593.
- Goldenberg, E. (2025).** Hematologic cancers in women: from fertility preservation to post-cancer fertility outcomes. *Human Reproduction*, 40(7), 1315–1324.
- Han, J., Son, Y., Jang, M., Cho, E., & Ahn, J. (2025).** Barriers to and facilitators of shared decision-making implementation in Fertility Preservation for patients with Cancer: A qualitative study. *Journal of Nursing Scholarship*, 1-15.
- Hu, L., Zheng, C., Xu, B., Tang, W., & Li, H. (2025).** Oncofertility barriers in nurses caring for women with Breast Cancer. *Scientific Reports*, 15(1), 1-8.
- Huang, E., Shandley, L., Mehta, A., Kobashi, K., & Muthigi, A. (2025).** Fertility preservation for iatrogenic infertility: Patient barriers and opportunities for the reproductive medicine workforce. *Urology Practice*, 12(2), 194-201.
- Huang, S., Lai, J., Chin-Ching, L. I., Ping-Ho, C., Pei-Ju, L., & Ching-Ting, L. (2022).** Development and validity testing of an assessment tool for oncofertility barriers in multidisciplinary healthcare providers on the breast cancer team. *Journal of Nursing Research*, 30(2), Doi: 10.1097/jnr.0000000000000479
- Hussien, E., Hassan, E., Abdellatif, A., & Gaber, M. (2025).** Fertility preservation in cancer patients: Review article. *The Egyptian Journal of Hospital Medicine*, 100(1), 2727–2733.
<https://doi.org/10.21608/ejhm.2025.436804>
- Hussien, S., Zoromba, M., El-Gazar, H., Mousa, O., Amin, S., & Atta, M. (2025).** Fertility-preservation knowledge, perceived barriers, and Tokophobia among female Oncology patients: The moderating role of psychological capital. *SAGE Open Nursing*, 11, 1-12.
- International Agency for Research on Cancer (IARC). (2024).** Egypt fact sheet — GLOBOCAN 2022 (Global Cancer Observatory). Lyon, France: IARC. Retrieved from: <https://gco.iarc.who.int/today/data/factsheets/populations/818-egypt-fact-sheet.pdf>.
- International Journal of Clinical Oncology. (2025).** Trends in fertility preservation treatments in Japan until 2023. *Analysis of the Japan Oncofertility Registry*, 30, 684–695.
- Kim, J., Lee, S., & Park, H. (2023).** Improving fertility-preservation counseling through provider education: A scoping review of oncofertility training programs. *Supportive Care in Cancer*, 31(4),

2341–2352.

<https://doi.org/10.1007/s00520-022-07571-8>

Lin, Y., Ma, Q., Wang, X., Li, X., Jin, M., Wei, Q., & Jiang, L. (2025). Shared decision-making on Fertility Preservation in reproductive-aged women with gynecological cancer: A qualitative study of patients' and health care professionals' perspectives. *International Journal of Women's Health*, 5155-5168.

Mansi, R., Rajan, A., Hynniewta, B. C., & Momin, F. (2025). Preservation of fertility in men with cancer. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, 14(11), 4066–4071.
<https://doi.org/10.18203/2320-1770.ijrcog20253568>

Mansour, S., & Hassan, S. (2021). An educational package for oncology nurses regarding fertility preservation among female cancer patients. *Egyptian Journal of Health Care*, 12(3), 1320–1329.
<https://doi.org/10.21608/ejhc.2021.196563>

Mousa, O., Jaramillo, J., & Alghanem, M. (2025). Fertility preservation awareness among oncology patients: Influencing factors. *Egyptian Journal of Health Care*, 16(2), 1147–1158.

Njiru, J., Philippe, P., Mogeni, R., Odongo, E., & Elkanah, O. (2025).

Knowledge, attitudes, and barriers to oncofertility services among cancer patients requiring chemoradiotherapy: A systematic review. *MedRxiv*, Doi: <https://doi.org/10.1101/2025.08.13.25333645>

Ono, M., Harada, M., Horie, A., Dai, Y., Horiguchi, I., Kikuchi, E., & Suzuki, N. (2023). Effect of a web-based fertility preservation training program for medical professionals in Japan. *International Journal of Clinical Oncology*, 28(9), 1112–1120.

Pirooznia, P., Meighani, E., & Ghaffari, F. (2025). Exploring new frontiers in oncofertility preservation: A case of ovarian stimulation during pregnancy. *Journal of Ovarian Research*, 18, 39.
<https://doi.org/10.1186/s13048-025-01615-4>

Polavarapu, M., Arsene, C., Singh, S., & Ansah, J. B. (2025). Fertility preservation among patients with breast cancer: a qualitative study of patient and healthcare provider perspectives. *Cureus*, 17(8), 1-13.

Rodriguez-Wallberg, K., Jiang, Y., Lekberg, T., & Nilsson, H. (2023). The late effects of cancer treatment on female fertility and the current status of fertility preservation: A narrative review. *Life (Basel)*, 13(5), 1195.
<https://doi.org/10.3390/life1305119>

- Seymour, J. F., Panday, T., Hilton, J., & Campo-Engelstein, L. (2024).** Health care provider knowledge and barriers surrounding oncofertility: A systematic review. *Journal of Cancer Survivorship*.
<https://doi.org/10.1007/s11764-023-01484-1>
- Sharma, S., & Ghosh, R. (2025).** Cancer and IVF: Assessing fertility preservation options and associated cancer risks. *Bulletin of the National Research Centre*, 49, 72.
<https://doi.org/10.1186/s42269-025-01368-6>
- Sindi, R., Bagabas, M., Al-Manabre, L., Alqasmi, R., Rednah, R., Al-Jahdali, S., & Hussein, H. (2025).** Fertility preservation in cancer patients: Evaluation of knowledge, attitude, and practice of health practitioners towards fertility preservation in Makkah region of Saudi Arabia. In *Proceedings in Technology Transfer* (pp. 1–12). Springer.
https://doi.org/10.1007/978-981-97-8588-9_48. (Reports ~90% of practitioners lacked adequate FP knowledge).
- Takeuchi, E., Kato, M., Miyata, K., Suzuki, N., Shimizu, C., Okada, H., & Miyoshi, Y. (2018).** The effects of an educational program for non-physician health care providers regarding fertility preservation. *Supportive Care in Cancer*, 26(10), 3447-3452.
- Villarreal-Garza, C., Martinez-Cannon, B. A., Barragan-Carrillo, R., Bargallo-Rocha, J. E., Platas, A., Peña-Curiel, O., & Rivera, S. (2021).** Physicians' attitudes, knowledge, and perceived barriers toward fertility preservation in young breast cancer patients in a developing country. *Revista de Investigacion Clinica*, 73(6), 347-353.
- Zhang, H., Jiang, Q. H., Huang, G., Kako, J., Kajiwarra, K., Lyu, J. X., & Miyashita, M. (2021).** The educational program for healthcare providers regarding fertility preservation for cancer patients: A systematic review. *Journal of Cancer Education*, 36(3), 452-462.

Effect of Negative Pressure Wound Therapy on Clinical Outcomes For Patients Undergoing Vascular Surgeries

Amira Mohamed Elneny^{1,2}, Adel Hussein Kamhawy³, Monira Bassuni
Elsheimy⁴, Reda Abdelsalam Elbastawesy⁵

¹Nurse Educator at Secondary Technical Nursing School in Samanoud.

²Master Student of Medical Surgical Nursing, Faculty of Nursing, Tanta University.

³Professor of Vascular Surgery and Interventions, Faculty of Medicine, Tanta University.

⁴Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University.

⁵Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University.

Corresponding author: Amira Mohamed Elneny

Email: amira_pg161150@nursing.tanta.edu.eg

Abstract

Background: Vascular surgical wounds are complex wounds that require advanced management strategies to enhance healing, reduce complications, and improve patient outcomes. Negative Pressure Wound Therapy (NPWT) has emerged as an effective modality that promotes wound healing through exudate management, improved perfusion, and stimulation of granulation tissue formation. **Aim:** The study aimed to evaluate the effect of Negative Pressure Wound Therapy on wound healing outcomes among patients undergoing vascular surgeries. **Design:** A quasi-experimental research design was utilized. **Setting:** The study was carried out at Tanta International Teaching University Hospital, at Vascular Surgery Department. **Subjects:** The study was conducted on 60 patients divided equally into a study group (n = 30) and a control group (n = 30). **Tools:** Four tools were used in this study **Tool I:** Structured Interview Questionnaire **Tool II:** wound characteristics assessment **Tool III:** "Pain Assessment" **Tool IV:** Check list for negative pressure wound therapy. **Results:** The findings revealed a statistically significant improvement in all wound healing parameters in the study group compared to the control group. Pain levels were also significantly lower in the study group. **Conclusion:** Negative Pressure Wound Therapy is an effective and safe method for improving wound healing outcomes in patients undergoing vascular surgeries. It accelerates the healing process, reduces complications, and enhances patient comfort. **Recommendations:** The study recommends the implementation of NPWT in clinical practice, continuous training of nursing staff, regular wound assessment, and further large-scale studies to confirm long-term outcomes.

Keywords: Clinical outcomes, Negative Pressure Wound Therapy (NPWT), Vascular surgeries.

Introduction

The human skin serves as the primary mechanical and biological barrier protecting underlying tissues from microbial invasion and environmental trauma (**Yousef et al., 2021**). Maintaining the structural integrity of this cutaneous barrier is paramount following surgical interventions, where any disruption can impair the normal wound healing cascade (**Gallo, 2022**). In patients undergoing vascular surgeries, the skin and subcutaneous tissues are particularly vulnerable due to pre-existing peripheral arterial disease, compromised local tissue perfusion, and comorbidities like diabetes (**Zarkos et al., 2023**). Consequently, surgical site complications (SSCs), including surgical site infections (SSIs) and wound dehiscence, remain a critical challenge in vascular reconstructive procedures, leading to prolonged hospitalization, increased healthcare costs, and higher morbidity rates (**Svensson et al., 2024**).

To mitigate these cutaneous risks and optimize clinical outcomes, closed incision negative pressure wound therapy (ciNPWT) has emerged as a promising prophylactic and therapeutic intervention (**Anghel & Kim,**

2025). By applying controlled sub-atmospheric pressure to the closed surgical wound, NPWT stabilizes the skin edges, reduces lateral tension, and decreases edema, thereby enhancing microvascular blood flow and accelerating tissue granulation (**Glaser et al., 2022**). Recent clinical evidence suggests that integrating NPWT into the postoperative care of high-risk vascular surgery wounds significantly reduces the incidence of infections and promotes optimal barrier restoration (**Staley et al., 2026**). However, a comprehensive evaluation of its specific impact on diverse clinical outcomes in vascular populations remains essential to standardize its application.

A wound is defined as a disruption in the anatomical integrity and physiological continuity of the skin or underlying tissues caused by mechanical, chemical, thermal, or pathological factors (**Guo & DiPietro, 2020**). Wounds are broadly classified into **acute** and **chronic** categories depending on their healing pattern and underlying pathophysiology. Acute wounds typically follow a predictable healing course and are commonly caused by surgical incisions, trauma, or minor injuries, usually resolving within

an expected timeframe (**Velnar et al., 2020**). In contrast, chronic wounds fail to progress through the normal healing stages due to factors such as infection, ischemia, diabetes mellitus, malnutrition, or impaired perfusion, often remaining in a prolonged inflammatory state (**Sen, 2023**).

Regarding to wound characteristics—including size, depth, tissue involvement, and vascular supply—is crucial for planning effective wound management. This is particularly significant in high-risk surgical populations, such as vascular surgery patients, where compromised perfusion and the use of prosthetic grafts increase the risk of infection, delayed healing, and wound breakdown (**Yu et al., 2024**).

Therefore, comprehensive wound assessment remains essential for preventing complications and improving postoperative outcomes. Vascular surgery remains a high-risk domain in surgical care, often involving major arterial reconstructions, grafts, and incisions in anatomically challenging areas. Patients undergoing vascular procedures frequently present with multiple comorbidities which compromise wound healing and increase the

incidence of surgical-site complications (**Yu et al., 2024**). One of the most significant postoperative issues in vascular surgery is the occurrence of surgical-site infections (SSIs), especially in groin incisions or in the presence of prosthetic grafts. For instance, graft-related infections and wound breakdowns in the groin have been reported at rates as high as 30 % in some series (**Yu et al., 2024**). Conventional wound management approaches—such as standard dressings, antibiotic prophylaxis, and drainage—have improved outcomes; however, they remain insufficient in high-risk vascular surgical wounds where tissue perfusion and patient factors pose additional challenges (**Balboula et al., 2024**).

The therapeutic concept of Negative Pressure Wound Therapy (NPWT) emerged as an adjunctive modality to enhance wound healing by applying controlled sub-atmospheric pressure to a sealed wound environment, thereby promoting drainage, reducing edema, improving perfusion, and facilitating granulation tissue formation. In the context of vascular surgery, the application of NPWT to closed incisions (incisional NPWT) or to infected

wound spaces has gained increasing attention, particularly for groin wounds, graft exposures, and high-risk patients. A systematic review and meta-analysis found that NPWT dressings in groin incisions after vascular procedures significantly reduced SSIs

The mechanisms by which NPWT may improve clinical outcomes in vascular surgical wounds include: reduction of lateral tension in incisions, improved interstitial fluid removal, enhanced microvascular perfusion, stabilization of tissue layers, and decreased bacterial burden in the wound environment. Despite these promising mechanisms, the use of NPWT in vascular surgery is not universally adopted, partly because high-quality large-scale randomized controlled trials (RCTs) are limited, the cost of devices remains a concern, and the optimal settings, duration, and patient selection criteria are yet to be fully standardized (Yu et al., 2024).

In addition to reducing infection rates, NPWT has been shown in broader wound types (non-vascular) to accelerate wound healing, shorten hospital stays (mean difference -4.78 days; 95 % CI -7.79 to -1.76) and improve

closure rates, though these data derive from mostly low-quality studies (Systematic Reviews, 2020). For vascular surgery patients, who typically carry multiple risk factors such as diabetes, smoking, obesity, and poor nutritional status, the adjunctive benefit of NPWT may be magnified, since these comorbidities impair normal healing pathways and predispose to seromas, hematomas, graft exposures and deep wound infections (Balboula et al., 2024). The economic and clinical burden of vascular wound complications is substantial. Extended hospital stays, repeated surgeries, graft removals or revisions, increased antibiotic use, and higher morbidity all contribute to increased cost and worse patient-centered outcomes. The adoption of NPWT may therefore have implications not only for surgical results but also for health-service resource utilization. Key clinical outcomes of interest when evaluating NPWT in vascular surgery include incidence of SSI (superficial, deep), seroma formation, need for reoperation or graft revision, length of hospital stay, readmission rates, wound healing time, graft preservation and overall morbidity and

mortality (**Baram, & Baban, 2020**).

From a practical standpoint, selecting appropriate candidates for NPWT in vascular surgery is critical. Patients with groin incisions, prosthetic grafts, obesity, diabetes, smoking history, or prior wound complications may benefit the most. Similarly, timing (prophylactic vs therapeutic), therapy duration, negative pressure settings (e.g., -125 mmHg) and maintenance protocols appear to influence outcomes (**Systematic Reviews, 2025**). In terms of implementation, surgical teams and wound care specialists must collaborate to integrate NPWT protocols into perioperative workflow, including identification of high-risk cases, device selection, monitoring for adverse events (such as bleeding or pseudo-aneurysm in groin NPWT) and cost-benefit considerations (**Scali et al., 2017**).

Regarding safety, although NPWT is generally well tolerated, specific concerns in vascular surgery include major bleeding (reported at 7.1 % in one study), graft exposure, or pseudo-aneurysm formation when used in groin wounds with prosthetic vascular grafts. Future research directions should include large-scale multi-center RCTs in

vascular surgical populations, standardized definitions of wound complications, cost-effectiveness analyses, stratification of patient risk-profiles, and exploration of optimal NPWT parameters (pressure level, duration, dressing types) to develop clear clinical guidelines and protocols.

Wound complications remain a major concern following vascular surgical procedures, particularly in groin incisions, which are prone to infection because of their proximity to lymphatic channels and bacterial colonization. The reported incidence of surgical site infections (SSIs) in vascular surgery ranges from **10% to 30%**, depending on patient comorbidities, type of graft used, and surgical technique (**Yu et al., 2024**). In high-risk populations—such as diabetic or obese patients—the infection rate may rise to more than **35%**, contributing significantly to delayed wound healing, prolonged hospital stays, and increased healthcare costs (**Balboula et al., 2024**).

Nurses play a pivotal role in the preoperative, intraoperative, and postoperative care of vascular surgery patients, particularly in wound management using NPWT. Preoperatively, nurses are responsible for risk assessment,

identifying patients with comorbidities such as diabetes, smoking, malnutrition) that may predispose them to poor wound healing (**Ousey & Milne, 2021**). In the postoperative phase, nurses are key in initiating and maintaining NPWT, ensuring proper dressing application, seal integrity, and monitoring pressure settings. They must observe early signs of infection, bleeding, or graft exposure, and promptly report complications to the surgical team (**Timmermans et al., 2022**). Additionally, Nurses provide **patient education** regarding device care, hygiene, mobility precautions, and follow-up appointments. Their role extends to emotional and psychological support, as patients often experience anxiety related to the device and wound appearance. Continuous nurse education and adherence to evidence-based NPWT protocols are vital for improving patient outcomes and reducing postoperative wound complications (**Ousey & Milne, 2021**).

Significance of the study:

"The process of tissue repair can be highly unpredictable, as acute injuries occasionally transition into non-healing, chronic states. Unsuccessful management of

extensive wounds is frequently linked to multiple co-existing diseases, extended hospital stays, diverse clinical complications, and increased mortality rates. Consequently, managing acute, complex, and persistent wounds remains a formidable task for healthcare providers, demanding immense global healthcare resources and imposing a heavy clinical and economic burden in Egypt (**Mohamed et al., 2019**).

"Negative Pressure Wound Therapy (NPWT) serves as an effective intervention to promote recovery across various wound classifications, including acute, chronic, open abdominal, and closed incisional wounds, as well as skin grafts. Given its widespread application across diverse clinical scenarios, implementing NPWT necessitates a comprehensive blend of specialized knowledge and advanced practical skills within the nursing profession (**Dingemans et al., 2019**)."

The aim of the study was to

Evaluate the effect of negative pressure wound therapy on clinical outcomes for patients undergoing vascular surgeries

Research hypothesis:

1- Study group who receive negative pressure wound therapy

may display greater complete wound healing than control group. 2-Study group who receive negative pressure wound therapy is expected to exhibit less infection manifestations and reduced pain parameters than control group.

Operational definition:

Negative pressure wound therapy: is a sealed wound-care system that is primarily utilized to treat complex wounds. Negative-pressure wound therapy works through mechanisms that include fluid removal, drawing the wound together, micro deformation, and moist wound healing.

Clinical outcomes: wound healing, infection manifestations and pain parameters.

Subjects and Method**Research design:**

A quasi-experimental research design was used.

Setting:

The study was carried out at Tanta International Teaching University Hospital, affiliated to the ministry of higher education and scientific research, Vascular Surgery Department which suited on 6th floor, and consists of 6 wards each ward contains 5 patients' beds, with a total capacity of 30 patients.

Subjects:

A purposive sample of 60 adult patients undergoing vascular

surgeries were selected and divided randomly into two equal groups, 30 patients in each group. The sample size calculation based on patient admission in hospital and expected improvement on patients' outcomes among studied groups at 95% confidence power of the study.

Group 1: Control group, 30 patients (received hospital routine of care as is now typically) provided (wound dressings, no NPWT).

Group 2: Study group; 30 patients managed by negative pressure wound therapy.

Inclusion criteria:

- Age 21-60 years old
- Both sexes
- Acute and chronic vascular surgeries wounds
- Patient free from wound infection or inflammation.

Exclusion criteria:

- Systemic or localized complications, including pyrexia (body temperature $>$ or $= 38.5^{\circ}\text{C}$).
- Gastrointestinal disturbances (such as nausea, vomiting, or diarrhea).
- Neurological symptoms (including vertigo or confusion).
- Patient exhibiting signs of hemorrhage, localized erythema, or abnormal warmth surrounding the lesion.

Tools for data collection:

Four tools were used in this study:

Tool I: Structured Interview Questionnaire: It was developed by the researcher after reviewing relevant literatures to collect data pertinent to the current study. It consists of two parts.

Part A: Socio-demographic characteristics of patients, to assess data related to patient code, age, sex, marital status, educational level, occupation and residence.

Part B: Health relevant data that include: date of admission, past and present medical, surgical history, body mass index.

Tool II: Wound characteristics assessment: "The instrument was designed by the researcher in light of pertinent literature, comprising two main parts."

Part A: Vascular surgeries wound characteristics assessment: It was classified into 5 parts.

1. Depth of wound, which indicated by estimating depth percentage out of 100% as a total epithelial tissue covering the wound surface. **It was scored as:**
0 = 100% wound healed and surfaces are intact.
1 = 75% to < 100% wound is covered &/or epithelial tissue extends > 0.5 cm into wound bed.

2 = 50% to < 75% wound is covered &/or epithelial tissue extends < 0.5 cm into wound bed.

3 = 25 to < 50% wound covering.

4 = < 25% wounds covering.

5 = No epithelial tissue present covering the wound.

2. Presence of abnormal findings of wound healing

a- Assessment of wound bed color: pink, red, dark red or yellow/white.

b- Assessment of wound exudate odor: **It was scored as**

0 = absent, and 1 = present.

3. Presence of granulation tissue type, color and amount, it scored as:

0 = normal: 100% wound covered, surface intact or partial thickness wound.

1 = bright, beefy red, 75% - < 100% wound fills &/or tissue overgrowth.

2 = bright, beefy red, < 75% & > 25% of wound fills.

3 = pink &/or dull, dusky red/or fills ≤ 25% of wound.

4 = no granulation tissue present.

4. Local infection which was examined and recorded starting from 3rd and 5th days of dressing. It scored as:

0 = absence of local signs of wound infection.

1 = Presence of local signs of wound infection (redness, hotness,

tenderness, purulent discharge and swelling).

2= presence of systemic wound infection signs (fever, elevated WBCs, ESR and CRP).

5. Finally, the estimated size of wound which was scored in centimeters for length and width using ruler.

Part B: “Wound Healing Assessment”: This part developed by the researcher to describe wound morphology against certain parameters:

-Moist granulation tissues formation.

-Improved healing surface area measurements (Decrease wound size).

-Presence or absence of healing epithelial edges.

-Presence or absence of clinical signs related to wound infection: redness, hotness, tenderness, swelling, edema, change wound color, and presence of exudates or discharge (amount, color, and odor).

Scoring system:

1 = Complete healing: indicated by presence of healthy granulation tissue covered by migration and proliferation of epithelial cells within the wound space and formation of scar tissue.

2 = Partial healing: presence of healthy granulation tissue within the wound space

or decrease of wound size without formation of scar tissue.

3 = No healing: represented by no improvement in wound characteristics or no granulation tissue formation, No decrease of wound size and depth and no fibrous scar tissue formation.

Tool III: “Pain Assessment”:

This tool was adopted from its first scientific descriptors; **Anne Boonstra et al. (2016)** To quantify pain severity, a 10-cm continuous horizontal Visual Analogue Scale (VAS) was utilized, anchored by '0' on the far left (representing no pain) and '10' on the far right (representing the most severe pain). The reliability and clinical consistency of this scale have been previously validated by **Bijur, Silver, and Gallagher (2016)** and was adopted by the researcher "to evaluate the severity of wound associated pain, several parameters were measured, including its anatomical location, duration (recorded in minutes), and severity, alongside its triggering and relieving factors. Subjective pain intensity was quantified utilizing the Visual Analogue Scale (VAS) scoring system, which categorizes

pain levels based on the following numerical ranges:

0: Indicates complete absence of pain.

-1–3: Reflects mild pain.

-4–7: Denotes moderate pain.

->or = 8: Represents severe pain.

Tool IV: Check list for negative pressure wound therapy. "The methodology was derived directly from its primary scientific descriptions" (Carol Taylor, Carol Lillis, and Pamela Lynn. 2015). This tool was used by the researcher to perform NPWT patient's dressing.

Method:

Ethical and legal consideration:

- An approval from ethical committee at Faculty of Nursing was obtained code no. (205-2-2023).
Prior to participation, informed written consent was secured from all eligible patients. This was achieved after thoroughly clarifying the study's objectives and guaranteeing the absolute confidentiality and anonymity of all gathered data.
- Confidentiality and privacy were maintained by the use of code number instead of name and the right of withdrawal is reserved.
- The study did not cause any harm to patients.

- Any unexpected risks that appeared during the course of the research were cleared to participants and the ethical committee on time.

-Tools of the study were developed after review of related literature.

1-Validity: To ensure the face and content validity of the developed tools, they were reviewed by a jury panel of experts in the fields of Medical-Surgical Nursing and Biostatistics The experts evaluated the tools for clarity, relevance, and comprehensiveness. All necessary modifications and adjustments were made based on their recommendations and consensus.

2-Pilot Study: A pilot study was conducted on 10% of the sample (6 patients) to evaluate the feasibility, applicability, and clarity of the developed tools, as well as to estimate the time required to complete them. Since no major modifications were required, the patients included in the pilot study were excluded from the main study sample.

3-Reliability: the reliability of study tools was adopted from standardized, previously validated research literature, which indicated that the tools possess high internal consistency and stability for clinical evaluation.

-Reliability was applied on the devolved tools (I, II, III, IV) and applicability was done.

- A jury of nine experts in biostatistics and medical-surgical nursing assessed the newly developed tools to ensure their validity, focusing specifically on appropriateness and clarity. All recommended adjustments were subsequently carried out.

- A pilot study was carried out on 10% of the total sample to test the feasibility and applicability of the developed tools, accordingly, needed modification was done.

- The process of data collection spans a period exceeding six consecutive months.

-The present study was conducted through the following steps:

- An initial clinical assessment for patients in both groups was performed utilizing Section A of Tool I. Additionally, a morphological assessment of the wounds was carried out by the investigator in collaboration with the attending surgeons, employing Section A of Tool II both at baseline and after a two-week period.

Start time aimed to:

Wound Assessment Parameters and Procedures:

a) Measurement of Wound Depth:

The investigator evaluated tissue thickness and depth to classify the wound as either superficial (confined to the epidermis) or partial thickness (involving the epidermis and/or dermis) by monitoring the epithelialization process.

b) Assessment of Local Signs of Abnormal Wound Healing:

Clinical Indicators of Localized Infection: The wound bed was inspected for signs of infection, including abnormal discoloration, localized warmth, tenderness, and edema.

Exudate Evaluation: Drainage was assessed based on type, volume, and odor, and categorized as follows:

Sanguineous (Bloody): Thin, bright red discharge.

Serosanguineous: Thin, watery, yellowish fluid.

Serous: Thin, watery, and clear fluid.

Purulent: Thin or thick opaque, yellowish discharge.

Foul Purulent: Thick, opaque, yellow-to-green discharge with a distinctive foul odor.

c) Assessment of Granulation Tissue:

The researcher documented the development of healthy

granulation tissue along with the formation of fibrous scar tissue.

d) Assessment of Peri-wound Area:

The surrounding skin was examined to detect signs of inflammation (erythematous changes, localized heat, tenderness, and swelling) and to evaluate skin hydration status (moist versus dry).

e) Wound Dimension Measurement Technique:

To determine wound size accurately in centimeters, the following standardized procedure was executed:

Hand hygiene was performed, and sterile latex gloves were done.

A sterile, flexible cotton-tipped applicator was moistened with normal saline.

The applicator was carefully inserted into the wound, marked at the level of the surrounding skin margin, and grasped with the thumb and forefinger at that precise point.

The applicator was then removed, and the length was measured against a calibrated ruler.

Furthermore, wound healing progress was systematically monitored over five distinct intervals, beginning at the first week and continuing on a weekly basis until the fifth follow-up week

Tool II (Part B) Evaluation Criteria:

This instrument was utilized to assess the following clinical parameters:

a) Granulation Tissue Development: Assessing the formation and progression of healthy granulation tissue within the wound bed.

b) Reduction in Wound Surface Area: Monitoring the rate of wound contraction and improvement in overall healing dimensions.

c) Epithelial Edge Progression: Observing the presence and advancement of thin, regenerating epithelial margins.

d) Resolution of Infection and Complete Healing: Confirming the complete absence of localized clinical signs of infection. In this context, successful and complete wound closure was operationally defined by the establishment of mature granulation tissue, characterized by the appearance of a thin epithelial layer or a distinctive bluish film advancing from the wound margins.

Using tool III, the researcher monitored patients' wound pain in both groups over five follow-up periods, beginning at the post surgery and extending until the fourth week of the study.

- Study group received NPWT dressings and control group patients received routine hospital dressing by nurses.

Preparation before the procedure:

-Reviewed physician's orders and the patient's medical record to verify the indication for NPWT, wound location, type of surgery, and any contraindications (e.g., active bleeding, exposed vessels, untreated infection).

-Explained the procedure to the patient to gain cooperation and reduce anxiety. Describe the purpose, expected sensations, and possible alarms of the NPWT device. Obtain verbal and written informed consent.

-Prepared the environment: ensure privacy, adequate lighting, and all sterile materials ready on a clean trolley.

-Performed hand hygiene, wear sterile gloves, mask, and gown according to infection-control policy.

Prepare Equipments:

-NPWT device and canister.

-Sterile NPWT foam or gauze dressing (as per manufacturer's guideline).

-Adhesive transparent drape to create airtight seal.

-Suction tubing and connector pad (track pad).

-Normal saline for wound cleansing.

-Sterile scissors, forceps, and measuring tape. Foam tape

-Skin-barrier film or protective wipes.

-Waste container for contaminated material.

-Pain scale and vital sign monitor

Initial Wound Assessment:

-Gently remove the old dressing and observe the wound for color, size, depth, odor, and amount/type of exudate.

-Measure wound dimensions (length × width × depth) using a sterile ruler and record findings.

-Assess surrounding skin for maceration or irritation.

-Assess pain level using a numerical rating scale (0–10) and provide analgesics if needed according to prescription.

-Cleanse the wound with sterile normal saline; remove debris and necrotic tissue if indicated.

-Dry the surrounding skin and apply a thin layer of protective barrier to prevent irritation from adhesive film.

Foam Dressing Application.

-Cut the NPWT foam to match the exact wound size and shape, slightly smaller than the wound edges to avoid pressure on intact skin.

- Using sterile forceps, place the foam gently into the wound cavity ensuring full contact with the wound bed and avoiding over packing.
- If the wound has tunnels or undermining, cut small strips of foam to fill the area lightly.
- Position the suction port (track pad) over the center of the foam or as directed by device type.
- Creating the Airtight Seal.
- Cover the foam and 3–5 cm of surrounding healthy skin with the adhesive drape, pressing firmly to achieve an airtight seal.
- Cut a small opening in the drape above the foam where the suction pad was attached.
- Attach the tubing connector firmly to the opening and secure with additional drape if necessary.
- Visually inspect all edges to ensure no wrinkles or air leaks.
- Connecting and Operating the Device.
- Connected the suction tubing from the dressing to the NPWT unit.
- Set the negative pressure as prescribed (usually –80 to –125 mmHg).
- Continuous mode is commonly used for vascular wounds.
- Intermittent mode may be used for highly exudative wounds.

- Turn on the unit and observe the foam collapse slightly—this indicates proper vacuum sealing.
- Check for air leaks by listening to hissing sounds or device alarms. Reseal if necessary.
- Record the starting time, pressure level, and patient tolerance.
- Monitor vital signs and pain level throughout the first 15–30 minutes.

Ongoing Monitoring:

- Assess the patient and device every 2–4 hours for comfort, alarms, drainage amount, and integrity of the seal.
- Observe the canister for color, volume, and odor of exudate.

Dressing Change Schedule:

- Usually every 48–72 hours or sooner if the dressing is saturated, leaking, or infected.

During dressing change:

- Turn off the device and gently remove the adhesive drape and foam.
- Reassessed wound size, tissue type, and exudate.
- Cleaned the wound with sterile saline and re-apply a new sterile foam using the same procedure.
- Document findings and compare with previous assessments.

Results

Table (1): Distribution of studied patients according to Socio-demographic characteristics.

The majority of patients in both groups were within the age categories of **30 to less than 50 years**.

Males represented a higher proportion in both groups (60.0% in the control group and 53.3% in the study group).

Most participants in both groups were married (73.3% in the control group and 60.0% in the study group).

The majority of patients had **diploma or university education in both groups**.

A higher percentage of rural residents was observed in the study group (60.0%) compared to the control group (40.0%).

Table (2): Distribution of studied groups according to Health relevant data.

Regarding past and present medical history, no statistically significant differences were observed between both groups in most conditions, a statistically significant difference was found in neurological diseases, where a higher percentage was observed in the study group (86.7%) compared to the control group (53.3%) in cardiac surgeries, which were more frequent in the study group (46.7%) compared to the control group (20.0%).

Concerning the length of hospital stay, the majority of the control group stayed for 9–12 days (80.0%), while most of the study group stayed for 6–9 days (73.3%).

Table (3): Distribution of studied groups according to Vascular surgeries wound characteristics assessment (1: Depth of wound).

At baseline (before intervention), there was no statistically significant difference between both groups regarding wound depth distribution ($p1 > 0.05$), indicating homogeneity between the groups prior to intervention.

After 3 days, a statistically significant difference began to appear between the two groups ($p2 < 0.001$), where the study group showed early signs of improvement compared to the control group.

After 7 days, the difference became more pronounced ($p3 < 0.001$), with a higher proportion of wounds in the study group demonstrating 6.7% increased epithelial coverage and reduced wound depth compared to the control group (2%).

By the end of 4 weeks, a highly statistically significant difference was observed ($p4 < 0.001$), where 33.3% of wounds in the study group were completely healed with

intact surfaces, while no cases of complete healing were observed in the control group.

Table (4): Distribution of studied patients according to wound healing assessment.

The findings revealed a statistically significant improvement in granulation tissue formation in the study group compared to the control group across all weeks ($p_2, p_3, p_4 < 0.05$).

At week 1, granulation tissue was absent in both groups (100% in study vs. 93.3% present in control), indicating similar baseline wound status.

By week 2, the study group showed a significant increase in granulation tissue formation (40.0%) compared to the control group (13.3%).

At week 3, a marked improvement was observed in the study group, where 93.3% of wounds showed granulation tissue compared to 23.3% in the control group.

By week 4, all patients in the study group (100%) demonstrated presence of granulation tissue compared to only 76.7% in the control group.

Table (5): Distribution of studied patients according to scoring system for Wound Healing Assessment.

The findings revealed a highly

statistically significant improvement in wound healing scores in the study group compared to the control group over time ($p < 0.001$ at all post-intervention periods).

At baseline and after 3 days, all patients in both groups showed no healing (50%), indicating comparable initial wound status.

After 7 days, partial healing was observed in 100% of the study group compared to 16.7% in the control group, while the majority of the control group (83.3%) still showed no healing.

By 4 weeks, a marked improvement was observed in the study group, where 33.3% of patients achieved complete healing and 66.7% showed partial healing, with no cases of non-healing recorded.

In contrast, the control group showed slower recovery, with 76.7% achieving only partial healing and 23.3% still showing no healing at the end of follow-up.

Table (6): Distribution of studied patients according to Pain Assessment.

The results of the present study revealed a statistically significant reduction in pain levels in the study group compared to the control group over time ($p_2, p_3, p_4 < 0.05$), while no significant

difference was observed at baseline ($p1 = 0.766$), indicating comparable initial pain status between both groups.

At baseline, the majority of patients in both groups experienced severe pain (73.3% in control vs. 76.7% in study group).

After 3 days, pain levels remained high in both groups, with the study group still showing predominantly moderate to severe pain.

By the 7th day, a noticeable improvement was observed in the study group, where more than half of patients (53.3%) reported mild pain, and no patients reported severe pain. In contrast, the control group still showed a considerable proportion of moderate pain cases.

At 4 weeks, a highly significant improvement was observed in the study group, where 70.0% of patients reported no pain and the remaining 30.0% reported mild pain only.

Table (7): Relation between wound healing with different parameters in study group at {After 3 Days & 4 Weeks}:

The findings illustrated that there was no statistically significant relation between **wound healing** and **wound depth** after 3 days ($MCp = 0.611$).

However, after 4 weeks, a highly statistically significant relation was

detected between wound depth and wound healing status ($MCp < 0.001$).

Regarding infection signs, all patients in both partial and no healing groups after 3 days exhibited signs of infection (100%), with no statistical comparison applicable.

After 4 weeks, most patients with complete healing showed absence of infection signs (66.7%), while the majority of patients with partial healing between infection signs and wound healing at 4 weeks was not statistically significant ($FEp = 0.540$).

Table (1): Distribution of studied patients according to socio-demographic characteristics (n=60)

Part A: Socio-demographic characteristics of patients	Control (n = 30)		Study (n = 30)		χ^2	P Value
	No.	%	No.	%		
Age						
21 < 30	2	6.7	6	20.0	3.366	p=0.340
30 < 40	10	33.3	12	40.0		
40 < 50	10	33.3	6	20.0		
50 – 60	8	26.7	6	20.0		
Sex						
Male	18	60.0	16	53.3	0.271	0.602
Female	12	40.0	14	46.7		
Marital status						
Single	2	6.7	2	6.7	1.499	p=0.532
Married	22	73.3	18	60.0		
Widow	0	0.0	0	0.0		
Divorced	6	20.0	10	33.3		
Educational level						
Illiterate	2	6.7	4	13.3	2.786	MC p=0.667
Read and Write	2	6.7	2	6.7		
Primary	0	0.0	0	0.0		
Secondary	0	0.0	2	6.7		
Diploma	16	53.3	14	46.7		
University education	10	33.3	8	26.7		
Occupation						
Housewife	6	20.0	8	26.7	2.305	MC p=0.381
Retired on work	6	20.0	2	6.7		
Other	18	60.0	20	66.7		
Residence						
Rural	12	40.0	18	60.0	2.400	0.121
Urban	18	60.0	12	40.0		

Table (2): Distribution studied groups according to health relevant data (n=60)

Part B: Health relevant data that included	Control (n = 30)		Study (n = 30)		χ^2	p	
	No.	%	No.	%			
Past and present medical							
Respiratory diseases	12	40.0	14	46.7	$\chi^2=0.271$	0.602	
Heart diseases	12	40.0	16	53.3	$\chi^2=1.071$	0.301	
Renal diseases	6	20.0	6	20.0	$\chi^2=0.000$	1.000	
Hepatic diseases	10	33.3	12	40.0	$\chi^2=0.287$	0.592	
Neurological diseases	16	53.3	26	86.7	$\chi^2=7.937^*$	0.005*	
diabetes	22	73.3	26	86.7	$\chi^2=1.667$	0.197	
cancer	0	0.0	0	0.0	—	—	
others	0	0.0	0	0.0	—	—	
Surgical history							
Heart surgeries	6	20.0	14	46.7	$\chi^2=4.800^*$	0.028*	
Chest surgeries	0	0.0	0	0.0	—	—	
Abdominal surgeries	18	60.0	22	73.3	$\chi^2=1.200$	0.273	
others	0	0.0	0	0.0	—	—	
Hospitalization							
<3	0	0.0	0	0.0	$\chi^2=36.186^*$	^{MC} p =<0.001*	
3 – 6	0	0.0	6	20.0			
6 –9	6	20.0	22	73.3			
9 –12	24	80.0	2	6.7			
Height							
Min. – Max.	1.20 – 1.87		1.48 – 1.90		t=	0.393	
Mean ± SD.	1.67 ± 0.13		1.69 ± 0.12		0.861		
Weight							
Min. – Max.	47.50 – 108.5		45.0 – 120.0		t=	0.847	
Mean ± SD.	76.33 ± 17.97		77.27 ± 19.45		0.194		
Body mass index							
<18.5	1	3.3	0	0.0	$\chi^2=6.802$	^{MC} p= 0.130	
18.5 – 24.9	10	33.3	15	50.0			
25 – 29.9	8	26.7	10	33.3			
30 – 39.9	9	30.0	2	6.7			
>40	2	6.7	3	10.0			
Min. – Max.	16.11 – 59.03		20.0 – 43.28		t=	0.526	
Mean ± SD.	28.03 ± 8.77		26.79 ± 6.12		0.638		

Table (3): Distribution of studied patients according to vascular surgeries wound characteristics assessment

Part A: Vascular surgeries wound characteristics assessment	Control (n = 30)								Study (n = 30)								Test of Sig. (p ₁)	Test of Sig. (p ₂)	Test of Sig. (p ₃)	Test of Sig. (p ₄)
	Before		After 3 Days		After 7 Days		After 4 Weeks		Before		After 3 Days		After 7 Days		After 4 Weeks					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
1. Depth of wound																				
100% wound will heal and surfaces are intact	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	10	33.3	$\chi^2=0.741$ (^{FE} p=0.671)	$\chi^2=28.000^*$ ($<0.001^*$)	$\chi^2=38.824^*$ ($<0.001^*$)	$\chi^2=59.730^*$ (^{MC} p $<0.001^*$)
75% to < 100% wound is covered &/or epithelial tissue extends > 0.5 cm into wound bed	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	6.7	18	60.0				
50% to < 75% wound is covered &/or epithelial tissue extends < 0.5 cm into wound bed	0	0.0	0	0.0	0	0.0	9	30.0	0	0.0	0	0.0	14	46.7	2	6.7				
25 to 50% wound covering	0	0.0	2	6.7	5	16.7	7	23.3	0	0.0	10	33.3	12	40.0	0	.0				
< 25% wound covering	2	6.7	6	20.0	15	50.0	12	40.0	4	13.3	18	60.0	2	6.7	0	.0				
No epithelial tissue present covering the wound	28	93.3	22	73.3	10	33.3	2	6.7	26	86.7	2	6.7	0	0.0	0	.0				
Fr (p)	69.888* ($<0.001^*$)								88.824* ($<0.001^*$)											

p: p value for comparing between the **three periods** in each groupp₁: p value for comparing between the **two studied** groups in **before**p₂: p value for comparing between the **two studied** groups in **After 3 Days**p₃: p value for comparing between the **two studied** groups in **After 7 Days**p₄: p value for comparing between the **two studied** groups in **After 4 weeks**

Table (4): Distribution of studied patients according to wound healing assessment

Part B: “Wound Healing Assessment	Control (n = 30)								Study (n = 30)								Test of Sig. (p1)	Test of Sig. (p2)	Test of Sig. (p3)	Test of Sig. (p4)
	Week 1		Week 2		Week 3		Week 4		Week 1		Week 2		Week 3		Week 4					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
Granulation tissue																				
Present	2	6.7	4	13.3	7	23.3	23	76.7	0	0.0	12	40.0	28	93.3	30	100.0	$\chi^2=2.069$	$\chi^2=5.455^*$	$\chi^2=30.240^*$	$\chi^2=7.925^*$
Not Present	28	93.3	26	86.7	23	76.7	7	23.3	30	100.0	18	60.0	2	6.7	0	0.0	(^{FE} p=0.492)	(0.020*)	(<0.001*)	(^{FE} p=0.011*)
Fr (p)	49.818* (<0.001*)								68.264* (<0.001*)											
Wound size(cm³) = length×width×depth																				
Min. – Max.	6.30 – 550.0		3.90 – 429.9		1.90 – 324.7		0.40 – 206.9		58.80 – 328.0		36.70 – 189.2		13.50 – 80.50		0.50 – 7.40		U=279.00* (0.011*)	U=428.50 (0.751)	U=303.00* (0.030*)	U=90.00* (<0.001*)
Mean ±SD.	117.1 ± 108.6		109.1 ± 96.57		90.51 ± 82.79		61.54 ± 60.56		165.9 ± 94.39		100.3 ± 53.70		42.25 ± 23.31		3.03 ± 2.18					
Median	84.65		74.45		55.80		43.85		110.3		67.10		31.20		2.90					
Fr (p)	74.455* (<0.001*)								90.000* (<0.001*)											
Formation of scar tissue																				
Present	0	0.0	0	0.0	10	33.3	23	76.7	0	0.0	8	26.7	26	86.7	30	100.0	–	$\chi^2=9.231^*$ (^{FE} p=0.005*)	$\chi^2=17.778^*$ (<0.001*)	$\chi^2=7.925^*$ (^{FE} p=0.011*)
Not Present	30	100.0	30	100.0	20	66.7	7	23.3	30	100.0	22	73.3	4	13.3	0	0.0				
Fr (p)																				
Epithelial wound edges																				
Present	0	0.0	0	0.0	7	23.3	23	76.7	0	0.0	12	40.0	28	93.3	30	100.0	–	$\chi^2=15.000^*$ (<0.001*)	$\chi^2=30.240^*$ (<0.001*)	$\chi^2=7.925^*$ (^{FE} p=0.011*)
Not Present	30	100.0	30	100.0	23	76.7	7	23.3	30	100.0	18	60.0	2	6.7	0	0.0				
Q (p)	55.737* (<0.001*)								68.264* (<0.001*)											

Table (5): Distribution of studied patients according to scoring system for Wound Healing Assessment

Part B: “Wound Healing Assessment	Control (n = 30)								Study (n = 30)								χ^2 (p ₁)	χ^2 (p ₂)	χ^2 (p ₃)	χ^2 (^{MC} p ₄)
	Before		After 3 Days		After 7 Days		After 4 Weeks		Before		After 3 Days		After 7 Days		After 4 Weeks					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
Complete healing	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	10	33.3	—	20.00* ($<0.001^*$)	42.857* ($<0.001^*$)	18.623* ($<0.001^*$)
Partial healing	0	0.0	0	0.0	5	16.7	23	76.7	0	0.0	15	50.0	30	100.0	20	66.7				
No healing	30	100.0	30	100.0	25	83.3	7	23.3	30	100.0	15	50.0	0	0.0	0	0.0				
Fr (p)	58.054* ($<0.001^*$)								73.125* ($<0.001^*$)											

p: p value for comparing between the **three periods** in each groupp₁: p value for comparing between the **two studied** groups in **Week 1**p₂: p value for comparing between the **two studied** groups in **Week 2**p₃: p value for comparing between the **two studied** groups in **Week 3**p₄: p value for comparing between the **two studied** groups in **Week 4***: Statistically significant at $p \leq 0.05$.

Table (6): Distribution of studied patients according to Pain Assessment

Tool III: “Pain Assessment	Control (n = 30)								Study (n = 30)								χ^2 (p ₁)	χ^2 (p ₂)	χ^2 (^{MC} p ₃)	χ^2 (^{MC} p ₄)
	Before		After 3 Days		After 7 Days		After 4 Weeks		Before		After 3 Days		After 7 Days		After 4 Weeks					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
No pain (0)	0	0.0	0	0.0	0	0.0	4	13.3	0	0.0	0	0.0	0	0.0	21	70.0	0.089 (0.766)	4.320* (0.038*)	6.162* (0.033*)	22.931* ($<0.001^*$)
Mild pain (1 – 3)	0	0.0	0	0.0	7	23.3	19	63.3	0	0.0	0	0.0	16	53.3	9	30.0				
Moderate pain (4 – 7)	8	26.7	22	73.3	22	73.3	7	23.3	7	23.3	28	93.3	14	46.7	0	0.0				
Severe pain (≥ 8)	22	73.3	8	26.7	1	3.3	0	0.0	23	76.7	2	6.7	0	0.0	0	0.0				
Fr (p)	68.949* ($<0.001^*$)								81.840* ($<0.001^*$)											

p: p value for comparing between the **three periods** in each groupp₁: p value for comparing between the **two studied** groups in **before**p₂: p value for comparing between the **two studied** groups in **After 3 Days**p₃: p value for comparing between the **two studied** groups in **After 7 Days**p₄: p value for comparing between the **two studied** groups in **After 4 Weeks***: Statistically significant at $p \leq 0.05$

Table (7): Relation between wound healing with different parameters in study group (n = 30) at {After 3 Days & 4 Weeks}

Wound healing with depth of wound & signs of infection.	Wound Healing							
	After 3 Days				After 4 Weeks			
	Partial healing (n = 15)		No healing (n = 15)		Complete healing (n = 10)		Partial healing (n = 20)	
	No.	%	No.	%	No.	%	No.	%
1. Depth of wound								
100% Complete wound closure with fully intact surfaces.	0	0.0	0	0.0	10	100.0	0	0.0
75% to < 100% wound is covered &/or epithelial tissue extends > 0.5 cm into wound bed	0	0.0	0	0.0	0	0.0	18	90.0
50% to < 75% wound is covered &/or epithelial tissue extends < 0.5 cm into wound bed	0	0.0	0	0.0	0	0.0	2	10.0
25 to 50% wound covering	5	33.3	5	33.3	0	0.0	0	0.0
< 25% wound covering	10	66.7	8	53.3	0	0.0	0	0.0
0% No epithelial tissue present covering the wound	0	0.0	2	13.3	0	0.0	0	0.0
$\chi^2(p)$	1.900 (^{MC} p=0.611)				31.284* (^{MC} p=<0.001*)			
Signs of infection (t4)								
Present	15	100.0	15	100.0	0	0.0	2	10.0
Not Present	0	0.0	0	0.0	10	66.7	18	90.0
$\chi^2(p)$	–				1.071 (^{FE} p=0.540)			

Discussion

Negative Pressure Wound Therapy (NPWT) has emerged as a pivotal advancement in promoting wound healing and optimizing postoperative recovery among patients undergoing vascular surgeries. These patients are particularly vulnerable to wound-related complications due to impaired tissue perfusion, comorbid conditions such as diabetes, and the inherent complexity of vascular procedures. NPWT works by applying controlled sub-atmospheric pressure to the wound bed, enhancing tissue perfusion, stimulating granulation tissue formation, reducing edema, and removing excess exudate (Argenta & Morykwas, 1997; Hyldig et al., 2024).

Through these mechanisms, NPWT accelerates wound closure, decreases infection rates, and consequently improves clinical outcomes including reduced length of hospital stay, fewer re-interventions, and enhanced quality of life. Numerous recent studies have supported the efficacy of NPWT in vascular surgical populations, highlighting its role as an essential component in contemporary postoperative wound management protocols. Collectively, strong evidence indicates that implementing NPWT may lead to

marked improvement in patient recovery trajectories compared to conventional wound dressing methods (Armstrong et al., 2022; Othman et al., 2021).

The present study findings revealed that the baseline socio-demographic characteristics demonstrated no statistically significant variations between the study and control group confirming baseline comparability between both groups. This homogeneity strengthens the internal validity of the study and ensures that any observed differences in outcomes are likely attributed to the implemented intervention rather than external variables.

Regarding age, the majority of participants were within the middle adulthood stage (30–50 years). **This finding is consistent with** recent studies that reported higher prevalence of surgical and vascular conditions among middle-aged adults due to progressive physiological changes and increased exposure to risk factors (Alshammari, 2022).

Regarding comorbidities, the absence of statistically significant differences in most chronic conditions such as respiratory, cardiac, renal, hepatic diseases, and diabetes mellitus reflects appropriate matching between groups. **This is consistent with recent studies**

emphasizing the importance of controlling comorbidities in clinical research to avoid confounding effects on outcomes (**Zhang et al., 2022**).

However, a statistically significant higher prevalence of neurological diseases was observed in the study group. This finding may influence patient outcomes, as neurological disorders are associated with reduced mobility, delayed wound healing, and increased risk of complications (**Smith & Davies, 2021**).

In relation to the length of hospital stay, a highly statistically significant difference was detected, with shorter stays observed in the study group. This finding is particularly important and may suggest the effectiveness of the applied intervention (such as Negative Pressure Wound Therapy, NPWT) in improving recovery and reducing hospitalization duration. **This is supported by recent evidence** indicating that NPWT is associated with faster wound healing and shorter hospital stays compared to conventional methods (**Huang & Zhang, 2024**).

The present findings demonstrate a clear and progressive improvement in wound depth healing among patients in the study group compared to the control group, particularly at 7 days and 4 weeks post-intervention. **This suggests that the applied**

intervention (likely Negative Pressure Wound Therapy, NPWT) had a significant positive effect on accelerating wound closure and epithelialization.

The early improvement observed after only 3 days supports the role of NPWT in enhancing local wound environment through continuous removal of exudate, reduction of edema, and improvement of tissue perfusion. **These mechanisms are well-documented in recent literature** as key factors promoting faster wound healing (**Shi & Wang, 2021**).

The intervention group exhibited a statistically meaningful enhancement in comprehensive wound healing indices relative to the control cohort, including granulation tissue formation, wound volume reduction, scar formation, and epithelial edge development. These findings indicate that the intervention (likely NPWT) had a strong positive impact on accelerating wound healing in vascular surgical patients.

The early and progressive increase in granulation tissue in the study group reflects enhanced fibroblast proliferation and angiogenesis. This is consistent with recent literature showing that NPWT promotes mechanical deformation of wound cells, leading to activation of cellular

pathways involved in tissue regeneration and repair (**Shi & Wang, 2021**).

The significant reduction in wound volume observed in the study group further supports the effectiveness of NPWT in promoting wound contraction. This may be attributed to improved microcirculation, reduction of interstitial edema, and continuous removal of exudates, which collectively create an optimal healing environment (**Kim & Attinger, 2022**).

A significant superiority of the study group over the control group regarding overall wound healing status as measured by the scoring system. The results clearly indicate that patients in the study group experienced faster progression from non-healing to partial and complete healing states, particularly by the end of the 4-week follow-up period.

The early shift toward partial healing in the study group by the first week reflects accelerated progression through the inflammatory phase and earlier initiation of the proliferative phase of wound healing. This improvement suggests enhanced cellular activity, improved perfusion, and more effective wound bed preparation in the study group compared to conventional care. This accelerated transition to the

proliferative phase is consistent with a study by **Apelqvist et al. (2020)**, which demonstrated that early application of negative pressure wound therapy promotes rapid macro- and micro-deformational changes, thereby significantly shortening the inflammatory stage in complex surgical wounds. Similarly, **Blume et al. (2021)** found that NPWT enhances localized tissue perfusion and capillary development within the first week of treatment. On the contrary, **Svensjö et al. (2020)** suggested that while early granulation tissue formation is enhanced, the definitive acceleration of epithelial migration might be less pronounced in patients with advanced arterial occlusive disease, presenting a contrast to the uniform early progress observed in our study population

By the fourth week, the presence of complete healing in one-third of the study group, with no cases of non-healing, highlights the strong therapeutic effect of the intervention (likely NPWT). This outcome reflects enhanced granulation tissue formation, improved epithelialization, and efficient wound contraction, all of which contribute to faster wound closure.

These findings are consistent with recent evidence demonstrating that

NPWT significantly improves wound healing rates by promoting microcirculation, reducing edema, enhancing cellular proliferation, and maintaining a moist and controlled wound environment (**Hyldig et al., 2024**). The mechanical forces applied by negative pressure also stimulate granulation tissue formation and accelerate epithelial migration, leading to improved healing outcomes.

A significant reduction in pain intensity in the study group compared to the control group throughout the follow-up period. Pain is a critical clinical indicator of wound status, and its reduction reflects improved wound healing, decreased inflammation, and reduced tissue damage.

The early persistence of moderate to severe pain in both groups at baseline and after 3 days is expected due to the acute postoperative inflammatory response associated with vascular surgical wounds. However, the study group showed a faster transition toward mild and eventually no pain, particularly by the 7th day and 4th week.

The significant reduction in pain in the study group can be explained by the effectiveness of the intervention (likely NPWT) in reducing local edema, improving microcirculation,

and decreasing inflammatory mediators. These physiological effects contribute to reduced nerve stimulation and consequently lower pain perception. This significant reduction in pain intensity is strongly consistent with findings by **Othman et al. (2021)**; **Armstrong et al. (2022)**, who reported that negative pressure wound therapy effectively diminishes postoperative pain perception by stabilizing the wound bed, reducing localized edema, and minimizing mechanical tension on nerve endings. Conversely, **Svensjö et al. (2020)** noted that initial pain perception might transiently increase during dressing changes, which partly varies from the continuous pain relief observed in our clinical sample.

By the end of the 4-week period, the majority of the patients in study group reported complete absence of pain, which strongly reflects advanced wound healing, reduced tissue inflammation, and improved tissue regeneration. In contrast, the control group continued to experience mild to moderate pain, indicating slower healing and persistent inflammatory activity.

These findings are consistent with recent literature demonstrating that NPWT not only accelerates wound healing but also significantly reduces

postoperative pain by stabilizing the wound environment and minimizing tissue tension and exudate accumulation (**Kim et al., 2022**) administered solely to patients within the study group, while the control group did not receive the intervention at any point during the follow-up period. This strict adherence to the study protocol ensures the internal validity of the study and strengthens the reliability of the observed outcomes across all wound healing parameters.

The complete application of NPWT in the study group reflects proper protocol implementation, which is essential for achieving optimal therapeutic effects such as enhanced wound contraction, improved granulation tissue formation, and reduced exudate accumulation. In contrast, the absence of NPWT in the control group explains the slower and less effective wound healing outcomes observed. These findings support that the significant improvements observed in wound healing outcomes, infection control, pain reduction, and wound size reduction in earlier tables can be directly attributed to the consistent application of NPWT in the study group.

Furthermore, full compliance with NPWT protocol is consistent with

evidence suggesting that the effectiveness of negative pressure therapy is highly dependent on correct and continuous application without interruption (**Hyldig et al., 2024**).

The present findings highlight the strong relationship between wound characteristics—particularly wound depth—and healing outcomes over time in patients receiving NPWT.

The absence of a significant relationship between wound depth and healing status at 3 days reflects the early inflammatory phase of wound healing, during which structural changes in the wound are still minimal and not yet indicative of final healing outcomes. At this stage, most wounds in both groups exhibited limited epithelialization, explaining the lack of differentiation between healing categories. This finding is strongly supported by previous studies in vascular surgery, such as those conducted by **Othman et al. (2021)**; **Armstrong et al. (2022)**, who demonstrated that negative pressure wound therapy significantly accelerates the rate of epithelialization and reduces overall wound surface area compared to conventional dressings. Conversely, a few studies, such as **Svensjo et al. (2020)**, noted that while NPWT enhances granulation tissue

formation, the definitive timeline for complete epithelial differentiation can vary depending on comorbidities like diabetes, which partially contradicts the uniform acceleration observed in some clinical subsets.

In contrast, the highly significant association observed after 4 weeks confirms that wound depth is a critical determinant of healing progression.

Complete epithelialization was exclusively associated with complete healing, while partial epithelial coverage corresponded to partial healing outcomes. This finding is consistent with the physiological stages of wound healing, where epithelialization represents a key marker of successful tissue repair.

These results align with recent evidence indicating that NPWT accelerates wound contraction and epithelialization, thereby improving wound depth reduction and overall healing outcomes (**Kim et al., 2022**). Regarding infection, the universal presence of infection signs at 3 days reflects the early postoperative inflammatory response rather than true infection in all cases. This explains why no statistical association could be established at this stage.

By 4 weeks, most patients demonstrated resolution of infection signs, particularly among those who achieved complete healing. Although the statistical relation was not significant, the clinical trend suggests that absence of infection is associated with better healing outcomes.

This can be explained by the well-documented role of NPWT in reducing bacterial load, improving local perfusion, and removing exudate, which collectively contribute to infection control and enhanced healing (**Shi et al., 2021**).

Conclusion

The findings of this present study demonstrated the **significant positive** impact of Negative Pressure Wound Therapy on accelerating wound healing, reducing postoperative complications, improving pain control, and shortening hospital stay among patients undergoing vascular surgeries compared with conventional dressing methods. The observed improvements in wound progression, granulation tissue formation, and functional recovery collectively highlight the clinical value of NPWT as an effective and evidence-based approach for optimizing outcomes in this vulnerable patient population.

These results further **support integrating** NPWT into postoperative wound care protocols for vascular patients to enhance healing efficiency, decrease readmission rates, and ultimately improve overall patient quality of recovery.

Overall, this study contributes to the growing body of evidence supporting NPWT as a superior alternative to conventional wound management methods in vascular patients.

Recommendation

Grounded on the outcomes of this study, several critical recommendations are tentatively suggested for clinical practice and future research:

Clinical Practice

-Negative Pressure Wound Therapy should be adopted as a routine component of postoperative wound management for patients undergoing vascular surgeries, particularly those at high risk for complications.

-Standardized clinical protocols for NPWT applications should be developed and implemented in vascular surgical units to ensure consistent and safe practice.

Nursing Practice

-Specialized training programs should be provided for nursing staff on appropriate NPWT applications, monitoring, troubleshooting, and

patient education to optimize therapy outcomes.

-Nurses should conduct regular wound assessments using evidence-based criteria to evaluate healing progression and detect early complications.

Policy and Administration

-Hospital administration should ensure availability of NPWT devices and supplies in vascular surgery units to support evidence-based practice.

-Healthcare organizations should allocate resources for continuous training and quality improvement programs related to advanced wound care techniques.

Recommendations for Future Studies

-Future research is recommended to examine the long-term outcomes of NPWT among vascular surgery patients using larger sample sizes and multicenter designs.

-Comparative studies should explore the effectiveness of NPWT on different types of vascular wounds and comorbidity profiles, including diabetic and obese patients.

-Further investigations should evaluate cost-effectiveness and patient quality-of-life outcomes following NPWT versus conventional wound care.

-Future research may explore advanced NPWT technologies,

including portable and homecare NPWT systems, to enhance postoperative recovery and minimize hospital stays

-Orientation program and continuous in-service educational program should be held for newly appointed staff nurses working in this field and patients.

Application of study on larger samples.

References

- Anghel, E., & Kim, P. (2025).** Negative pressure wound therapy: Mechanism of action and clinical applications in complex wounds. *Plastic and Reconstructive Surgery*, 155(2), 291-302.
- Alshammari, F. (2022).** Age-related differences in surgical outcomes among adult patients. *Journal of Clinical Medicine*, 11(4), 1023.
- Armstrong, D., Marston, W., & Reyzelman, A. (2022).** Clinical efficacy of negative pressure wound therapy (NPWT) vs conventional dressings for graft fixation and wound healing following vascular interventions: A randomized controlled trial. *International Wound Journal*, 19(4), 812–821. <https://doi.org/10.1111/iwj.13678>
- Apelqvist, J., Willy, C., & Fagerdahl, A. M. (2020).** Clinical validation of protocol-driven negative pressure wound therapy in complex wound care: A prospective study. *Journal of Wound Care*, 29(3), 154–161. <https://doi.org/10.12968/jowc.2020.29.3.154>.
- Balboula, A. A., Atef, M., El Maadawy, A. M., & Taha, H. A. (2024).** Effect of closed-incision negative pressure therapy on wound complications after vascular reconstruction. *Egyptian Journal of Surgery*, 43(2), 171-179.
- Argenta, L., & Morykwas, M. (1997).** Vacuum-assisted closure: A new method for wound control and treatment: Clinical experience. *Annals of Plastic Surgery*, 38(6), 563–576. <https://doi.org/10.1097/00000637-199706000-00002>.
- Baram, A., & Baban, Z. (2020).** Short and long-term outcomes of the peripheral arterial indirect bypass in diabetic patients with chronic limb-threatening ischemia single-center case series. *International Journal of Surgery*, 27, 72–78.
- Blume, P. A., Walters, J., & Payne, W. (2021).** Comparison of protocol adherence vs standard care in negative pressure wound therapy: A retrospective analysis of clinical outcomes. *International Wound*

- Journal*, 18(5), 632–641.
<https://doi.org/10.1111/iwj.13564>
- Dingemans, S., Birnie, M., & Backes, M., (2019).** Prophylactic negative pressure wound therapy after lower extremity fracture surgery: A pilot study. *International Orthopaedics*, 42,747-753.
- Guo, S., & DiPietro, L. A. (2020).** Factors affecting wound healing. *Journal of Dental Research*, 89(3), 219–229.
- Gallo, R. L. (2022).** Human skin with an established microbiota is a complex immunological organ. *Science Translational Medicine*, 14(635), eabh3600.
- Glaser, D. A., Farnsworth, C. L., & Edmonds, M. E. (2022).** Biomechanical and physiological effects of negative pressure wound therapy on surgical incisions. *Journal of Wound Care*, 31(Sup 4), S12-S20.
- Huang, C., & Zhang, Y. (2024).** Effectiveness of negative pressure wound therapy in reducing hospital stay: A systematic review. *International Wound Journal*, 21(2), 345–356.
- Hyldig, N., Joergensen, S., & Ovesen, O. (2024).** Physiological and clinical mechanism of closed incision negative pressure wound therapy in wound healing: A prospective cohort study. *International Wound Journal*, 21(3), e14580.
- Kim, P. J., & Attinger, C. E. (2022).** Mechanisms of negative pressure wound therapy in promoting wound healing. *Wound Repair and Regeneration*, 30(4), 415-424.
<http://doi.org/10.1111/wrr.13018>
- Mohamed, E., AbdElmoniem, A., Elmowafi, H., & Shebl, A. (2019).** Effect of training program on performance of nurses caring for patient with negative pressure wound therapy. *IOSR Journal of Nursing and Health Science*, 8 (1), 31-35.
- Ousey, K., Milne, J., & Atkin, L. (2021).** Evidence-based wound care and the nurse's role in optimizing outcomes. *Wounds International*, 12(3), 20-27.
- Stevenson, P., & Patel, M. (2020).** Human and animal bite wound infections. *Infectious Disease Clinics*, 14(3), 201–215.
- Staley, B., Tucker, J., & Miller, R. (2026).** Prophylactic negative pressure wound therapy in high-risk vascular surgery incisions: A contemporary review of clinical outcomes. *Journal of Vascular Surgery*, 83(1), 145-153.
- Scali, S., Feezor, R., Chang, C. K., Waterman, A., Berceli, S., & Huber, T. (2017).** Management of

- vascular graft infections with negative pressure wound therapy. *Journal of Vascular Surgery*, 65(4), 1113–1120. <https://doi.org/10.1016/j.jvs.2016.09.027>
- Othman, A., Mahmoud, S., & El-Hadary, S. (2021).** Effectiveness of negative pressure wound therapy on surgical site infections and healing outcomes in vascular surgery patients. *Journal of Vascular Nursing*, 39(2), 45–52. <https://doi.org/10.1016/j.jvn.2021.02.003>
- Sen, C. (2023).** Human wounds and its burden: An updated compendium of estimates. *Advances in Wound Care*, 12(2), 59–76. <https://doi.org/10.1089/wound.2021.0134>
- Smith, R., & Davies, L. (2021).** Neurological disorders and postoperative recovery outcomes. *Journal of Clinical Anesthesia and Perioperative Care*, 15(2), 142–150. <http://doi.org/10.1016/j.jclinane.2021.01012>
- Shi, C., & Wang, Y. (2021).** Biological effects of negative pressure wound therapy on wound repair. *Frontiers in Bioengineering and Biotechnology*, 9, 645120.
- Svensjö, T., Fischer, S., & Pomahac, B. (2020).** The role of negative pressure wound therapy in micro-deformational tissue changes and epithelial edge progression. *Wound Repair and Regeneration*, 28(1), 114–122. <https://doi.org/10.1111/wrr.12765>
- Timmermans, L., De Smet, G., & Vermeulen, H. (2022).** Nursing management and safety considerations in negative pressure wound therapy for vascular patients. *Journal of Clinical Nursing*, 31(7-8), 983–992.
- Velnar, T., Bailey, T., & Smrkolj, V. (2020).** The wound healing process: An overview of the cellular and molecular mechanisms. *Journal of International Medical Research*, 48(3), 1–20.
- Yousef, H., Alhajj, M., & Sharma, S. (2021).** Anatomy, Skin (Integument), Features. Stat Pearls Publishing.
- Yu, X., Xie, W., Li, S., Cao, J., & Ye, X. (2024).** Effects of negative-pressure wound therapy in the prevention of surgical-site wound infection after vascular surgery: A meta-analysis. *International Wound Journal*, 21(1), e14695.
- Zarkos, G., Skandalakis, P., & Filippou, D. (2023).** Wound healing challenges in patients with

peripheral arterial disease
undergoing revascularization.
Annals of Vascular Surgery, 92,
285-296

**Zhang, L., Wang, X., Wang, Y., &
Zhang, Y. (2022).** Impact of
comorbidities on surgical patient
outcomes. *BMC Surgery*, 22(1),
115.

Effect of Nurse-led Educational Package on Mothers' Knowledge and Home Care Practices for Children with Acute Diarrheal Disease

Sahar Saleh Kamal ¹, Rasha Abd Elateef Abd Elaziz Ramadan², Miada Mohamed Ali Hanfy³, Azza El-Sayed Ali Hegazy⁴

¹Lecturer of Pediatric Nursing, Faculty of Nursing, Ain-Shams University.

²Lecturer of Pediatric Nursing, Faculty of Nursing, Zagazig University.

³Lecturer of Pediatric Nursing, Faculty of Nursing, Zagazig University.

⁴Assistant Professor of Pediatric Nursing, Faculty of Nursing, El-Fayoum University.

Corresponding author: Azza El-Sayed Ali

Email: asa19@fayoum.edu.eg

Abstract

Background: Acute childhood diarrheal disease remains a major public health problem and a leading cause of morbidity among children under five years of age, particularly in developing countries. Inadequate maternal knowledge and improper home care practices contribute significantly to complications such as dehydration and increased hospital admissions. The Teach-Back Method was integrated throughout all nurse-led health education sessions and is considered an effective strategy for improving caregivers' knowledge and home care practices.

Aim: To evaluate the effect of nurse-led educational package on mothers' knowledge and home care practices for children with acute diarrheal disease.

Design: A quasi-experimental pretest–posttest research design was utilized.

Setting: The study was conducted at the Pediatric Outpatient Clinics affiliated with Zagazig University Hospital.

Subjects: A purposive sample of 167 mothers of children diagnosed with acute diarrhea.

Results: The findings revealed a highly statistically significant improvement in mothers' knowledge and home care practices following implementation of the nurse-led educational package ($p < 0.001$). The proportion of mothers with satisfactory knowledge increased from 20.9% before the intervention to 70.3% after the intervention. Likewise, the percentage of mothers demonstrating good home care practices increased from 31.1% to 76.6%. A significant positive correlation was found between mothers' knowledge and home care practices after the intervention ($r = 0.62$, $p < 0.001$).

Conclusion: The nurse-led educational package can contribute to improving mothers' knowledge and home care practices for children with acute diarrheal disease. Improved knowledge was positively associated with better home care practices for children with acute diarrheal disease.

Recommendations: Implement nurse-led educational programs in hospitals and primary health care centers, provide continuous health education focusing on the prevention and home care of childhood diarrhea, and integrate structured educational packages into routine pediatric nursing care.

Keywords: Acute diarrheal disease, children, home care practices, mothers' knowledge, nurse-led educational package.

Introduction

Diarrheal disease is one of the most common health problems affecting children worldwide and remains a major cause of morbidity and mortality among children under five years of age, particularly in developing countries (**Momoh et al., 2022**). It is commonly defined as the passage of three or more loose or watery stools within a 24-hour period. Diarrhea may result from infections caused by viruses, bacteria, or parasites and is often associated with poor sanitation, unsafe drinking water, inadequate environmental conditions, and poor hygiene practices (**Giri et al., 2022**). Although diarrheal disease is largely preventable and treatable, it continues to represent a significant public health challenge. Recurrent or severe episodes may lead to dehydration, electrolyte imbalance, malnutrition, impaired physical growth, and, in severe cases, death. Young children are particularly vulnerable because of their immature immune systems and increased susceptibility to infectious diseases. Consequently, effective prevention and early management of diarrhea are essential to reducing its adverse health consequences (**WHO, 2024**). Appropriate home care for childhood diarrhea plays a critical role in

preventing complications and promoting recovery. Recommended practices include early recognition of warning signs, adequate fluid replacement, continued breastfeeding and feeding, proper use of oral rehydration solution (ORS), and timely seeking medical care when necessary. However, inadequate maternal knowledge and inappropriate home care practices remain common in many communities and may contribute to increased rates of childhood morbidity and hospitalization (**Desta et al., 2017**).

Mothers are usually the primary caregivers and are responsible for making decisions regarding the care of sick children at home. Therefore, improving mothers' knowledge and care practices regarding diarrheal diseases is essential for enhancing child health outcomes. Health education has been recognized as an effective strategy for empowering mothers with the knowledge and skills required to manage childhood illnesses appropriately and prevent disease-related complications (**Kombat et al., 2024**).

Pediatric nurses play a pivotal role in providing health education and counseling to mothers and families. Through structured educational programs, nurses can promote

healthy behaviors, improve caregivers' understanding of disease prevention and management, and enhance the quality of care provided to children at home. Nurse-led health education interventions are considered cost-effective, practical, and sustainable approaches for improving maternal knowledge and home care practices (**American Academy of Pediatrics, 2019**).

Accordingly, the present study was conducted to evaluate the effect of a nurse-led health education package on mothers' knowledge and home care practices regarding acute childhood diarrheal disease.

Significance of study:

Acute childhood diarrheal disease remains one of the leading causes of morbidity and mortality among children under five years of age, particularly in developing countries (**World Health Organization, 2017; UNICEF, 2023**). Its significance lies in the fact that it can rapidly lead to dehydration and life-threatening complications if not properly managed at home or through timely healthcare intervention (**Liu et al., 2016**).

This study is important as it highlights the role of a nurse-led health education package in improving mothers' knowledge and enhancing their home management

practices regarding acute diarrhea in children. Mothers represent the primary caregivers at home; therefore, improving their awareness of warning signs, oral rehydration therapy, appropriate feeding practices, and timely healthcare seeking behavior can significantly reduce complications and hospital admissions (**Fischer Walker, & Black, 2010**).

Furthermore, this study supports cost-effective and preventive nursing educational interventions that can be implemented at the primary healthcare level (GBD 2019 Diseases and Injuries Collaborators, 2020). It also strengthens the role of nurses in community health education and health promotion activities (**UNICEF & WHO, 2009**).

Finally, the findings may provide evidence to guide future health education programs and policies aimed at reducing the burden of diarrheal diseases and improving child health outcomes globally (**Mohammed & Tamiru, 2020**).

Aim of the study

This study aimed to evaluate the effect of nurse-led educational package on mothers' knowledge and home care practices for children with acute diarrheal disease.

This study was conducted through the following objectives:

-Assess mothers' knowledge for children with acute diarrheal disease
 -Assess mothers' home care practices for children with acute diarrheal disease.

-Develop and implement a nurse-led educational package to enhance mothers' knowledge and home care practices for children with acute diarrheal disease.

Research hypothesis:

H_I. Nurse-led educational package has a positive effect on mothers' knowledge for children with acute diarrheal disease.

H_{II}. Nurse-led educational package has a positive effect on mothers' home care practices for children with acute diarrheal disease.

H_{III}. There is a significant positive correlation between mothers' knowledge scores and their home care practice scores following the nurse-led educational package.

Subjects and Method

Research Design:

A quasi-experimental research design using a pre/ post-test approach was employed to conduct this study.

Research Setting:

This study was conducted at the Pediatric Outpatient Clinics affiliated to Zagazig University Hospital.

Research Subject:

A purposive sample composed of 167 mothers of children diagnosed with

acute diarrhea in the previous study setting, with the following criteria: children who had previous episodes of acute diarrhea, and their age were age ≤ 8 years.

Sample size:

The sample size calculation is based on power analysis, using the following equation:

$$= \frac{P(1-P)}{(SE \div t) + (P(1-P) \div N)}$$

$$= \frac{0.50(1-0.50)}{(0.05 \div 1.96) + (0.50(1-0.50) \div 495)}$$

$$= 167 \text{ cases.}$$

So, the sample size will be 167 cases.

Description:

N = the population size = 1005.

The total population size (N = 1005) was obtained from the records of the Pediatric Outpatient Clinics affiliated to Zagazig University.

Hospital during the previous year.

P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size).

SE = 0.05

t = 1.96

Tools of data collection:

It included 2 tools as follows:

A- Pre-designed Knowledge Questionnaire:

It was designed by the researcher after reviewing the current updated literature (Kliegman et al., 2024). It was written in simple Arabic

language and includes the following parts:

Part I: Characteristics of mothers of children diagnosed with acute diarrhea: such as age, educational level, residence, and source of mothers' information about diarrheal disease.

Part II: Characteristics of children diagnosed with acute diarrhea: such as age, gender and recurrence of diarrheal episodes before.

Part III: Knowledge of mothers about acute childhood diarrheal disease. It is composed of 10 closed-ended questions about definition, causes, symptoms, complications, prevention of childhood diarrheal disease, signs of dehydration, importance of ORS, breastfeeding during episodes of diarrhea.

Scoring system of knowledge: Answers graded using a researcher-created template key answer after reviewing the related literature, with 1 point awarded for an accurate response and zero for incorrect or incomplete responses. The total score of knowledge was 10 degrees, converted into a percentage. A score of more than or equal to 75% indicates satisfactory knowledge, and a score of less than 75% indicates unsatisfactory knowledge.

B- Mothers' home care practices.

It was developed by researcher to assess mothers home care practices regarding acute childhood diarrheal disease, preparation of ORS, hand hygiene before food preparation, after diaper change and feeding pattern during diarrhea.

Scoring system of practice:

Each step reported done taken (1 score) and not done (zero). Then the total score of reported practices total score of 10. A score of more than or equal to 75% indicates satisfactory level of reported practices, and a score of less than 75% indicates unsatisfactory level of reported practices.

Validity and reliability:

Content validity was established by a panel of five pediatric nursing experts from Faculties of Nursing, Zagazig and El-Fayoum Universities. Reliability was assessed using Cronbach's alpha coefficient. The reliability coefficient was 0.78 for the knowledge questionnaire and 0.82 for the home care practices scale. This suggests the items on each scale are consistent and reliable.

Pilot Study

Ten percent of all mothers of children diagnosed with acute diarrhea in the sample (16) were subjected to it. It was used to evaluate and ensure the instruments' application and clarity.

Although the tools were not altered, the final sample did not contain them.

Ethical considerations:

Official approval was obtained from the Scientific Research Ethics Committee of the Faculty of Nursing, Zagazig University, prior to the commencement of the study. Also, official approval to conduct the study was obtained from the director of the designated setting following a detailed description of the goals and parameters of the study. Mothers of children diagnosed with diarrhea were also given a clear overview of the study's objectives and provided their informed consent to participate. Confidentiality was ensured for all mothers, and they were assured that any collected data would be used strictly for research purposes and to support their health care. To protect mothers' identities, code numbers were assigned to all data entered the system. Access to the database and the code key linking to personal information was restricted to the primary researchers only.

Fieldwork:

A quasi-experimental design was used. A specifically validated and designed instrument was utilized to evaluate the dimensions of knowledge and practice before and after. The study was performed from January 2026 to June 2026 at the

Pediatric Outpatient Clinics affiliated to Zagazig University. Study subjects composed of 167 mothers of children diagnosed with acute diarrhea, received pre- and post-intervention based on need/ risk assessment through the pretest phase. The researcher was available two days per week from 9 am to 12 pm. The researchers interviewed mothers of children diagnosed with acute diarrhea. The researchers asked mothers about causes of diarrhea, signs and symptoms, complications of diarrhea, ORS benefits and its preparation, signs of dehydration, prevention, how to deal with it and how to prevent recurrence episodes of diarrhea and dehydration.

The risk assessment used to address items such as lack of the knowledge and home care practices of mothers regarding acute childhood diarrheal disease, signs, early detection, benefits and preparation of ORS and prevention of diarrheal disease recurrence. Then, the intervention/posttest phase included tasks completed through designing and implementing of a nurse – led health education package aimed at improving knowledge, and home care practices of mothers having children diagnosed with acute diarrhea and preventing recurrence of diarrheal episode through teach-back

method including lectures with discussion, demonstration and re-demonstration. The intervention was developed based on an extensive review of current literature, evidence-based guidelines, and recommendations from international and national health organizations concerning childhood diarrhea management (WHO/UNICEF guidelines).

The educational package was delivered to mothers of children diagnosed with acute diarrhea through structured educational sessions conducted in the pediatric outpatient clinic. The intervention employed a combination of teaching strategies, including lectures, discussion, demonstration and re-demonstration, and the Teach-Back Method, to enhance learning, retention, and practical application of knowledge. The educational content was delivered through small group sessions consisting of approximately 5–10 mothers per group to facilitate interaction and active participation.

The educational package was conducted in three sequential sessions. Each session lasted approximately 30-45 minutes according to mothers' availability. Educational materials, including illustrated handouts, posters, and

visual aids, are utilized to facilitate understanding and reinforce learning. The first group of sessions focused on improving mothers' knowledge regarding acute childhood diarrheal disease. A lecture combined with group discussion used to present information about the definition of diarrhea, causes and risk factors, signs and symptoms, potential complications, preventive measures, and indications requiring medical consultation. The lecture encouraged mothers to actively participate by asking questions, sharing experiences, and discussing common misconceptions regarding diarrhea management. This interactive approach allowed clarification of inaccurate beliefs and promoted meaningful learning.

The second group of sessions focused on home care of diarrhea, particularly the prevention and management of dehydration. The researchers provided detailed information regarding fluid replacement, continued breastfeeding and feeding during diarrhea episodes, hygiene measures, and danger signs requiring immediate medical attention. During these sessions, demonstrations are employed to train practical skills. The researcher demonstrated the correct preparation and administration of Oral Rehydration

Solution (ORS), proper hand-washing techniques, and appropriate hygienic practices for food preparation and childcare. Visual aids and actual materials as ORS packages, soap and water used to ensure clear understanding of each procedure.

Following the demonstration, mothers asked to perform the same procedures through re-demonstration under the direct supervision of the researchers. Each mother gave an opportunity to prepare ORS and demonstrate proper hand-washing techniques. Immediate feedback, correction, and reinforcement provided to ensure mastery of the required skills and promote confidence in performing these practices at home.

The Teach-Back Method was integrated throughout all educational sessions as a strategy to assess understanding and reinforce learning. The nurse-led educational package was the main intervention while the Teach-Back Method used only as instructional strategies to enhance mothers' understanding and retention of the educational content. After each educational topic, the researchers asked mothers to explain the information in their own words or demonstrate what learned. Examples of teach-back questions included:

"Can you tell me how you can prepare ORS at home?" or "Can you explain the warning signs that require taking your child to the hospital?" Mothers who demonstrate incomplete understanding received additional explanation and clarification. The Teach-Back Method ensured that mothers comprehend the educational content rather than merely receiving information.

At the end of each session, researchers provided a summary of the key messages provided, and mothers encouraged them to ask questions and discuss any concerns related to caring for their children during diarrheal episodes. Educational booklets written in simple language and supported with illustrations distributed to mothers as a reference for home use.

Following completion of the nurse-led educational package, mothers' knowledge and home care practices regarding acute childhood diarrheal disease reassessed using the same study instruments employed during the pre-intervention assessment. The researchers assessed the effectiveness of the nurse-led health education package was evaluated by comparing pre- and post-intervention scores to determine improvements in

mothers' knowledge and home management practices.

Results

Table (1) reveals that more than half (58.8%) of the studied mothers were aged 20–<30 years old. More than one-third (37.7%) of them could read and write, while approximately two-thirds (67.7% and 65.3%) were housewives and lived in rural areas, respectively. Nearly half (47.9%) of the studied mothers had three children or more. Half of mothers (52.0%) reported family and friends as their main source of information about diarrheal disease.

Table (2) shows that nearly half (49.7%) of the studied children were less than 2 years of age. More than half (54.5%) were males, and two-thirds (66.5%) had a previous history of diarrhea.

Table (3) portrays a statistically significant improvement in mothers' knowledge regarding childhood diarrheal disease after nurse-led educational package. Significant improvements were observed in most knowledge items, including meaning, causes, symptoms, and complications, signs of dehydration, ORS use, breastfeeding continuation, and preventive measures ($p < 0.001$). However, no statistically significant improvement was observed regarding knowledge about times

when mothers seek medical help ($p = 0.22$). A highly statistically significant improvement was observed in total knowledge scores after nurse-led educational package.

Table (4) illustrates a statistically significant improvement in most home care practices after the intervention. Significant

improvements were observed in breastfeeding continuation, ORS methods and preparation, hand washing after diaper changing, fluid intake during diarrhea, use of clean water, seeking health care when symptoms worsen, and maintaining child hygiene ($p < 0.001$). A highly statistical significant improvement in total home care practices scores was observed after nurse-led educational package.

Table (5) presents a statistically significant relationship between mothers' educational level and total knowledge post-intervention ($p = 0.005$), as well as occupation ($p = 0.03$). No statistically significant relationships were found regarding age or residence ($p > 0.05$).

Table (6) illustrates a statistically significant relationship between mothers' educational level and total home care practices post-intervention ($p = 0.002$), as well as occupation ($p = 0.01$). No statistically significant

differences were observed regarding age or residence ($p > 0.05$).

Table (7) demonstrates a highly statistically significant relationship between mothers' total knowledge and home care practices after the intervention ($\chi^2 = 48.6$, $p < 0.001$), where mothers with satisfactory knowledge were more likely to demonstrate good practices.

Table (8) shows a statistically significant positive correlation between mothers' knowledge and home care practice pre-intervention ($r = 0.21$, $p = 0.008$). This correlation increased markedly post-intervention ($r = 0.62$, $p < 0.001$), indicating that higher knowledge was associated with better home care practices.

Table (1): Characteristics of mothers

Characteristics of mothers	Frequency (n)=167	Percentage (%)
Age (years)		
< 20	22	13.2
20–<30	98	58.8
30–<40	36	21.6
≥40	11	6.6
Education		
Illiterate	16	9.6
Read & write	63	37.7
Primary	14	8.4
Secondary	41	24.6
University	33	19.7
Occupation		
Housewife	113	67.7
Working	54	32.3
Residence		
Urban	58	34.7
Rural	109	65.3
Number of children:		
One	26	15.6
Two	61	36.5
Three or more	80	47.9
Source of information about diarrheal disease**		
Health care providers	23	19
Media	35	29
Family & friends	63	52
Previous experience	46	38

** Multiple responses were allowed

Table (2): Characteristics of children with diarrhea

Characteristics of pediatric patients with diarrhea	Frequency (n)=167	Percentage (%)
Age (years)		
<2 years	83	49.7
2–<5 years	54	32.3
5–<8 years	30	18.0
Gender		
Male	91	54.5
Female	76	45.5
Previous diarrhea		
Yes	111	66.5
No	56	33.5

Table (3): Knowledge of Mothers Regarding Childhood Diarrheal Disease (n =167)

Knowledge of Mothers Regarding Childhood Diarrheal Disease (10 items):	Pre				Post				Chi-square	
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory		X ²	P-value
	No.	%	No.	%	No.	%	No.	%		
1. Meaning of diarrhea?	26	16%	141	84%	156	93%	11	7%	204.0	<0.001**
2. Causes of diarrhea?	21	13%	146	87%	122	73%	45	27%	124.8	<0.001**
3. Symptoms of diarrhea	38	23%	129	77%	86	51%	81	49%	29.6	<0.001**
4. Complications of diarrhea	18	11%	149	89%	113	68%	54	32%	113.3	<0.001**
5. Signs of dehydration	9	5%	158	95%	142	85%	25	15%	213.8	<0.001**
6. Uses of oral rehydration solution (ORS)	56	34%	111	66%	94	56%	73	44%	17.5	<0.001**
7. During diarrhea, breastfeeding continued or not	41	25%	126	75%	159	95%	8	5%	173.6	<0.001**
8. Methods of prevention of diarrhea	26	16%	141	84%	82	49%	85	51%	42.9	<0.001**
9. Times when mother seek medical help	63	38%	104	62%	74	44%	93	56%	1.50	≈0.22
Total knowledge	35	20.9	132	79.1	117	70.3	50	29.7	70.19	<0.001*

Table (4): Home Care Practices by Mothers for Children with Acute Diarrheal Disease score pre- and post-intervention

Practice of Mothers Regarding Childhood Diarrheal Disease	Pre				Post				Chi-square	
	Done		Not done		Done		Not done		χ^2	P-value
	No.	%	No.	%	No.	%	No.	%		
1. Giving ORS to child during diarrhea	69	41%	98	59%	123	74%	44	26%	32.5	<0.001*
2. Preparation ORS correctly	45	27%	122	73%	119	71%	48	29%	65.8	<0.001*
3. Method of ORS preparation	47	28%	120	72%	149	89%	18	11%	128.4	<0.001**
4. Washing hand before preparing food	84	50%	83	50%	96	57%	71	43%	1.9	0.16
5. Washing hands after changing diapers	73	44%	94	56%	136	81%	31	19%	48.7	<0.001*
6. Giving fluids frequently to child during diarrhea	65	39%	102	61%	118	71%	49	29%	40.2	<0.001*
7. stopping food during diarrhea	14	8%	153	92%	91	54%	76	46%	72.6	<0.001*
8. Using clean water for drinking and food preparation	46	28%	121	72%	79	47%	88	53%	11.4	0.001*
9. Taking the child to a health facility when symptoms worsen	80	48%	87	52%	145	87%	22	13%	62.3	<0.001*
10. Maintaining personal hygiene of the child during diarrhea	91	54%	76	46%	156	93%	11	7%	78.9	<0.001*
Total practice	52	31.1%	115	68.9%	128	76.6%	39	23.4%	14.60	<0.001*

Table (5): Relation between sociodemographic characteristics of mothers and total knowledge

Sociodemographic Characteristics	Satisfactory Knowledge (%)	Unsatisfactory Knowledge (%)	χ^2	p-value
Age (years)			3.21	0.36
<20 (n=22)	14 (63.6%)	8 (36.4%)		
20–<30 (n=98)	70 (71.4%)	28 (28.6%)		
30–<40 (n=36)	25 (69.4%)	11 (30.6%)		
≥40 (n=11)	8 (72.7%)	3 (27.3%)		
Educational Level			12.84	0.005*
Illiterate (n=16)	7 (43.8%)	9 (56.2%)		
Read & Write (n=63)	40 (63.5%)	23 (36.5%)		
Primary (n=14)	9 (64.3%)	5 (35.7%)		
Secondary (n=41)	33 (80.5%)	8 (19.5%)		
University (n=33)	28 (84.8%)	5 (15.2%)		
Occupation			4.67	0.03*
Housewife (n=113)	75 (66.4%)	38 (33.6%)		
Working (n=54)	42 (77.8%)	12 (22.2%)		
Residence			2.14	0.14
Urban (n=58)	44 (75.9%)	14 (24.1%)		
Rural (n=109)	73 (67.0%)	36 (33.0%)		

Table (6): Relation Between Socio-demographic Characteristics of Mothers and Total Home Care Practices for Children with Acute Diarrheal Disease (Post-Intervention) (n = 167)

Sociodemographic Characteristics	Good Practice no (%)	Poor Practice no (%)	χ^2	p-value
Age (years)				
<20 (n=22)	15 (68.2%)	7 (31.8%)	2.87	0.41
20–<30 (n=98)	77 (78.6%)	21 (21.4%)		
30–<40 (n=36)	27 (75.0%)	9 (25.0%)		
≥40 (n=11)	9 (81.8%)	2 (18.2%)		
Educational Level				
Illiterate (n=16)	8 (50.0%)	8 (50.0%)	14.62	0.002*
Read & Write (n=63)	45 (71.4%)	18 (28.6%)		
Primary (n=14)	10 (71.4%)	4 (28.6%)		
Secondary (n=41)	34 (82.9%)	7 (17.1%)		
University (n=33)	31 (93.9%)	2 (6.1%)		
Occupation				
Housewife (n=113)	82 (72.6%)	31 (27.4%)	6.11	0.01*
Working (n=54)	46 (85.2%)	8 (14.8%)		
Residence				
Urban (n=58)	48 (82.8%)	10 (17.2%)	3.45	0.06
Rural (n=109)	80 (73.4%)	29 (26.6%)		

Table (7): Relationship between Mothers' Knowledge Level and Home Care Practices Post-intervention

Practice (Post)	Satisfactory Knowledge	Unsatisfactory Knowledge	Total	χ^2	P-value
Good	95	22	117	48.6	<0.001*
Poor	22	28	50		
Total	117	50	167		

Table (8): Correlation between Total Knowledge Scores and Home Care Practices Scores Pre- and Post-Intervention

Total Home Care Practices Score	Total Knowledge Score	
	(r)	p-value
Pre	0.21	0.008*
Post	0.62	<0.001*

Discussion

Acute diarrheal disease remains one of the most common causes of illness among children worldwide, particularly in developing countries. Effective home management by mothers plays a crucial role in preventing dehydration, reducing complications, and promoting recovery. However, inadequate knowledge and inappropriate home care practices may increase the risk of severe outcomes and hospital admissions. Nurse-led educational interventions have been recognized as an effective approach to improving mothers' understanding and caregiving skills. Therefore, this study was conducted to evaluate the effect of a nurse-led educational package on mothers' knowledge and home care practices for children with acute diarrheal disease.

Regarding characteristics of the studied mothers, nearly two thirds of them were aged 20 – < 30 years, more than one-third were able to read and write, about two-thirds were housewives, and most of them lived in rural areas. Nearly half of mothers had three or more children, and more than half reported family and friends as their main source of information about diarrheal disease. These findings are in line with **Said, Elhawy and Abd El-Sattar (2024)**, who reported that most mothers were

young, had secondary education, and had at least one child less than five years. This similarity may be attributed to the inclusion criteria and similar community characteristics.

In the present study, there was a statistically significant improvement in mothers' total knowledge after the implementation of the nurse-led health educational package, where the proportion of mothers with satisfactory knowledge increased from nearly one fifth of mothers pre-intervention to more than two-thirds of them post-intervention ($p < 0.001$). In this study, there was a statistically significant difference between total knowledge levels pre- and post-implementation of nurse-led health education package. This indicates the effectiveness of the nurse – led health education package regarding knowledge about acute childhood diarrheal disease. This result is in accordance with **Mary and Girly (2025)**, who stated that most of the respondents didn't know the benefits of ORS and how to use it before intervention, while after the intervention, their knowledge improved about how to use ORS correctly, its benefits and the duration of its use.

Concerning the home care practices of mothers regarding acute childhood diarrheal disease, the current study

illustrated that most practices show highly significant improvement after intervention ($p < 0.001$). Only Question 4 (hand washing before food) is not statistically significant ($p > 0.05$). This suggests the intervention was effective in improving maternal practices regarding acute childhood diarrheal disease in almost all areas. There is a highly statistically significant improvement in total practice scores after the intervention ($p < 0.001$). The proportion of mothers with good practice increased markedly from 31% to 77%. This result comes in accordance with the study conducted by **Akkari, et al. (2025)**, who demonstrated a better performance of mothers regarding care of their children with diarrhea especially who received a practical training.

The majority of mothers were satisfied following the nurse-led health education package. This indicates a substantial positive shift in mothers' attitudes after the intervention. The relatively high satisfaction level reflects the effectiveness of the nurse-led education in improving mothers' understanding, confidence, and overall perception toward managing acute childhood diarrheal disease. This result is in contrary with **Choden and de Bruin (2012)**, who suggested that the behavior of

mothers didn't change or improved towards care of children with diarrhea or preparation, administering ORS for children after intervention. In the researcher perspective this may be due to indifference of social norm (role modeling) and seeing health education as part of job responsibility rather.

Regarding the relationship between mothers' socio-demographic characteristics and total knowledge post-intervention, there was a statistically significant relationship between mothers' educational level and total knowledge ($p = 0.005$), as well as occupation ($p = 0.03$). However, no statistically significant relationship was found regarding age or residence ($p > 0.05$). This result is corroborated by **Mutalik and Raje (2017)**, who showed a statistically significant difference (p -value of 0.001^{**}) between mothers' total knowledge about her children regarding acute diarrheal diseases and their educational level whereas total practice was not associated.

The current study illustrated the relationship between mothers' socio-demographic characteristics and total practice post-intervention. There was a statistically significant relationship between educational level and total practice ($p = 0.002$), as well as occupation ($p = 0.01$). However, no statistically significant differences

were observed regarding age or residence ($p > 0.05$). This finding can be explained by the fact that mothers with higher educational levels are generally more likely to understand health education messages, correctly interpret instructions, and apply recommended home-care practices effectively. Education enhances cognitive processing, health literacy, and decision-making skills, which directly influence the quality of childcare practices. Similarly, occupation may reflect differences in exposure to health information, access to resources, and time management skills, all of which can contribute to improved post-intervention practice. In contrast, age and residence may have shown no significant effect because health education interventions can standardize knowledge and skills across different age groups and geographic settings when delivered in a structured and interactive manner. These findings are consistent with those reported by **Workie et al. (2018)**; **Desta et al. (2017)**; **Said et al. (2024)**, who identified maternal education and occupation as significant determinants of appropriate diarrhea management practices. Conversely, age and residence were not found to be consistently associated with care giving practices. Similar to the

present study, previous research has suggested that structured health education interventions can reduce the influence of demographic factors such as age and residence by minimizing socio-demographic disparities and promoting more uniform knowledge acquisition and care giving performance among participants (Abdel-Aziz et al., 2016). Also, **Al-Mashahedah and Dhahi (2024)**, go in the same line who stated that mothers' practice of caring for children with diarrhea was highly associated with their socio-demographic characteristics especially level of education and number of children.

In this study, there was a relationship between mothers' total knowledge and total practice regarding care of children with diarrheal disease post-intervention. There was a statistically significant relationship between mothers' knowledge and practice post-intervention ($p = 0.01$). This result is in contrary with the study conducted by **Galal Fathy, Saad and Farg (2025)** who stated that there was no obvious relation between mothers knowledge and total practice regarding care of children with diarrheal disease while there is slight relation between mothers practice and attitude towards care of children with diarrhea ($p < 0.001$, $r = 0.298$).

A statistically significant positive correlation was observed between mothers' total knowledge and home care practices before the intervention ($r = 0.21$, $p = 0.008$). Following the intervention, the strength of the correlation markedly increased ($r = 0.62$, $p < 0.001$), indicating that improvements in mothers' knowledge were associated with better home care practices. These findings suggest that enhancing mothers' knowledge through the educational intervention contributed positively to improving their home management practices.

The majority of mothers were satisfied following the nurse-led health education package. This indicates a substantial positive shift in mothers' attitudes after the intervention. The relatively high level of satisfaction reflects the effectiveness of the nurse-led education in improving mothers' understanding, confidence, and overall perception toward managing acute childhood diarrheal diseases. However, this finding is in contrast with **Choden and de Bruin (2012)**, who reported that mothers' behavior did not significantly improve after health education regarding diarrhea management and ORS preparation. This discrepancy may be explained by differences in cultural context, health education methods, and the degree of practical training provided.

Regarding the relationship between mothers' socio-demographic characteristics and total knowledge post-intervention, the present study found a statistically significant relationship with educational level ($p = 0.005$) and occupation ($p = 0.03$), while no significant relationship was observed with age or residence ($p > 0.05$). This finding is supported by **Mutalik and Raje (2017)**, who reported a significant association between mothers' education level and knowledge regarding childhood diarrheal diseases, emphasizing that higher educational status enhances health awareness and understanding. Similarly, the current study demonstrated a statistically significant relationship between mothers' socio-demographic characteristics and total practice post-intervention, where educational level ($p = 0.002$) and occupation ($p = 0.01$) were significant predictors of better practices, while age and residence were not significantly associated. This finding is consistent with **Jagadeesh et al. (2024)**, who found that maternal education was strongly associated with improved caregiving practices for children with diarrhea. Furthermore, the present study revealed a statistically significant relationship between mothers' total knowledge and practice regarding care of children with diarrheal disease

post-intervention ($p = 0.01$). However, this finding is in contrast with **Galal Fathy, Saad and Farg (2025)**, who reported no clear association between mothers' knowledge and practice, although a weak correlation was observed between practice and attitude ($p < 0.001$, $r = 0.298$). This variation may be attributed to differences in sample characteristics, study design, and effectiveness of the educational intervention.

Finally, a statistically significant positive correlation was observed between mothers' total knowledge and home care practices before the intervention ($r = 0.21$, $p = 0.008$), which increased markedly after the intervention ($r = 0.62$, $p < 0.001$). This indicates that improvements in mothers' knowledge were strongly associated with better home care practices following the nurse-led health education package. These findings highlight the importance of health education in strengthening maternal competencies and improving home care practices for children with diarrheal disease.

Conclusion

The present study demonstrated that the nurse-led educational package had a highly significant positive effect on mothers' knowledge and home care practices regarding acute childhood diarrheal disease. There

was a marked improvement in mothers' knowledge of diarrhea, its causes, complications, and preventive measures, as well as a significant enhancement in their ability to correctly manage diarrhea at home, particularly in relation to oral rehydration solution (ORS) preparation, continuation of feeding, and recognition of dehydration signs. Additionally, the study revealed a statistically significant improvement in overall practice scores after the intervention, with an increase in the proportion of mothers demonstrating good practices. A positive correlation was also found between mothers' knowledge and their home care practices following the intervention, indicating that increased knowledge contributed directly to improved caregiving behavior.

Recommendations

Based on the findings of the current study, the following recommendations are suggested:

- Implementation of nurse-led educational programs in pediatric outpatient clinics and primary health care centers to improve mothers' knowledge and practices regarding childhood diarrheal disease.
- Integration of structured educational packages into routine pediatric nursing care to ensure consistent health education for caregivers.

-Use of visual aids, booklets, and teach-back methods in all educational interventions to enhance understanding and retention of information.

-Strengthening community health nursing roles in health promotion activities targeting mothers of under-five children.

-Future research studies should be conducted on larger and more diverse populations to further evaluate long-term effectiveness of nurse-led interventions and their impact on child morbidity and mortality.

References

- Abdel-Aziz, S., Mowafy, M., & Galal, Y. (2016).** Assessing the impact of a community-based health and nutrition education on the management of diarrhea in an urban district, Cairo, Egypt. *Global Journal of Health Science*, 8(2), 46–55.
<https://doi.org/10.5539/gjhs.v8n2p46>
- Akkari, C., Kerbage, G., Malaeb, D., Hallit, S., & Hallit, R. (2025).** Knowledge and practices on diarrheal illness and associated factors in Lebanon. *Frontiers in Public Health*, 13, 1618648.
<https://doi.org/10.3389/fpubh.2025.1618648>
- Al-Mashahedah, A., & Dhahi, B. (2024)** Epidemiological patterns of diarrheal disease among under-five children. *Journal of Pediatric Health Research*.
- American Academy of Pediatrics. (2019).** Diarrhea and steatorrhea/ Pediatric care recommendations for acute gastroenteritis.
<https://publications.aap.org/pediatriccare/article/doi/10.1542/aap.ppcqr.396060/1575/Diarrheaand-Steatorrhea>.
- American Academy of Pediatrics. (2019).** Management of acute gastroenteritis in children (clinical guidance).
<https://publications.aap.org/pediatrics>.
- Choden, K., & de Bruin, M. (2012).** *Communication and innovation studies: Mothers' knowledge and practices regarding childhood diarrhea management*. (Master's Thesis). Wageningen University, Netherlands. Available at: <https://edepot.wur.nl>
- Desta, B. K., Assimamaw, N., & Ashenafi, T. D. (2017).** Knowledge, practice, and associated factors of home-based management of diarrhea among caregivers of children attending under-five clinic in Fagita Lekoma District, Awi Zone, Amhara Regional State, Northwest Ethiopia. *Nursing Research and Practice*, 2017, Article 8084548.
<https://doi.org/10.1155/2017/8084548>

- Fischer Walker, C. L., & Black, R. E. (2010).** Diarrhea morbidity and mortality in older children, adolescents, and adults. *The Lancet Infectious Diseases*, 10(6), 403–411.
[https://doi.org/10.1016/S1473-3099\(10\)70039-6](https://doi.org/10.1016/S1473-3099(10)70039-6)
- Galal Fathy, E., Saad, M., & Farg, H. K. (2025).** Mothers' performance towards the prevention and home-based care of diarrheal diseases among their children. *Trends in Nursing and Health Care Journal*, 9(3), 46–66.
- GBD 2019 Diseases and Injuries Collaborators. (2020).** Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019. *The Lancet*, 396(10258), 1204–1222.
[https://doi.org/10.1016/S0140-6736\(20\)30925-9](https://doi.org/10.1016/S0140-6736(20)30925-9)
- Giri, S., Shrestha, A., & Joshi, R. (2022).** Water, sanitation and hygiene practices and their association with childhood diarrhea in rural households. *Cureus*, 14(10), e29888. Doi : <https://doi.org/10.7759/cureus.29888>
watersanitationandhygiene-practices-and-their-association-with-childhood-diarrhoea
- Jagadeesh, K., Narasannavar, A., Kamble, M., Prakasha, S., & Raja, B. Y. (2024).** Knowledge, attitude and practice of mothers in the management of diarrhea among under-five children in a rural area of India. *Ethiopian Journal of Health Sciences*, 34(4), 321–330.
- Kombat, M., Kushitor, S., Sutherland, E., Boateng, M., & Manortey, S. (2024).** Prevalence and predictors of diarrhea among children under five in Ghana. *BMC Public Health*, 24, 154.
<https://doi.org/10.1186/s12889-024-17654-5>
- Liu, L., Oza, S., Hogan, D., Perin, J., Rudan, I., Lawn, J., Cousens, S., Mathers, C., & Black, R. E. (2016).** Global, regional, and national causes of under-5 mortality in 2000–15: An updated systematic analysis. *The Lancet*, 388(10063), 3027–3035.
[https://doi.org/10.1016/S0140-6736\(16\)31593-8](https://doi.org/10.1016/S0140-6736(16)31593-8)
- Mary, O., & Girly, M. (2025).** Effectiveness of a nurse-led training intervention on maternal practices in managing childhood diarrhea at home in rural Ogun State, Nigeria. *International Journal of Caring Sciences*, 18(3), 1580–1589.
- Mohammed, S., & Tamiru, D. (2020).** The burden of diarrheal diseases among children under five in Ethiopia: A systematic review and meta-analysis. *BMC Pediatrics*, 20, 123.

<https://doi.org/10.1186/s12887-020-02041-6>

Momoh, M., Adekunle, O., & Bello, S. (2022). Childhood diarrheal diseases: burden, risk factors and prevention strategies. Doi:<https://doi.org/10.1155/2022/>

Mutalik, A., & Raje, V. (2017). Relationship between maternal education and socioeconomic status on knowledge, attitude and practice of mother and her child regarding acute diarrheal diseases. *International Journal of Community Medicine and Public Health*, 4(12), 4472–4476. <https://doi.org/10.18203/2394-6040.ijcmph>.

Said, H., Elhawy, L., & Abd El-Sattar, E. (2024). Mothers' knowledge and behavior regarding home management of diarrhea among children under five years: Interventional study. *The Egyptian Journal of Community Medicine*, 42(3), 193–201. <https://doi.org/10.21608/EJCM.2024.270388.1285>

United Nations Children's Fund (UNICEF) & World Health Organization (WHO). (2009). *Diarrhea: Why children are still dying and what can be done*. UNICEF/WHO. <https://www.unicef.org/reports/diar>

rhoea-why-children-are-still-dying-and-what-can-be-done

United Nations Children's Fund (UNICEF). (2023). Child health and diarrhea prevention. <https://www.unicef.org/health>

Workie, H., Sharifabdilahi, A., & Addis, E. (2018). Mothers' knowledge, attitude and practice towards the prevention and home-based management of diarrheal disease among under-five children in Dire Dawa, Eastern Ethiopia: A cross-sectional study. *BMC Pediatrics*, 18, 358. <https://doi.org/10.1186/s12887-018-1321-6>

World Health Organization. (2017). Diarrheal disease. <https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease>

World Health Organization. (2024). Diarrheal disease. <https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease>

Awareness of the Cognitive Intact Elderly Toward Alzheimer's Disease

Majda Shubrum Alshammari^{1,2}, Entisar Abo Elghite Elhossiny ELkazeh³,
Nahla Said Mahmoud⁴, Hend Reda Ali Elkest⁵

¹Master Student of Community Health Nursing, Faculty of Nursing, Tanta University.

²Nursing Specialist at Sharaf Hospital in Hail, Saudi Arabia.

³Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.

^{4,5}Assistant Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Majda Alshammari

Email: Majdasa@moh.gov.sa

Abstract

Background: Alzheimer's disease is a growing health problem among older adults and is associated with progressive cognitive, behavioral, and functional decline. Improving awareness among cognitively intact elderly individuals is important because they are still able to understand health information, recognize warning signs, and adopt preventive behaviors. **Aim:** This study aimed to assess awareness of cognitively intact elderly individuals toward Alzheimer's disease. **Study design:** A descriptive cross-sectional design was used. **Setting:** The study was conducted at AL Shamla Clinics in Egypt and Hail General Hospital in Saudi Arabia. **Subjects:** A purposive sample of 150 cognitively intact elderly individuals from Egypt and Saudi Arabia participated in the study. **Study tools:** Two tools were used for data collection: **Tool I:** Cognitive Intact Elderly Knowledge Regarding Alzheimer's Disease Interview, and **Tool II:** Dementia Attitudes Scale. **Results:** The findings showed that almost all participants (98.7%) had insufficient knowledge regarding Alzheimer's disease, and more than three quarters (76.0%) had negative attitudes toward Alzheimer's disease and related dementia. Positive correlations were detected between MMSE total score and knowledge score ($r = 0.431$, $P < 0.001$), and between MMSE total score and attitude score ($r = 0.271$, $P = 0.001$). **Conclusion:** The study indicated unsatisfactory awareness of Alzheimer's disease among cognitively intact elderly individuals, accompanied by predominantly negative attitudes. **Recommendations:** Strengthening health education programs is recommended to improve dementia-related knowledge and promote more positive attitudes among older adults. **Keywords:** Alzheimer's disease, Awareness, Cognitively intact elderly.

Introduction

Advancing age is accompanied by a variety of biological and cognitive changes that may influence daily functioning and overall health status. These changes can affect memory, concentration, learning ability, communication skills, and decision-making capacity. While many cognitive changes are considered part of normal aging, others may indicate the onset of pathological conditions that require attention and early intervention **(American Brain Foundation, 2025; Stefanacci, 2025)**.

Alzheimer's disease represents the most prevalent type of dementia and is responsible for the majority of dementia cases worldwide. The disease is characterized by gradual deterioration in cognitive abilities, memory, behavior, and functional performance, ultimately affecting an individual's independence and quality of life. As the condition progresses, affected individuals increasingly require assistance with daily activities and long-term care **(American Brain Foundation, 2025; Mendez, 2017; Kumar et al., 2021)**.

The worldwide impact of Alzheimer's disease has increased substantially over recent decades as a result of population aging and improvements in life expectancy.

Dementia currently affects millions of people across different regions of the world, creating considerable challenges for healthcare systems, families, and communities. Consequently, Alzheimer's disease has become a significant public health concern requiring effective preventive and educational strategies **(Breijyeh & Karaman, 2020; Cho et al., 2024; World Health Organization, 2023)**.

Several modifiable and non-modifiable risk factors contribute to the development of Alzheimer's disease, including increasing age, family history, genetic predisposition, smoking, physical inactivity, unhealthy diet, hypertension, diabetes mellitus, obesity, social isolation, and cardiovascular diseases. Increasing awareness of these risk factors may contribute to disease prevention and risk reduction **(Mayo Clinic, 2026; Alzheimer's Association, 2026; Safiri et al., 2024)**.

Cognitively intact elderly individuals represent an important target group for Alzheimer's disease awareness because they remain capable of understanding health information, recognizing early symptoms, adopting preventive behaviors, and seeking appropriate healthcare services. Adequate awareness may facilitate early detection and improve

health outcomes (Calatayud et al., 2021; Ashour et al., 2024; Ribas et al., 2020).

Community health nurses play a vital role in promoting awareness and prevention of Alzheimer's disease through health education, risk reduction counseling, early detection activities, and implementation of community-based interventions that support healthy aging and cognitive health among elderly populations (Alam et al., 2021; Gong et al., 2023).

Significance of the study:

Alzheimer's disease is considered one of the most serious neurodegenerative disorders affecting older adults worldwide. The disease not only impairs cognitive functioning and independence but also imposes substantial emotional, social, and economic burdens on patients, families, caregivers, healthcare systems, and society. The increasing prevalence of Alzheimer's disease due to population aging highlights the importance of addressing this growing public health challenge (Jack et al., 2024; World Health Organization, 2023).

Awareness of Alzheimer's disease among cognitively intact elderly individuals is particularly important because this population represents a key target group for prevention, early recognition, and health promotion

interventions. Adequate awareness regarding risk factors, warning signs, and preventive measures may encourage healthier lifestyles and timely healthcare-seeking behaviors. Therefore, assessing awareness toward Alzheimer's disease can help identify knowledge gaps and support the development of effective nursing educational and preventive programs (Gong et al., 2023; Alam et al., 2021; Heikal et al., 2025).

Aim of the study

To assess awareness of cognitively intact elderly toward Alzheimer's disease.

Research Questions:

- 1- What is the level of knowledge of cognitively intact elderly regarding Alzheimer's disease?
- 2- What are the attitudes of cognitively intact elderly toward Alzheimer's disease and related dementia?
- 3- What is the relationship between cognitive function, knowledge, and attitudes regarding Alzheimer's disease?

Subjects and Method

Study design:

The current research adopted a descriptive cross-sectional approach to evaluate awareness regarding Alzheimer's disease among cognitively intact older adults.

Setting:

Data were collected from two settings. The first setting was in Egypt at Outpatient clinics at AL Elshamla out-patient clinic at Tanta University Hospital– Gharbiya Governorate affiliated to the Ministry of Higher Education and Scientific Research. The second setting in Hail, Saudi Arabia, specifically at Hail General Hospital Affiliated to Hail Health cluster, Saudi Arabia.

Subjects:

The study involved 150 cognitively intact older adults aged 60 years and above were selected through purposive sampling from Egypt and Saudi Arabia.

Tools of the study:

Two tools were used by the researcher to obtain the necessary data for this study based on recent literature review

Tool I: Cognitive Intact Elderly Knowledge Regarding Alzheimer's Disease Interview.

This tool was developed by the researcher after reviewing the related literatures (Andreakou et al., 2016; Cho et al., 2024) and consisted of the following parts:

Part (1): Socio- demographic characteristics of the Cognitive Intact Elderly: This part included data about age, sex, educational level, marital status, occupation before retirement, place of residence,

type of family, number of family members, and monthly income.

Part (2): Medical history of the cognitively intact elderly: This part included data regarding previous hospitalization, chronic diseases, family history of Alzheimer's disease, forgetfulness episodes, smoking status, and other medical conditions related to Alzheimer's disease risk factors.

Part (3): Mini-Mental State Examination (MMSE): This part was developed by Folstein, Folstein, and McHugh (1975) and adapted by Andreakou et al. (2016); Cho et al. (2024) to assess cognitive function among elderly individuals. It consisted of 30 items covering orientation, registration, attention and calculation, recall, and language abilities., and assessment of source of knowledge.

The scoring system:

The MMSE consisted of 30 items. Each correct answer was given one score, while incorrect answers were given zero. The total score ranged from 0 to 30. Elderly individuals who scored 24 or more were considered cognitively intact and eligible to participate in the study.

Part (4): Alzheimer's Disease Knowledge Scale (ADKS): This part was adapted from Carpenter et al. (2009) to assess knowledge regarding Alzheimer's disease. It

consisted of 30 true/false items covering risk factors, symptoms, assessment and diagnosis, disease course, treatment, life impact, and caregiving.

The scoring system:

The ADKS consisted of 30 true/false items. Each correct answer was given one score, while incorrect and “I don’t know” answers were given zero. The total score ranged from 0 to 30 and was converted into percentages. Knowledge level was classified as follows:

- High level of knowledge: >70% of the total score.
- Moderate level of knowledge: 50–70% of the total score.
- Low level of knowledge: <50% of the total score.

Tool II : Dementia Attitudes Scale (DAS).

This tool was adapted from **O’Connor and McFadden (2009)** to assess attitudes of cognitively intact elderly toward Alzheimer’s disease and related dementia. It consisted of 20 statements measured using a five-point Likert scale ranging from strongly disagree to strongly agree.

The scoring system:

The responses were scored as follows: Strongly Agree (4), Agree (3), To some extent (2), Disagree (1), and Strongly Disagree (0). The scores of negative statements were reversed. The total score ranged from

0 to 80, where higher scores indicated more positive attitudes toward Alzheimer’s disease and related dementia.

The attitude level was classified as follows:

- Positive attitude $\geq 60\%$ of the total score.
- Negative attitude $< 60\%$ of the total score.

Method

1. Obtaining approval:

- An official letter to conduct the study was obtained from the Dean of the Faculty of Nursing – Tanta University and directed to the responsible authorities at Hail General Hospital, Saudi Arabia, and AL Shamla Outpatient Clinics, Egypt, to obtain permission for data collection.

2- Ethical considerations:

- Approval of the Scientific Research Ethical Committee of the Faculty of Nursing, Tanta University was obtained with Code No. (606-3-2025).
- An informed consent was obtained from all study participants after providing an appropriate explanation about the purpose of the study.
- Each participant was informed that he/she had the right to withdraw from the study at any time.
- Confidentiality and anonymity of the collected data were assured.

- The data collected were used only for scientific research purposes.

- The nature of the study did not cause any harm to the participants.

3- Developing the study tool:

- Tool I was developed by the researcher after extensive review of the related national and international literature concerning Alzheimer's disease awareness among cognitively intact elderly individuals.

- Tool II was adapted and translated into Arabic language by the researcher.

4- The study tool was tested for face and content validity by a jury of five experts in the field of Community Health Nursing, Faculty of Nursing, Tanta University. The necessary modifications were carried out according to the jury's recommendations.

5. Pilot study

- A pilot study was carried out on 10% of the study sample (15 elderly participants) to test the clarity, applicability, and feasibility of the study tools and identify any potential obstacles during data collection. This sample was included in the study as there were no major modifications.

6. Reliability of the study tool

Cronbach's Alpha coefficient was used to assess the internal consistency of the study tools. It was found to be (0.813) for the overall study tools, (0.813) for Mini-Mental

State Examination (MMSE), (0.917) for Alzheimer's Disease Knowledge Scale (ADKS), and (0.710) for Dementia Attitudes Scale (DAS).

7. Actual study

- The researcher met the studied elderly individually at the previously mentioned settings in Saudi Arabia and Egypt after explaining the aim and nature of the study and obtaining their consent to participate.

- The Mini-Mental State Examination (MMSE) was administered initially to assess cognitive eligibility. A total of 167 elderly individuals were screened; 17 participants were excluded because their MMSE scores were less than 24. Consequently, the final study sample consisted of 150 cognitively intact elderly individuals.

- Eligible participants were then interviewed using the study tools. Face-to-face structured interviews were conducted for data collection in suitable places within the previously mentioned outpatient clinics.

- The average time required for each interview ranged from 30 to 45 minutes depending on the participant's response and level of understanding.

- Data collection was carried out over a period of six months.

8. Statistical analysis

The data were organized, tabulated and statistically analyzed using

statistical package for social studies (SPSS) version 23. The mean, standard deviation and range were calculated for quantitative data. For categorical variables numbers and percent were calculated. Comparison was done using chi-square test (χ^2), when chi square isn't appropriate Monto Carlo Exact test (MCET) and Fissure Exact test (FE) were used. Pearson's correlation coefficient (r) was used to identify correlation between variables. A significance was adopted at $P < 0.05$ for interpretation of results of tests of significance (*). Also, highly significant was adopted at $P < 0.01$ for interpretation of results of tests of significance (**).

Results

Table (1): Distribution of the studied cognitively intact elderly according to their socio-demographic characteristics. Data presented in table indicate that nearly two thirds (64.7%) of the studied cognitively intact elderly were aged from 60 to less than 70 years, with a mean age of 69.30 ± 7.577 years. More than half (52.7%) were males and 63.3% were married. More than one third (36.7%) were illiterate, while 54.0% resided in urban areas. Concerning family characteristics, 48.7% belonged to extended families and 52.0% lived with 4–7 household members.

Figure (1): Distribution of the studied cognitively intact elderly according to their levels of knowledge about Alzheimer's disease. The findings displayed reveal that the majority (98.7%) of the studied cognitively intact elderly had low levels of knowledge regarding Alzheimer's disease, whereas only 1.3% demonstrated moderate levels of knowledge.

Table (2): Mean and standard deviation of cognitive functions of the studied cognitively intact elderly according to Mini-Mental State Examination (MMSE). As shown, the highest mean score (8.486 ± 0.895) was observed in the language domain, followed by orientation to place (4.973 ± 0.198), attention and calculation (4.853 ± 0.717), and orientation to time (4.140 ± 1.634). The total MMSE score ranged from 24 to 30, with a mean total score of 25.580 ± 7.497 .

Figure (2): Distribution of the studied cognitively intact elderly according to their sources of knowledge about Alzheimer's disease. The figure illustrates that family members represented the most frequently reported source of information (43.3%), followed by social media (33.3%) and radio and television (26.0%), whereas official medical websites represented the

least reported source of information (16.0%).

Table (3): Mean and standard deviation of dementia attitudes scale domains total score of the studied cognitively intact elderly.

The table reveals that the affective and behavioral domain had a slightly higher mean score (20.560 ± 8.943) compared with the cognitive domain (19.700 ± 9.654), indicating relatively comparable scores between both domains.

Figure (3): Distribution of the studied cognitively intact elderly according to their levels of attitudes toward Alzheimer's disease and related dementia. The figure shows that more than three quarters (76.0%) of the cognitively intact elderly demonstrated negative attitudes, while only 24.0% showed positive attitudes.

Table (4): Relationship between levels of knowledge of the studied cognitively intact elderly regarding Alzheimer's disease and their socio-demographic characteristics.

The table demonstrates statistically significant relationships between knowledge level and both age ($P=0.033$) and educational level ($P=0.032$). However, no statistically significant relationships were found between knowledge level and sex, occupation before retirement, marital status, place of residence, monthly

income, type of family, or number of household members ($P>0.05$).

Table (5): Relationship between levels of attitude of the studied cognitively intact elderly toward Alzheimer's disease and their socio-demographic characteristics.

The table reveals statistically significant relationships between attitude level and occupation before retirement ($P=0.046$), educational level ($P<0.001$), marital status ($P<0.001$), type of family ($P=0.016$), and number of household members ($P=0.017$). No statistically significant relationships were found between attitude level and age, sex, place of residence, or monthly income ($P>0.05$).

Table (6): Correlation between Mini-Mental State Examination (MMSE), knowledge, and attitude scores of the studied cognitively intact elderly. The table demonstrates a highly statistically significant positive correlation between MMSE total score and knowledge score ($r=0.431$, $P<0.001$), as well as between MMSE total score and attitude score ($r=0.271$, $P=0.001$). In addition, a statistically significant positive correlation was found between knowledge score and attitude score ($r=0.188$, $P=0.021$).

Table (1): Distribution of the studied cognitively intact elderly according to their socio-demographic characteristics

Socio-demographic characteristics	The studied cognitively intact elderly (n=150)	
	No	%
Age / years		
60 < 70	97	64.7
70 - 80	38	25.3
> 80	15	10.0
Range	60 – 90	
Mean ± SD	69.30 ± 7.577	
Sex		
Male	79	52.7
Female	71	47.3
Occupation before retirement		
Employee	72	48.0
Farmer	43	28.7
Professional work	21	14.0
Skilled/manual work	14	9.3
Educational level		
Illiterate	55	36.7
Reads and writes	40	26.7
Basic education	30	20.0
Secondary education/ University education or higher	25	16.6
Marital status		
Married	95	63.3
Widowed	39	26.0
Single / Divorced	16	10.7
Place of residence		
Rural	69	46.0
Urban	81	54.0
Monthly income		
Just sufficient	72	48.0
Sufficient with savings	63	42.0
Insufficient and requires borrowing	15	10.0
Type of family		
Nuclear family	71	47.3
Extended family	73	48.7
Single-parent family	6	4.0
Household members living with the elderly		
1 – 3 members	40	26.6
4– 7 members	78	52.0
8 – 10 members	19	12.7
More than 10 members	13	8.7

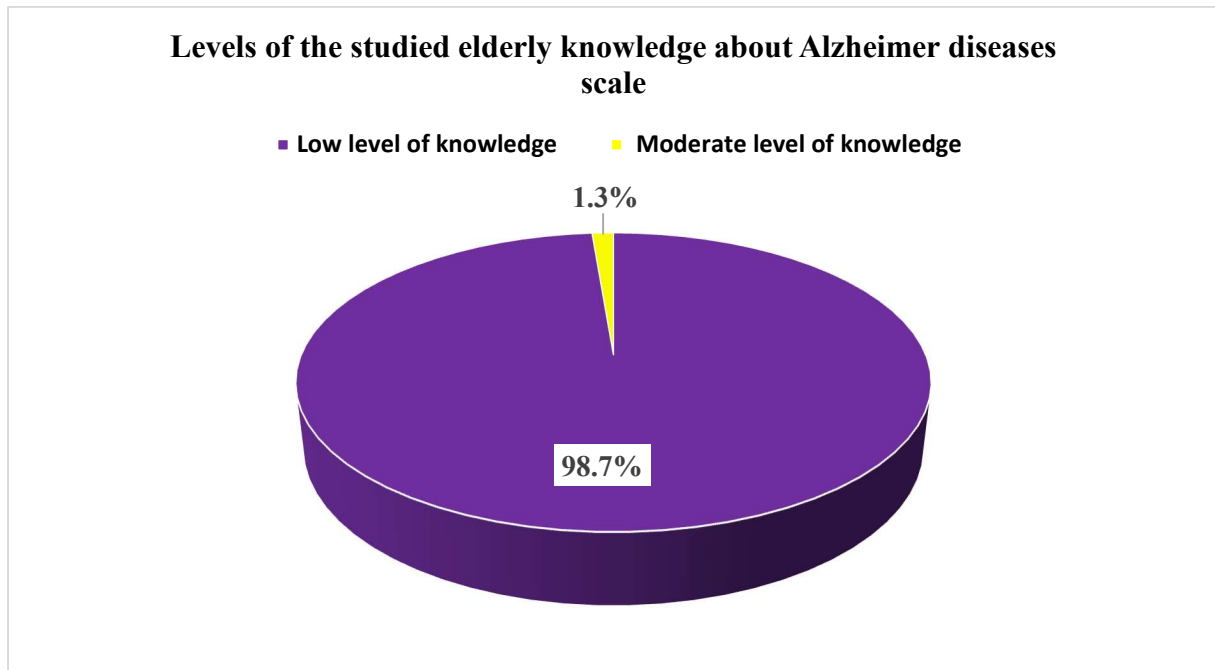


Figure (1): Distribution of the studied cognitively intact elderly according to their levels of knowledge about Alzheimer diseases

Table (2): Mean and standard deviation of cognitive functions of the studied cognitively intact elderly according to Mini-Mental State Examination (MMSE)

Elderly mini mental state examination	The studied cognitively intact elderly (n=150)	
	Mean $\pm$ SD	Range
Orientation to time	4.140 $\pm$ 1.634	1 – 5
Orientation to place	4.973 $\pm$ 0.198	3- 5
Storage or recording	2.853 $\pm$ 0.535	0 – 3
Attention and calculation	4.853 $\pm$ 0.717	0 – 5
Recall	2.920 $\pm$ 0.317	1 – 3
Language	8.486 $\pm$ 0.895	6 – 9
Total score of MMSE	25.580$\pm$7.497	24 – 30

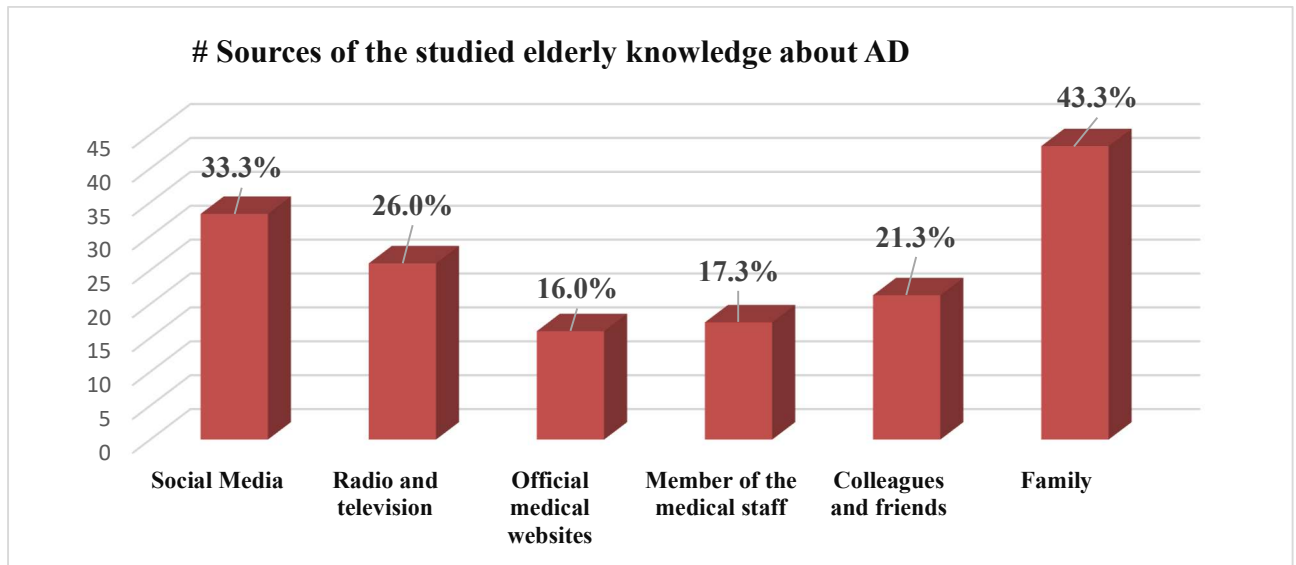


Figure (2): Distribution of the studied cognitively intact elderly according to their sources of knowledge about Alzheimer diseases (# more than one source)

Table (3): Mean and standard deviation of dementia attitudes scale domains total score of the studied cognitively intact elderly

Dementia attitudes scale domains total score	Mean $\pm$ SD	Range
Cognitive domain	19.700 $\pm$ 9.654	0 – 40
Affective and behavioral domains	20.560 $\pm$ 8.943	1 – 40

Levels of attiudes of the studied elderly toward Alzheimer disease and related dementia

■ Negative Attitude ■ Positive attitude

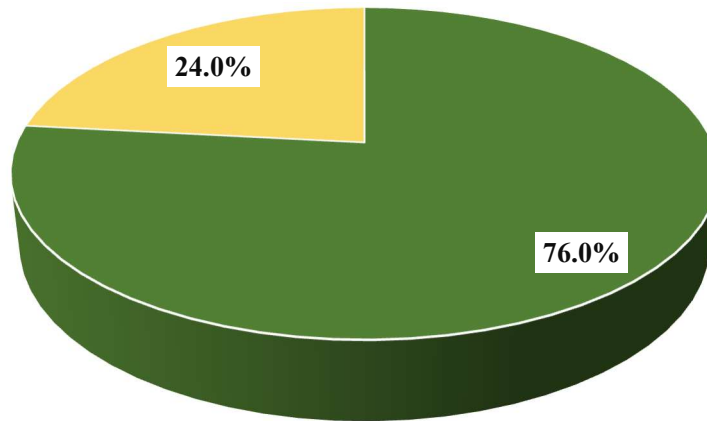


Figure (3): Distribution of the studied cognitively intact elderly according to their levels of attitudes toward Alzheimer's disease and related dementia

Table (4): Relationship between levels of knowledge of the studied cognitively intact elderly about Alzheimer disease and their socio-demographic characteristics

Socio-demographic characteristics	The studied cognitively intact elderly (n=150)				χ^2 P
	Low level of knowledge (n= 148)		Moderate level of knowledge (n=2)		
	No	%	No	%	
Age / years					MCET 0.033*
60 < 70	97	65.5	0	0.0	
70 - 80	36	24.3	2	100.0	
> 80	15	10.1	0	0.0	
Sex					FE 0.498
Male	77	52.0	2	100.0	
Female	71	48.0	0	0.00	
Occupation before retirement					MCET 0.720
Employee	70	47.3	2	100.0	
Farmer	43	29.1	0	0.0	
Professional work	21	14.2	0	0.0	
Skilled/manual work	14	9.5	0	0.0	
Educational level					MCET 0.032*
Illiterate	53	35.8	2	100.0	
Reads and writes	40	27.0	0	0.0	
Basic education	30	20.3	0	0.0	
Secondary education / University education or higher	25	16.9	0	0.0	
Marital status					MCET 0.640
Married	93	62.8	2	100.0	
Widowed	39	26.4	0	0.0	
Single / Divorced	16	10.8	0	0.0	
Place of residence					FE 1.000
Rural	68	45.9	1	50.0	
Urban	80	54.1	1	50.0	
Monthly income					MCET 1.00
Just sufficient	71	48.0	1	50.0	
Sufficient with savings	62	41.9	1	50.0	
Type of family					MCET 1.00
Nuclear family (parents and children)	70	47.3	1	50.0	
Extended family	72	48.6	1	50.0	
Single-parent family	6	4.1	0	0.0	
Number of household members living with the participant					MCET 0.74
1 – 3 members	40	27.0	0	0.0	
4– 7 members	76	51.4	2	100.0	
8 – 10 members	19	12.8	0	0.0	
More than 10 members	13	8.8	0	0.0	

* (<0.05) Significant

Table (5): Relationship between levels of attitude of the studied cognitively intact elderly about Alzheimer disease and their socio-demographic characteristics

Socio-demographic characteristics	The studied cognitively intact elderly (n=150)				χ^2
	Negative attitude (n= 114)		Positive attitude (n=36)		
	No	%	No	%	
Age / years					1.834 0.400
60 < 70	77	67.5	20	55.6	
70 - 80	27	23.7	11	30.6	
> 80	10	8.8	5	13.9	
Sex					2.393 0.122
Male	56	49.1	23	63.9	
Female	58	50.9	13	36.1	
Occupation before retirement					MCET 0.046*
Employee	53	46.5	19	52.8	
Farmer	36	31.6	7	19.4	
Professional work	14	12.3	7	19.4	
Skilled/manual work	11	9.6	3	8.3	
Educational level					MCET 0.000**
Illiterate	47	41.2	8	22.2	
Reads and writes	37	32.5	3	8.3	
Basic education	19	16.7	11	30.6	
Secondary education / University education or higher	11	9.6	14	38.9	
Marital status					MCET 0.000**
Married	64	56.1	31	86.1	
Widowed	36	31.6	3	8.3	
Single / Divorced	14	12.3	2	5.6	
Place of residence					0.028 0.100
Rural	52	45.6	17	47.2	
Urban	62	54.4	19	52.8	
Monthly income					MCET 0.173
Just sufficient	55	48.2	17	47.2	
Sufficient with savings	45	39.5	18	50.0	
Insufficient and requires borrowing	14	12.3	1	2.8	
Type of family					MCET 0.016*
Nuclear family (parents and children)	56	49.1	15	41.7	
Extended family	52	45.6	21	85.3	
Single-parent family	6	5.3	0	0.0	
Number of household members living with the participant					MCET 0.017*
1 – 3 members	27	23.7	13	36.1	
4– 7 members	57	50.0	21	58.3	
8 – 10 members	18	15.8	1	2.8	
More than 10 members	12	10.5	1	2.8	

* P (<0.05) Significant ** (P< 0.01) highly significant

* P (<0.05) Significant

Table (6): Correlation between total mini mental state, total knowledge, and total attitude score of the studied cognitively intact elderly

Variables	The studied cognitively intact elderly (n=150)	
	Mini mental state total score	Knowledge total score
	R P	R P
Knowledge total score	0.431 0.000**	-
Attitude total score	0.271 0.001**	0.188 0.021*

Correlation is significant at the 0.01 level (2-tailed)

Correlation is significant at the 0.05 level (2-tailed)

Discussion

Alzheimer's disease is considered one of the most serious public health challenges affecting older adults worldwide because of its progressive neurodegenerative nature and its profound impact on memory, cognition, behavior, independence, and quality of life. Poor awareness regarding Alzheimer's disease may contribute to delayed recognition of symptoms, misconceptions about the disease, negative attitudes toward affected individuals, and reduced utilization of preventive and healthcare services. Therefore, the present study was conducted to assess awareness of cognitively intact elderly toward Alzheimer's disease.

Regarding the socio-demographic characteristics of the studied cognitively intact elderly, the findings of the current study revealed that nearly two thirds of the participants were aged from 60 to

less than 70 years, more than half were males, and approximately two thirds were married. More than one third of the studied elderly were illiterate, while more than half resided in urban areas (**Table 1**). These findings may be attributed to the increasing life expectancy and the growing proportion of older adults within the community. The relatively high percentage of illiteracy among the studied elderly may reflect the limited educational opportunities available for older generations. Furthermore, the predominance of urban residence may be related to easier accessibility of healthcare services and outpatient clinics where data were collected.

The present study demonstrated that knowledge regarding Alzheimer's disease was generally poor among cognitively intact elderly individuals, with nearly all participants falling within the low knowledge category and only a very small proportion

achieving a moderate level of knowledge (**Figure 1**). This outcome may reflect insufficient dissemination of dementia-related information within the community, limited participation of older adults in educational activities addressing cognitive health, and dependence on non-professional sources of information. In addition, the relatively low educational attainment observed among many participants may have contributed to reduced understanding of Alzheimer's disease and its associated risk factors. These findings support those reported by **Ashour et al. (2024)**, who identified considerable gaps in dementia awareness among the Egyptian population. Likewise, **Alhazzani et al. (2020)** documented inadequate public knowledge regarding Alzheimer's disease in Saudi Arabia. In contrast, **Carpenter et al. (2009)** reported higher knowledge levels among their participants. Such differences may be related to variations in educational background, accessibility of health information, and exposure to awareness initiatives across study settings.

The results of the current study indicated that cognitively intact elderly participants achieved generally satisfactory scores on the Mini-Mental State Examination,

reflecting preserved cognitive abilities among the study sample. Higher mean scores were observed in language, orientation to place, and attention domains, whereas comparatively lower scores were found in recall and registration domains (**Table 2**). These variations may represent normal age-related changes that commonly affect memory performance before influencing other cognitive functions. Language skills and orientation abilities often remain relatively stable among cognitively healthy older adults, which may explain the higher scores obtained in these domains. The present finding agrees with **Calatayud et al. (2021)**, who reported that older adults without cognitive impairment tended to maintain adequate performance in language and orientation despite experiencing mild reductions in memory-related functions. A similar observation was described by **Evans et al. (2014)**, who emphasized that cognitively intact elderly individuals usually retain sufficient cognitive capacity to engage in learning activities, understand health information, and participate effectively in health-promotion programs.

Concerning sources of information about Alzheimer's disease, the present study showed that family

members were the primary source from which participants obtained information, followed by social media platforms and traditional media such as radio and television. In contrast, healthcare professionals and official medical websites were reported less frequently as sources of knowledge (**Figure 2**). This pattern may be related to the tendency of older adults to depend on close social networks and readily available communication channels when seeking health-related information. Family members often play a central role in sharing experiences and health advice, particularly among elderly populations. These findings are comparable to those of **Gong et al. (2023)**, who identified family and informal social contacts as common sources of dementia-related information. Likewise, **Cengiz et al. (2025)** reported that participants frequently relied on relatives, friends, and media outlets to increase their understanding of Alzheimer's disease. The limited use of healthcare professionals as information sources may indicate insufficient health education efforts and reduced opportunities for dementia counseling within healthcare settings.

With regard to dementia attitude domains, the findings revealed only slight differences between the

cognitive domain and the affective and behavioral domain scores, suggesting that participants demonstrated similar responses across both dimensions of the scale (**Table 3**). This may indicate that perceptions of Alzheimer's disease are influenced by both emotional reactions and cognitive understanding of the condition. Limited knowledge about dementia and uncertainty regarding communication with affected individuals may contribute to unfavorable beliefs and attitudes. In addition, misconceptions concerning the capabilities and behavior of people living with dementia may further influence participants' responses. This interpretation is supported by **Bergman et al. (2023)**, who emphasized that inadequate health literacy and insufficient dementia knowledge can contribute to stigma and negative perceptions toward individuals affected by dementia.

The present study demonstrated that negative attitudes toward Alzheimer's disease and related dementia were more common than positive attitudes among the studied elderly participants, as more than three quarters expressed unfavorable attitudes while less than one quarter demonstrated positive attitudes (**Figure 3**). This finding may reflect

concerns about cognitive decline, fear of dependency during aging, and limited understanding of the nature of dementia and its management. Misconceptions regarding the disease and insufficient exposure to educational programs may also contribute to the development of negative perceptions. The current finding is consistent with **O'Connor and McFadden (2010)**, who found that poor understanding of dementia was associated with less favorable attitudes toward affected individuals. Similarly, **Bergman et al. (2023)** suggested that inadequate knowledge may reinforce negative beliefs and stigma related to dementia. On the other hand, **O'Connor and McFadden (2009)** reported more positive attitudes among their participants. Such differences may be explained by variations in educational background, previous contact with individuals living with dementia, and the availability of awareness initiatives within different communities.

The findings of the present study demonstrated statistically significant associations between knowledge regarding Alzheimer's disease and both age ($P=0.033$) and educational level ($P=0.032$) as shown in **Table (4)**. These results suggest that individual characteristics may influence awareness and

understanding of dementia-related information. Educational level, in particular, may contribute to better health literacy and greater ability to access and comprehend disease-related information. Likewise, differences across age groups may reflect variations in life experiences, information exposure, and health-seeking behaviors. The current finding is consistent with **Carpenter et al. (2009)**, who reported that individuals with higher educational attainment tended to possess greater knowledge regarding Alzheimer's disease. Similarly, **Alam et al. (2021)** found that higher educational levels were associated with increased awareness of dementia symptoms, risk factors, and preventive measures.

The present study revealed statistically significant relationships between attitudes toward Alzheimer's disease and occupation before retirement ($P=0.046$), educational level ($P<0.001$), marital status ($P<0.001$), type of family ($P=0.016$), and number of household members ($P=0.017$), as presented in **Table (5)**. These findings indicate that social and educational circumstances may play an important role in shaping perceptions and attitudes toward dementia. Individuals who have stronger family support and better educational

backgrounds may be more likely to develop positive perceptions and greater acceptance of people living with dementia. In addition, family interactions and social engagement may enhance understanding of dementia-related challenges. These findings agree with **Cengiz et al. (2025)**, who reported that educational background and social support significantly influenced attitudes toward dementia. Likewise, **Ashour et al. (2024)** observed that positive attitudes were more prevalent among participants with higher educational levels and stronger family support systems.

The correlation analysis demonstrated a highly statistically significant positive relationship between MMSE total score and knowledge score ($r=0.431$, $P<0.001$), indicating that participants with better cognitive performance tended to have greater knowledge regarding Alzheimer's disease, as shown in **Table (6)**. Furthermore, a significant positive correlation was identified between MMSE total score and attitude score ($r=0.271$, $P=0.001$), suggesting that preserved cognitive abilities may contribute to more favorable attitudes toward dementia. In addition, a statistically significant positive correlation was observed between knowledge score and attitude score ($r=0.188$, $P=0.021$),

indicating that increased knowledge may be associated with more positive attitudes toward Alzheimer's disease and related dementia. These findings highlight the importance of improving dementia awareness among older adults as a potential approach to enhancing attitudes toward affected individuals. Similar findings were reported by **Calatayud et al. (2021)**, who emphasized the importance of preserved cognitive abilities in understanding and processing health information. Likewise, **Evans et al. (2014)** reported that cognitively healthy older adults were more likely to engage in health education activities and benefit from disease-awareness programs.

Conclusion

The present study concluded that most of the cognitively intact elderly had low levels of knowledge regarding Alzheimer's disease and predominantly negative attitudes toward Alzheimer's disease and related dementia. In addition, significant positive correlations were found between cognitive function, knowledge, and attitudes. Therefore, improving awareness among older adults may contribute to promoting more positive attitudes toward Alzheimer's disease and related dementia.

Recommendations

Based on the findings of the present study, the following recommendations are suggested:

- Organize community-based awareness campaigns aimed at correcting misconceptions, reducing stigma, and improving public understanding of dementia and healthy cognitive aging.
- Integrate cognitive screening tools such as Mini-Mental State Examination into routine elderly healthcare services for early identification of at-risk individuals.
- Provide counseling and emotional support for elderly individuals expressing fear, anxiety, or misconceptions related to cognitive decline and dementia.
- Improve accessibility of scientifically reliable educational resources regarding Alzheimer's disease through healthcare institutions, primary healthcare centers, elderly clinics, and digital health platforms.
- Strengthen multidisciplinary collaboration among healthcare professionals involved in elderly care to improve dementia prevention, screening, and supportive healthcare services.

References

Alam, R., Ashrafi, S., Pionke, J., & Schwingel, A. (2021). Role of community health workers in

addressing dementia: A scoping review and global perspective. *Journal of Applied Gerontology*, 40(12), 1881–1892.

Alhazzani, A., Alqahtani, A., Alqahtani, M., Alahmari, T., & Zarbah, A. (2020). Public awareness, knowledge, and attitude toward Alzheimer's disease in Aseer Region, Saudi Arabia. *The Egyptian Journal of Neurology, Psychiatry and Neurosurgery*, 56(81). <https://doi.org/10.1186/s41983-020-00213-z>

Alzheimer's Association. (2026). What are the causes and risk factors of Alzheimer's and other dementias? <https://www.alz.org/alzheimers-dementia/what-is-alzheimers/causes-and-risk-factors>

American Brain Foundation. (2025). Brain aging explained: What speeds it up and what we can do to slow it down. <https://www.americanbrainfoundation.org>

Andreakou, M., Papadopoulos, A. A., Panagiotakos, D., & Niakas, D. (2016). Assessment of health-related quality of life for caregivers of alzheimer's disease patients. *International Journal of Alzheimer's Disease*, 1(1), 9213968.

Ashour, A., Sabry, N., Ashour, A., Nassef, H., Alwerdani, M., Nofal, M., & Khalaf, O. (2024). Dementia awareness in Egypt: What do people

- really know? *The Egyptian Journal of Neurology, Psychiatry and Neurosurgery*, 60, 91. <https://doi.org/10.1186/s41983-024-00864-2>
- Bergman, H., Borson, S., Jessen, F., Krolak-Salmon, P., Pirani, A., Rasmussen, J., ... & Taddeo, D. (2023).** Dementia and comorbidities in primary care: A scoping review. *BMC Primary Care*, 14; 24(1), 277. [doi:10.1186/s12875-023-02229-9](https://doi.org/10.1186/s12875-023-02229-9). PMID:38097969;PMCID:PMC10720181.
- Breijyeh, Z., & Karaman, R. (2020).** Comprehensive review of Alzheimer's disease causes and treatment. *Molecules*, 25(24), 5789. <https://doi.org/10.3390/molecules25245789>
- Calatayud, E, Salavera, C., & Gómez-Soria, I. (2021).** Cognitive differences in the older adults living in the general community: Gender and mental occupational state study. *Int J Environ Res Public Health*, 18(6), 3106. [Doi: 10.3390/ijerph18063106](https://doi.org/10.3390/ijerph18063106).
- Carpenter, B., Balsis, S., Otilingam, P., Hanson, P., & Gatz, M. (2009).** The Alzheimer's Disease Knowledge Scale: Development and psychometric properties. *The Gerontologist*, 49(2), 236–247. <https://doi.org/10.1093/geront/gnp023>
- Cengiz, B., Akyol, M., & Açıl, D. (2025).** Community health physicians' and nurses' dementia knowledge and attitudes: A cross-sectional survey. *Journal of Community Health Nursing*, 42, 185–196.
- Cho, E., Yang, Y., Kim, H., & Kim, H. (2024).** Priorities of family caregivers in preserving functional abilities of individuals with Alzheimer's disease living at home. *Research in Community Public Health Nursing*, 35(2), 156–167.
- Folstein, M., Folstein, S., & McHugh, P. R. (1975).** “Mini-Mental State”: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12(3), 189–198. [https://doi.org/10.1016/00223956\(75\)90026-6](https://doi.org/10.1016/00223956(75)90026-6)
- Gong, D., Peng, Y., Liu, X., Zhang, J., Deng, M., Yang, T., & Yang, Y. (2023).** Does health education on dementia prevention have more effects on community residents when a community physician/nurse leads it? A cross-sectional study. *Frontiers in Public Health*, 11, 1101913. <https://doi.org/10.3389/fpubh.2023.1101913>
- Heikal, S., Fawi, G., Khedr, E., Othman, M., Moustafa, S., Elsheikh, N., & Salama, M. (2025).** The Egyptian Dementia Network (EDN): Baseline characteristics from

- the first dementia registry in an African Arab country. *Alzheimer's & Dementia*, 21(11), 1–13.
- Jack, CR, Jr., Andrews, J., Beach, T.G, Buracchio, T., Dunn, B., Graf, A., ... & Carrillo, M. C. (2024).** Revised criteria for diagnosis and staging of Alzheimer's disease: Alzheimer's Association Workgroup. *Alzheimer's & Dementia*, 20(8), 5143-5169. Doi: 10.1002/alz.13859. Epub 2024 Jun 27. PMID: 38934362; PMCID: PMC11350039.
- Kumar, A., Sidhu, J., Goyal, A., Tsao, J. W., & Doerr, C. (2021).** *Alzheimer disease (Nursing)*. In Stat Pearls. Stat Pearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK568805/>
- Mayo Clinic. (2026).** Alzheimer's disease: Symptoms and causes. <https://www.mayoclinic.org/diseases-conditions/alzheimersdisease/symptoms-causes/syc-20350447>
- Mendez, M. (2017).** Early-onset Alzheimer disease. *Neurologic Clinics*, 35(2), 263–281. <https://doi.org/10.1016/j.ncl.2017.01.005>
- O'Connor, M., & McFadden, S. (2009).** Development and psychometric validation of the Dementia Attitudes Scale. *International Journal of Alzheimer's Disease*, 2010, 454218. <https://doi.org/10.4061/2010/454218>
- Ribas, G., Arcelay, E., Montoya, A., & Maurino, J. (2020).** Assessing knowledge and perceptions of Alzheimer's disease among employees of a pharmaceutical company in Spain: A comparison between caregivers and non-caregivers. *Patient Preference Adherence*, 14, 2357–2364. Doi: 10.2147/ppa.s282147
- Safiri, S., Ghaffari Jolfayi, A., Fazlollahi, A., Morsali, S., Sarkesh, A., Daei Sorkhabi, A., ... & Kolahi, A. A., (2024).** Alzheimer's disease: A comprehensive review of epidemiology, risk factors, symptoms, diagnosis, management, caregiving, advanced treatments and associated challenges. *Frontiers in Medicine*, 11, 1474043. <https://doi.org/10.3389/fmed.2024.1474043>
- Stefanacci, R. (2025).** Overview of Aging. <https://www.msmanuals.com/home/older-people-s-health-issues/the-aging-body/overview-of-aging>
- World Health Organization. (2023).** Dementia. <https://www.who.int/newsroom/factsheets/detail/dementia>

Academic Stress of University Students: Interrelationship between Stressors and Coping Strategies

Dina Aly Rashad Aly¹, Manal Mansour Mostafa², Hala Hassan Sayed³,
OLa Hussien Abo Elmaaty⁴

¹Clinical Instructor at Faculty of Nursing, El Fayoum University.

²Professor of Community Health Nursing, Faculty of Nursing, El Fayoum University.

³Professor of Community Health Nursing, Faculty of Nursing, El Fayoum University.

⁴Assistant Professor of Family and Community Health Nursing, Faculty of Nursing, Demietta University.

Corresponding author: Dina Aly Rashad

Email: da1409@fayoum.com

Abstract

Background: Higher education students' performance and mental health are greatly impacted by academic stress. It results from a number of social, intellectual, and environmental issues. To control stress and preserve academic achievement and mental health, effective coping mechanisms are crucial. If unmanaged, stress can result in anxiety, depression, sleep disturbances, and poor academic performance. **Aim of the study:** this study aimed to: Assess stress level among university students, assess factors contributing to stress among university students and determine coping strategies of stress. **Design:** A descriptive cross-sectional research design was utilized in this study. **Setting:** This study was carried out at the Faculty of Nursing, fayoum University. **Subjects:** A purposive sample of 200 students were selected from the previous mentioned chosen setting. **Tools:** - Data of this study was collected through three tools namely: first tool: A structured Interviewing Questionnaire, second tool: Perceived Stress Scale (PSS), third tool: The Academic Coping Strategies Scale. **Results:** The result indicate that the majority of students had a moderate level of perceived stress, this was followed by students with a high stress level, while the lowest proportion had a low level of perceived stress, two thirds of students had a moderate level of coping strategies, while minority of them demonstrated a high level, and less than quarter reported a low level of coping strategies. **Conclusion:** The majority of students were males, the majority of students had a moderate level of perceived stress, quarter of students had a high stress level, majority of students had a moderate level of coping strategies, **Recommendation:** Students should be encouraged to develop effective coping strategies to manage academic stress and universities should implement structured stress management and mental health support programs tailored to students' needs.

Keywords: Academic stress, Coping strategy, University students.

Introduction

Academic stress refers to the psychological distress and pressure experienced by students due to academic demands, such as workload, exams, deadlines, and performance expectations. It arises when students perceive an imbalance between the academic challenges they face and their ability to cope with them. Stress is a psychological state that occurs when individuals appraise a situation as threatening or challenging and believe that their coping resources are insufficient. Stress has been described as an unpleasant emotional and psychological state experienced when individuals perceive situations as threatening to their wellbeing (**Dunn, et al., 2024**).

Academic stress is a complicated phenomena that has a substantial impact on the academic performance and general well-being of university students worldwide. The extent of this pressure shows up in both their personal and academic life. In addition to physiological symptoms like sleep disruptions, sleepiness, and chronic exhaustion, students also display psychological responses like worry and sadness (**Kiltz et al., 2024**).

In higher education, academic stress has grown to be a serious psychological issue. Today's students

are under more and more pressure to succeed academically, successfully manage their time, and strike a balance between their personal and social obligations. Transitions like transitioning to college life, adjusting to online learning, or getting ready for professional vocations can result in increased stress. Academic stress is increasingly seen as a multifaceted response to ongoing academic pressures, high expectations, and conflicting goals, in contrast to previous conceptions of stress as a response to failure (**Agiello, et al., 2024**).

Anxiety, sadness, sleep problems, and subpar academic performance may all be brought on by stress. Students' responses to stress are greatly influenced by their coping skills, with both adaptive and maladaptive tactics having an impact on long-term results. Strong academic requirements, such as frequent tests, stringent deadlines, competitive grading schemes, and substantial course material, are often cited as the main causes of stress for students (**Barman et al., 2023**).

Students' stress levels are greatly impacted by the existence or lack of social support. Vulnerability to anxiety and depression is increased by a lack of interpersonal interactions, little peer engagement, and emotional detachment from the

academic setting. High rates of anxiety and depression among college students were linked to a lack of social support networks. On the other hand, it was discovered that social resilience and a feeling of community mitigated the negative impacts of academic pressure (Neufeld, et al., 2024).

Financial instability continues to be a major source of stress, particularly for students who must manage living expenditures, tuition, and material prices. One of the main causes of high stress levels is financial problems. Students who juggle part-time employment with their education often report feeling more emotionally spent and less productive academically. While financial management autonomy promotes independence, it may also psychologically strain pupils who aren't ready for budgeting responsibility (Teuber et al., 2024).

The cognitive and behavioural techniques people use to deal with stressful internal and external pressures are referred to as coping strategies. Coping strategies may have a big impact on college students' academic achievement, emotional control, and general psychological well-being. These tactics are often divided into three categories: avoidance-based, emotion-focused,

and problem-focused (Hamaideh, et al., 2024).

Distancing oneself from the stressor or downplaying its importance are two aspects of avoidance-based coping. This covers actions like drug abuse, procrastination, excessive use of digital media, and oversleeping. Although these tactics could provide some emotional respite, they often worsen academic stress over time by postponing important tasks or increasing academic obligations (Alwhaibi, et al., 2023).

Taking proactive measures to reduce or eliminate stressors is a key component of problem-focused coping. Time management and structured academic planning are crucial for proving their beneficial effects on students' academic results and personal growth. These strategies are usually proactive and goal-oriented, such as planning study schedules, dividing big tasks into smaller goals, and actively seeking academic or peer support (Mushtaq, et al., 2024).

Significance of the study:

Educational stress among nursing students is a recognized global phenomenon, with international studies revealing that (40% to 85%) of student's experience moderate-to-high levels of stress. Middle East & Africa, in Egypt, studies reported that up to (69.5 %) of nursing students

suffer from significant academic stress, closely tied to feelings of inadequate clinical preparation and tutor support. Similarly, research in Ethiopia indicates a stress prevalence of (58.4 %) during clinical rotations, while (65.1 %) of Saudi Arabian nursing students reported symptoms of depression. Studies in Italy show that (46.6 %) of nursing students exhibit moderate-to-severe anxiety and over (71 %) reported depressive symptoms. Asia, research in Vietnam notes that nearly half of nursing students experienced pathological stress, primarily driven by financial concerns alongside heavy clinical and educational demands. Similar moderate-to-high stress trends are observed in Malaysia and China (Ngoc & Tuan 2024).

Aim of the study

1. Assess stress level among university students
2. Assess factors contributing to stress among university students
3. Determine coping strategies of stress

Research Questions

- 1-What is the level of stress among university students?
- 2-What are factors contributing to stress among university students?

Subjects and Method

The subjects and methods for this study were portrayed under the following four main items:

I. Technical design.

II. Operational design.

III. Administrative design.

IV. Statistical design.

I. Technical Design:

Includes research design, setting of the study, subjects of the study, and tools for data collection.

A. Research design:

A descriptive research design was used to utilize this study.

B. Setting:

The study was conducted at the Faculty of Nursing, Fayoum University at Kaman Fares next to vocational training. The fourth faculty students were selected as it includes the Community Nursing Department, which provides educational and practical training for undergraduate nursing students, particularly those engaged in community-based learning activities.

Subjects of the study:

Sample Size

Fourth-year students were 400 students divided into two departments, 200 students enrolled in the psychiatry and mental health nursing department and 200 fourth-year students enrolled in the Community Nursing Department. The study sample consisted of 200 fourth-year students enrolled in the Community Nursing Department at the Faculty of Nursing, Fayoum University.

Subjects:

A purposive sample of 200 fourth-year community nursing students was selected from the study setting according to specific inclusion and exclusion criteria.

Tools for data collection:

Three tools were used for data collection in this study after an extensive review of the relevant literature.

Tool I: Structured Interviewing Questionnaire. A structured interview questionnaire was developed by the researcher based on a review of pertinent literature. It was used to collect data related to the socio-demographic characteristics of the studied students. This tool included the following items: gender, age, duration of clinical areas, support received from, household income, previous working experience in nursing care, father's education, father's occupation, mother's education and mother's occupation.

Tool II: Perceived Stress Scale (PSS). The perceived stress scale was developed by Cohen et al. It is a 10-item scale designed to measure the degree to which individuals perceive their lives as stressful during the previous month. Each item is rated on a 5-point Likert Scale ranging from:

0 = Never.

1 = Almost never.

2 = Sometimes.

3 = Fairly often.

4 = Very often.

The total PSS score was calculated by reversing the scores of the positively stated items, then summing the responses for all 10 items. The total score ranged from 0 to 40, where higher scores indicate lower perceived levels of stress. Low perceived stress (0-13 point) Moderate perceived stress (14-26 point) High perceived stress (27-40 point).

Tool III: Academic Coping Strategies Scale (ACSS). The Academic Coping Strategies Scale (ACSS) was developed by Sullivan (2010) to assess coping strategies used by college students when facing academic stressors. The scale was constructed based on an extensive review of literature addressing coping mechanisms and their measurement. Previous studies have focused on the development of the ACSS and examined its preliminary psychometric properties. In the present study, the Three Scales of Academic Coping Strategies were utilized, which consists of 56 statements distributed across three dimensions:

-Approach Coping Strategies (23 items).

Avoidance Coping Strategies (19 items).

- Social Support Coping Strategies (14 items).

-Following a specific academic stressor prompt, students were asked to report how frequently they used each coping strategy. Responses were rated on a 5-point Likert Scale as follows:

1 = Never.

2 = Hardly ever.

3 = Sometimes.

4 = Often.

5 = Almost always.

Each item represents a specific behavioral or cognitive coping strategy used in response to academic stress. Total Score for ACSS The total ACSS score was calculated by summing the responses for all 56 items. The total score ranged from 56 to 280, where higher scores indicate greater use of coping strategies in response to academic stress. Scores can be categorized as follows: Low coping strategies (56–130 points) Moderate coping strategies (131–205 points) High coping strategies (206–280 points).

II. Operational Design:

The operational design included the following components: a preparatory phase, content validity and reliability, a pilot study, ethical considerations, and fieldwork.

a) The preparatory phase:

This phase began before tool development and involved reviewing

current national and international literature (books, journals, online resources) related to the study topic to gain a comprehensive understanding of the research problem and guide tool construction.

b) Pilot study:

A pilot study was conducted on 10% of the total sample (about 20 students) of the study subjects to test applicability, feasibility, practicality of the tools and then the necessary modifications will be done according to the results of pilot study. the pilot study will be included in the results.

c) Content validity:

A team of experts made up of three community health nursing professors revised the instruments in order to assess their content validity and make the required adjustments.

d) Content reliability:

To ascertain how the questionnaire items connected to one another, the tools' reliability was examined.

Alpha Cronbach Reliability Analysis of the Used Tool

Items	Cronbach's Alpha	N of Items
Perceived Stress	0.804	10
Academic Coping Strategies	0.864	56

e) Fieldwork:

The participant and the investigator sat down throughout the interview. Before beginning any data collection,

the researcher introduced himself to the subjects. Each participant was then given a clear explanation of the study's purpose, and before moving on, their formal consent was acquired.

Participants completed the questionnaire sheet throughout the procedure, and the investigator completed the structured interviewing questionnaire sheet for each research subject on an individual basis. On the other hand, some senior citizens choose to complete the survey independently. Beginning at the beginning of February 2025 and ending at the end of June 2025, data gathering took place throughout a five-month period. It took each participant 15 to 20 minutes to finish. During the five months of data collection, the investigator visited four to five individuals every day, twice a week, on Sunday and Tuesday between 9:00 am and 1:00 pm .

At every point, the gathered information's confidentiality was guaranteed. The participants were made aware of their choice to take part in the research or not. Additionally, they were guaranteed anonymity and freedom to leave at any moment. Lastly, participants were told that the information gathered would only be used for the study's objectives.

III. Administrative Design:

The dean of Fayoum University's nursing department granted permission to carry out the research.

Ethical considerations:

The Fayoum University Supreme Committee for Scientific Research Ethics' Faculty of Nursing will formally grant authorisation to carry out the planned research. Before giving the informed permission, participants were fully told about the research and their role, and participation in the survey is entirely optional. Explaining the goal and nature of the research, offering the option to withdraw at any time, and maintaining the security of the data so that no other party could access it without the participants' consent were all ethical issues. There shall be respect for ethics, values, culture, and beliefs.

IV. Statistical Design:

The information was gathered, coded, and input onto a personal computer. The statistical package for social science (SPSS) version 20 application was used to analyse it. Descriptive statistics were used to provide data in the form of frequencies and percentages; quantitative variables were described as mean and standard deviation; qualitative variables were described as numbers and percentages; and qualitative variables were compared

using the Chi-square test. Two variables may be ranked using the Spearman correlation coefficient. The linear connection between two sets of data was shown using Monte Carlo simulation and Pearson product moment correlation (PPMC), with >0.05 non-significant $<0.05^*$ significant $<0.001^{**}$ High significant.

Results

Table (1): Shows the distribution of the studied nursing students according to their personal characteristics. The findings indicate that the majority of students were males (78.0%). Nearly half of the students were aged 20–21 years (48.5%). Regarding the duration of clinical areas, the highest percentage of students had 6 weeks of training (29.0%). Concerning sources of support, student colleagues (22.0%) were the most frequently reported sources. More than half of the students reported insufficient household income (54.5%), and 56.0% of them had previous working experience in nursing care.

Regarding parents' education, the highest percentage of fathers had secondary education (37.5%). Similarly, the highest percentage of mothers had secondary education (34.0%). Concerning parents' occupation, skilled worker was the most common occupation among

fathers (41.0%), while the majority of mothers were housewives (34.0%), followed closely by those in professional occupations (24.0%).

Table (2): The results show that the highest percentage in the never category was reported for (how often have you been upset because of something that happened unexpectedly?) (16.5%). Regarding the almost never category, the highest proportion was observed in feeling that things were going your way (26.0%).

In sometimes category, the highest percentage was reported for feeling unable to control important things in life (41.0%). As for the fairly often category, the highest proportion was observed in how often have you been upset because of something that happened unexpectedly? (19.5%).

Finally, the highest percentage in the very often category was reported feeling nervous and stressed and feeling confident about the ability to handle personal problems, each accounting for 10.0%.

Figure (1): Shows the total perceived stress level among the studied nursing students. The findings indicate that the majority of students (62%) had a moderate level of perceived stress. This was followed by students with a high stress level (24%), while the lowest proportion

(14%) had a low level of perceived stress.

Table (3): Shows that approach coping ranked first among the coping strategies dimensions, with a mean score of 72.35 ± 10.21 , indicating that students tend to actively deal with stressors and attempt to solve problems directly.

This was followed by social support coping, which ranked second with a mean score of 45.92 ± 7.84 , reflecting the tendency of students to seek help and support from others when facing stressful situations.

Meanwhile, avoidance coping ranked third, with a mean score of 48.63 ± 8.15 , suggesting that avoidance strategies were used less frequently compared to approach and social support coping methods.

Regarding the overall coping score, the total mean score was 166.90 ± 15.75 , indicating a generally moderate to high level of coping strategies among the studied nursing students.

Table (4): Shows that there was a highly statistically significant correlation between overall coping strategies and perceived stress level among the studied nursing students.

Table (1): Distribution of the studied nursing students according to their personal characteristics (n=200)

Characteristics	No.	%
1-Gender		
Male	156	78%
Female	44	22 %
2-Age (Years)		
18 – 19	27	13.5
19 – 20	57	28.5%
20 – 21	97	48.5 %
≥ 21	19	9.5%
3-Duration of clinical areas		
4 weeks	43	21.5%
6 weeks	58	29%
8 weeks	53	26.5%
≥ 8 weeks	46	23%
4-Support received from		
Teacher	39	19.5%
Supervising nurse	42	21%
Student colleague	44	22%
Other person	24	12%
No one	51	25.5%
5-Household income		
Sufficient	91	45.5%
In sufficient	109	54.5%
6-Previous working experience in nursing care		
Yes	112	65%
No	88	44%
7-Father's education		
Illiterate	8	4.0
Read and write	14	7.0
Primary education	38	19.0
Secondary education	75	37.5
University education	65	32.5
8-Father's occupation		
Professional	58	29.0
Skilled worker	82	41.0
Unskilled worker	45	22.5
Retired	8	4.0
Not working	7	3.5
9-Mother's education		
Illiterate	12	6.0
Read and write	18	9.0
Primary education	42	21.0
Secondary education	68	34.0
University education	60	30.0
10-Mother's occupation		
Housewife	68	34.0
Professional	48	24.0
Skilled worker	42	21.0
Unskilled worker	42	21.0

Table (2): Percentage distribution of the studied nursing students' stressful thoughts related to various life situations within the last month (n=200)

Items	Never (0)		Almost never (1)		Sometimes (2)		Fairly often (3)		Very often (4)	
	No.	%	No.	%	No.	%	No.	%	No.	%
1- How often have you been upset because of something that happened unexpectedly?	33	16.5	38	19.0	71	35.5	42	21.0	16	8.0
2- How often have you felt that you were unable to control the important things in your life?	27	13.5	41	20.5	82	41.0	36	18.0	14	7.0
3- How often have you felt nervous and “stressed”?	22	11.0	47	23.5	78	39.0	33	16.5	20	10.0
4- How often have you felt confident about your ability to handle your personal problems?	26	13.0	49	24.5	74	37.0	31	15.5	20	10.0
5- How often have you felt that things were going your way?	29	14.5	52	26.0	69	34.5	37	18.5	13	6.5
6-How often have you found that you could not cope with all the things that you had to do?	31	15.5	45	22.5	76	38.0	34	17.0	14	7.0
7-How often have you been able to control irritations in your life?	28	14.0	51	25.5	72	36.0	35	17.5	14	7.0
8-How often have you felt that you were on top of things?	32	16.0	44	22.0	73	36.5	38	19.0	13	6.5
9-How often have you been angered because of things that were outside of your control?	30	15.0	46	23.0	75	37.5	36	18.0	13	6.5
10-How often have you felt difficulties piled up so high that you could not overcome them?	25	12.5	43	21.5	79	39.5	39	19.5	14	7.0

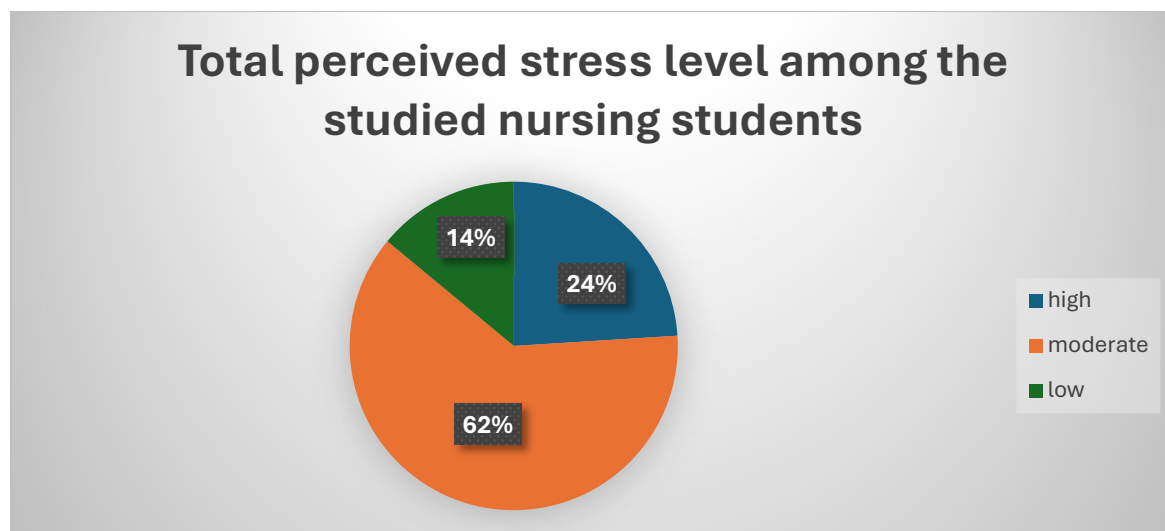


Figure (1): Total perceived stress level among the studied nursing students (n=200)

Table (3): Mean scores and ranking of studied nursing students' coping strategies dimensions (n=200)

Power dimensions	Bases No of items	Min – Max	Mean±SD	Ranking
Approach Coping	23	115-23	72.35 ± 10.21	1
Avoidance Coping	19	19-95	48.63 ± 8.15	3
Social Support Coping	14	14-70	45.92 ± 7.84	2
Overall Coping Score	56	56 – 279	166.90 ± 15.75	

Table (4): Correlation between overall coping strategies and perceived stress level among studied nursing students

		Overall Coping Strategies
Perceived Stress Level	R	0.612
	P	0.000**

Discussion

Stress is one of the topics that receives a lot of attention these days. Even if it doesn't result in major health issues, it may have an impact on people's physical and emotional well-being. Young folks usually start their higher education at the undergraduate stage while going through psychological upheavals. Academic stress is one of the main pressures that young people face during this time. Students in Chinese communities, who face more academic stress than students in Western countries due to increased competitiveness, larger study loads, and higher parental expectations, may be particularly concerned about this kind of stress (**Chyu & Chen, 2024**).

In terms of the distribution of the nursing students under investigation based on their personal characteristics, the current research revealed that over half of the students were between the ages of 20 and 21, and the majority of students were male. In terms of clinical area length, the largest proportion of students received instruction for six weeks. Student coworkers were the most often mentioned source of assistance. Over 50% of the pupils said their home income was inadequate .

According to **Rehman and Shah's (2023)** study, "Level of academic stress and its influence on the

academic achievements of students at Mirpur University of Science and Technology, Pakistan," male enrolment in nursing programs has significantly increased in Middle Eastern countries due to cultural and workforce demands. The study also found that the majority of nursing students fall within early adulthood, reflecting standard academic progression.

According to **Mohamed et al. (2025)**, who focused on clinical and academic stress in their research comparing male and female nursing students. Short-term clinical rotations (4–8 weeks) are frequently used in undergraduate nursing curricula, according to Salud, Science Technology, Saudi Arabian. Peer support is crucial for lowering stress and improving learning among nursing students, and financial constraints are common among them and may have a detrimental impact on their academic performance. This outcome can be the consequence of men needing to work more to pay for necessities.

According to the findings, the largest number of people in the never group said they were disturbed because of an unforeseen event. Feeling like things were going your way accounted for the largest percentage in the virtually never group. The greatest number of

people in the sometimes group said they felt powerless over significant aspects of their lives.

This outcome is consistent with the findings of **Sailo and Varghese's (2025)** research, Academic Stress, Its Sources, Effects, and Coping Mechanisms among College Students, College of Nursing, Bengaluru, Karnataka, India. International Journal of Science and Healthcare Research) found that people frequently experienced moderate to high levels of perceived stress, with many participants reporting frequent feelings of anxiety and difficulty controlling life events. It also showed that people frequently experience stress intermittently ("sometimes"), especially in relation to unpredictability and lack of control, which is consistent with the current result showing the highest percentage in the "sometimes" category for inability to control important things.

This outcome can be the consequence of students' unstable emotions, how they respond to stress, and how they adjust to it.

In terms of the coping strategies dimension of nursing students, the current study revealed that approach coping ranked highest among the coping strategies dimensions, indicating that students typically

actively deal with stressors and try to solve problems directly. This is followed by social support coping, which reflects students' propensity to ask for assistance and support from others when faced with stressful situations .

Avoidance coping, on the other hand, came in third, indicating that avoidance techniques were used less often than approach and social support coping strategies. The total mean score for the overall coping score showed that the nursing students under study used coping mechanisms at a usually moderate to high level.

This is consistent with the findings of **Alharbi et al. (2026)** study, "Perceived Social Support and Psychological Stress Among Nursing Students," conducted at King Saud University's College of Nursing. They found that nursing students primarily use problem-focused (approach) coping strategies, like planning and active problem-solving, especially in clinical training environments. They also found that social support coping was the second most used strategy among nursing students, underscoring the significance of peer and family support in managing academic and clinical stress.

Additionally, in their study titled "Stressors and mental health in

Chinese medical students: the mediating roles of positive and negative affect and moderating role of positive coping, China," **Lin and Zhen (2026)** showed that avoidance coping strategies were much less common and had a negative correlation with both academic performance and psychological well-being. This suggests that students are more likely to use adaptive coping mechanisms. The overall coping score was found to be moderate to high. Additionally, owing to recurrent exposure to clinical stresses and training, nursing students often display moderate to high coping ability, according to research by **Saleeby et al. (2025)** titled "Cultural Differences in Coping Among High School Students, Japan".

According to researchers, this might be because men and women have different coping mechanisms for stress, which are influenced by their life experiences. As individuals get older, their responses also change significantly .

Ultimately, the current research demonstrated a highly statistically significant relationship between the nursing students' reported stress levels and their overall coping mechanisms. This result contradicts the findings of **(Ansari, et al., 2025)**, who explained

in the study titled (Association of stress and emotional well-being in non-medical college students: A systematic review and meta-analysis, pellagic.) that nursing students who are under a lot of clinical and academic pressure naturally increase their reliance on different coping mechanisms to manage the psychological burden. This association implies that the activation of coping behaviours is primarily triggered by stress .

Similar to this, **Tsukuda et al. (2026)** found in their study (Clinical Nurses' Attitudes and Self-Reported Practices of Family Nursing in Japan Following COVID-19 Visitation Restrictions: A Cross-Sectional Study, Japan) that students switch from low-effort coping to more sophisticated, multifaceted strategies to deal with the demands of the nursing profession as perceived stress levels rise.

Conclusion

According to the study's findings, the majority of students were male, the greatest proportion had six weeks of training, over half of the students reported having a low household income, the highest percentage in the never category reported feeling anxious and stressed, and the highest percentage in the sometimes category reported feeling powerless over

significant aspects of life. The largest percentage for the quite frequent group was found in the question, "How often have you been upset because something unexpected happened?" Feeling anxious and agitated and having confidence in one's capacity to manage personal issues were stated by the largest proportion in the very frequently group. The results show that most pupils felt a considerable amount of stress. Students with high levels of stress came next, while those with low levels of perceived stress made up the smallest percentage.

Recommendations

The following recommendations are made in light of the results of the current study:

For students:

- To assist students, develop a positive perspective on academic stress, the university should encourage them to utilize its counseling services.
- In order to help students attain excellent academic accomplishment in the face of academic stress, lecturers and educators should concentrate on intrinsic motivation.
- Students are urged to utilize more problem-focused coping mechanisms, such asking for help, managing their time, and working with others.

For educational institutions:

- Curriculum Restructuring: To reduce academic stress among medical students.
- Encourage breaks during study, faculty and advisors can suggest time management techniques.
- Incorporating stress management into coursework: Include topics on stress management, resilience, and self-care in the curriculum.
- Encourage self-reflection, provide opportunities for self-reflection on learning, allowing students to assess their strengths and areas of improvement. This promotes a sense of autonomy and control over their education, reducing stress.

Further studies:

- To provide a more complete picture, future research will involve students from different institutions or universities.
- Other variables like social support, study habits, or emotional well-being should be included in future research.
- Longitudinal or mixed-method designs should be used in future studies to assess the efficacy of intervention programs and investigate causal links between stress, coping mechanisms, and academic achievement.

References:

Agiello, P., Caparros-Gonzalez, RA., & Estevez-Lopez, F. (2024).

- School-Based Academic Stress Programs for Adolescents: A systematic review and meta-analysis. *Child Psychiatry Hum Dev*, 55 (1), 1–19. Doi: 10.1007/s10578-024-01667-5.
- Alharbi, B., Majed, M., Aljabri & Endale, A. A. (2026).** Perceived Social Support and Psychological Stress Among Nursing. <https://doi.org/10.1107/s10213-024-00680-x>.
- Ali, K., Syeda, F., Batoo, A., Bibi, A., Zahra, K., Syeda, U., ... & Qamar, H. (2025).** The impact of resilience on academic stress: A comparative study between male and female university students. *International Journal of Social Science*, 3(12), 330-346. Doi: <https://doi.org/10.5281/zenodo.17983620>.
- Alwhaibi, M., Alotaibi, A., & Alsaadi, B. (2023).** Perceived stress among healthcare students and its association with anxiety and depression: A cross-sectional study in Saudi Arabia. *Healthcare*, 11,1625. <https://doi.org/10.3390/healthcare11>
- Ansari, S., Khan, I., & Iqbal, N., (2025).** Association of stress and emotional well-being in non-medical college students: A systematic review and meta-analysis. *Affect Disord*, 368, 200–23. <https://doi.org/10.1016/j.jad.2024.09.029>.
- Barman, D., Dkhar, N., Mukhim, S., Kyndiah, M., & Kharbhih, P. (2023).** A study on understanding academic stress and coping strategy amongst college students in Shillong, Meghalaya. *Int J Indian Psychol*, 11(4), 1–7. Doi: 10.25215/1104.001.
- Chen, H., Guo, H., Chen, H., Cao, X., Liu, J., Chen, X., ... & Zhou, J. (2023).** Influence of academic stress and school bullying on self-harm behaviors among Chinese middle school students: The mediation effect of depression and anxiety. *Frontiers in Public Health*, 10, 1049051.
- Dunn, L. B., Iglewicz, A., Moutier, C., & Rubin, D. T. (2024).** Implementing the systematic assessment for resilience (SAR) framework to reduce academic stress and burnout among medical students. *BMC Medical Education*, 24(1), 1-9. <https://doi.org/10.1186/s12909-024-05444-9>.
- Hamaideh, S., Abuhammad, S., Khait, A., Al-Modallal, H., Hamdan-Mansour, A., ... & Masa'deh, R. (2024).** Levels and predictors of empathy, self-

- awareness, and perceived stress among nursing students: A cross-sectional study. *BMC Nurs*, 23,131. <https://doi.org/10.1186/s12912-024-01774-7>.
- Kiltz, L., Trippenree, M., Fleer, J., Fokkens-Bruinsma, M., & Jansen, EPWA. (2024)** Student well-being in times of COVID-19 in the Netherlands: Basic psychological need satisfaction and frustration within the academic learning environment. *Eur J Psychol Educ*, 39(1), 319–339. <https://doi.org/10.1007/s10212-023-00680-x>.
- Lin, H., & Zhen, Z. (2026).** Stressors and mental health in Chinese Ma, C. (2023). The academic stress and subjective well-being of graduate nursing students: The mediating role of resilience. *Journal of Advanced Nursing*, 79(7), 2654-2663.
- Mohamed, A., Ali, S., Elkhider Ehrahim, E., Ahmed Eltayeb, M., Al-Sabeely, A., Mohamed Kamel, A. (2025).** Comparative study between male and female nursing students regarding clinical and academic stress. *Salud, Cienciay Tecnología*, 5, 1462. <https://doi.org/10.56294/saludcyt20251462>.
- Mushtaq, O., Soh, M., Dong, T., Durning, SJ., Melton, J., & McCants, KM. (2024)** Perceived stress among graduate students in health sciences at a military university: A mixed-method approach. *BMC Med Educ*, 24,1343. <https://doi.org/10.1186/s12909-024-06326-w>.
- Neufeld-Kroszynski, G., Michael, K., & Karnieli-Miller, O. (2024).** Associations between medical students' stress, academic burnout and moral courage efficacy. *BMC Psychology*, 12(1), Article 296. <https://doi.org/10.1186/s40359-024-01787-6>.
- Ngoc, N., & Tuan, V. (2024).** Stress among nursing students in Vietnam: *Prevalence and Associated Factors Mar*, 71(1), 28-34.
- Rehman, M., & Shah, S. (2023).** Level of academic stress and its influence on the academic achievements of students at Mirpur University of Science and Technology. *Sir Syed Journal of Education & Social Research*, 6(1), 169–175.
- Sailo, H., & Varghese, D. (2024).** Academic stress: Its sources, effects and coping mechanisms among college students. *International Journal of Science and Healthcare Research*, 9(03), 124-132.
- Saleeby, S., Geoffrey, R., & Allen, A., (2025).** Cultural differences in

coping among high school students.
Veritas Villanova Research Journal,
7(1),160-169. DOI:10.61372/vvrj.
v7i1.3149.

Tsukuda, M., Junko, H., Keisuke, N., Yoshiyasu, I., & Hiromi, A., (2026). Clinical nurses' attitudes and self-reported practices of family nursing in Japan following COVID-19 Visitation Restrictions: A Cross-sectional study. *Journal of Clinical Nursing*, 35, 1598–1608. <https://doi.org/10.1111/jocn.70181>.

Awareness of Nursing Students regarding the Applications of Artificial Intelligence in Nursing

Fatma Mohammed Rashed Donia^{1,2}, Ikbal Fathala Elshafie³, Entisar Abo Elghite Elhossiny Elkazeh⁴, Hend Reda Ali Alkest⁵

¹Nursing Specialist at Tanta General Hospital, Egypt.

²Master Student of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.

^{3,4}Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.

⁵Assistant Professor of Community Health Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Fatma Mohammed Rashed Donia

Email: fdonia319@gmail.com

Abstract

Background: Nursing students need adequate awareness and positive attitudes toward AI to effectively adapt to modern healthcare technology. **Aim:** To assess awareness among nursing students regarding the applications of AI in nursing. **Design:** Descriptive cross-sectional study design was used. **Setting:** The study was conducted at Faculty of Nursing, Tanta University. **Subjects:** A stratified random sample technique of 800 students from each stratum (2nd, 3rd, 4th academic levels) were included in the study. **Study tool:** Data was collected using one tool. **Tool:** Awareness of nursing students regarding the applications of AI in nursing it included three parts: Part (1): Socio-demographic characteristics of the students, Part (2): Students' knowledge regarding AI and its applications in nursing, and Part (3): Attitudes of nursing students. **Results:** Less than half (47.1%) of the studied nursing students had a high level of knowledge about AI. In addition, 72.2% of the studied students had a positive attitude toward the applications of AI. There was a statistically significant positive correlation between age of the studied students, parents' education and occupation, family type, their total knowledge, and attitudes scores. **Conclusion:** There was no statistically significant association between knowledge and attitudes levels regarding AI. **Recommendations:** Incorporating AI-related content in undergraduate nursing curricula to improve students' awareness and readiness for future healthcare system.

Keywords: Applications, Artificial Intelligence, Attitude, Awareness, Nursing students.

Introduction

Nursing as a health profession has sought to respond to new technology to develop better skills to provide quality nursing care based on the best scientific knowledge available. AI has significant importance to nursing education, research and practice. AI help nursing students practice clinical scenarios and critical thinking skills in a safe environment and prepare them to work with clinical decision-support tools (Fernandes, Santos, Sa, & Neves, 2023; Hamad, El-Ashry, Ibrahim, & Hassan, 2025; Nashwan et al., 2025).

The Egyptian government established the National Council for AI in November 2019, which is responsible for setting regulations for this sector and contributing to the development of appropriate legislation (AL-Faraj et al., 2024; Ministry of Communications and Information Technology (MCIT), 2021). Generative AI has demonstrated its` potential across various domains of higher education, encompassing content generation, tutoring, formative assessment, and online learning. Researchers use AI in several aspects of academic writing, doing literature reviews, analyzing data, and even producing initial drafts (Park, Kim,

& Han, 2025; Sajja, Sermet, Cikmaz, Cwiertny, & Demir, 2024). Applications of AI in healthcare aren't limited to Electronic Health Records (EHRs) and medication administration but also, AI Generated powered devices and sensors, Chat GPT and Google's Gemini which are large language models. It is also used in robots, drug dispensing and bots for special needs (Bhambri, & Khang, 2024; Luo, Mao, Wu, & He, 2024). However, a number of significant barriers to AI integration into nursing are found including, a limited understanding of AI, lack of standardization in AI usage and fear of AI technology (Pailaha, 2023; Yasin, Al-Hama, Metersky, & Kehyayan, 2024). Community health nurses must always ensure that AI technology is used in a way that respects the rights of individuals, enhances trust in the health systems, and nsuring that patient data is appropriately used (Kan, 2024).

Significance of the study:

Artificial intelligence systems used in Egypt's healthcare sector would continue to learn and improve using new data and adapt their algorithms to improve accuracy and performance over time. This would ensure that healthcare practices stay updated

with the latest medical knowledge (El Hadi, 2022).

Nurses should develop a clear understanding of how the data they generate and utilize interact with AI systems. Nursing education programs are encouraged to establish dedicated committees or working groups to integrate AI-related competencies into undergraduate nursing curricula. In clinical settings, nurses should receive ongoing training tailored to the AI applications implemented in their practice environments. Additionally, healthcare and nursing stakeholders should foster organizational frameworks that support continuous dialogue regarding the ethical, professional, and practical implications of AI in nursing. Future nursing research should further explore the profession's role in the design, development, and effective implementation of AI technologies. Nursing leaders are also responsible for encouraging positive attitudes toward AI literacy and promoting continuous learning among nurses regarding emerging AI tools and applications. (Ronquillo et al., 2021).

Aim of the Study

The study aimed to assess awareness of nursing students regarding the applications of AI in nursing.

Research Questions:

- 1- What is the nursing students' level of knowledge regarding the applications of AI in nursing?
- 2- What are the attitudes of nursing students' regarding the applications of AI in nursing?
- 3- What is the relation between knowledge and attitudes of nursing students regarding the applications of AI in nursing?

Subjects and Method

Study design:

A descriptive cross sectional study design was used to conduct this study.

Setting:

This study was conducted at the Faculty of Nursing, Tanta University.

Subjects:

The sample was 800 nursing students selected from the 2nd, 3rd, and 4th academic levels at Faculty of Nursing, Tanta University. The total number of the students at the previous levels was 3181 students (Males & females) at the academic year 2024-2025. The sample was selected by proportionate stratified random sample technique to select 25% of students from each stratum.

Tool of the study:

One tool was employed by the researcher to gather the necessary data for the current study based on recent literature review (Allam et al., 2023;

Hussein, Abed El-Rahman, Farouk, & Hessien, 2023; Ogolodom et al., 2023; Schepman, & Rodyway, 2020).

Tool: Awareness of nursing students regarding Artificial intelligence and its' applications in nursing: It included three parts:

Part (1): Socio-demographic characteristics of the nursing students: It included data about: age, sex, place of residence, academic year, birth order, type of family, number of family members, rooms number, education of parents, occupation of parents, and family income.

Part (2): Students' knowledge regarding AI and its applications in nursing: This part was assessed using a questionnaire adapted from (Allam et al., 2023; Hussein et al., 2023; Ogolodom et al., 2023) to assess the students' knowledge regarding AI. It included 13 questions related to AI as following: definition, elements (AI workflow), determinants, types, components, importance, advantages, disadvantages, the obstacles, applications in nursing practice, education, and research, domains of AI contributions in nursing, and assessment of source of knowledge.

The scoring system:

Students' responses to each question were checked with model answer

based on literature review. Correct response received score (1), while incorrect and don't know received score zero (0). These scores were summed and the total score converted into a percentage and categorized as follows:

- High level of knowledge > 70% from the total score.
- Moderate level of knowledge 60%-70% of the total score.
- Low level of knowledge < 60% of the total score.

Part (3): Attitudes of nursing students regarding AI and its applications in nursing: This part was adapted from Schepman, and Rodyway (2020) to assess levels of attitudes of nursing students regarding AI and its applications in nursing. It used 24 statements through a five - point Likert Scale.

Scoring system:

- For positive statements, responses were assigned scores on a five-point Likert scale as follows: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1), while scores of negative statements were inversed as follows: Strongly Agree (1), Agree (2), Neutral (3), Disagree (4), and Strongly Disagree (5).

The scores were summed and classified as follows:

- Negative attitude < 60% of the total value.
- Positive attitude $\geq$ 60% of the total value.

Method

1- Obtaining approval:

- An official letter to conduct the study was obtained from the Dean of the Faculty of Nursing – Tanta University and directed to the chairpersons of departments of each academic level.
- The chairpersons of departments of each academic level were informed about the objective of the study to take their permission to collect the data from the students.

2-Ethical considerations:

- Approval of the Scientific Research Ethical Committee of the Faculty of Nursing in Tanta University was obtained with **code No (457-5-2024)**.
- An informed consent was secured from all participants prior to data collection after providing appropriate clarification concerning the study aim.
- Every participant was notified that he or she was able to discontinue participation in the study at any time he or she wanted.
- All sheets were anonymous.
- The study was designed in a way that ensured no harm or pain was caused to any participant.

- Data confidentiality was maintained at all stages of the research for participants.

3- Development of the data collection tool: The tool (part 1) was designed by the researcher based on reviewing related literatures. Part 2 & 3 were adapted and converted into the Arabic language by the researcher.

4-The tool was assessed for face and content validity by jury of five professors' expertise in the field of Community Health Nursing, Faculty of Nursing, Tanta University before conducting the study. Modifications were done according to opinions of jury committee.

5. Pilot study

A pilot study was carried out by the researcher on 10% of 800 of studied subjects for examining the tool clarity, applicability and identifying the obstacles that may experience by the researcher during the period of collecting data. This sample was added to the study as there were no major changes.

6. Reliability of the study tool

Cronbach's Alpha test was used, and it was found to be (0.889) for all the study tool (0.897) for knowledge and (0.741) for attitudes.

7. The main study

- The researcher met with students at Faculty of Nursing, Tanta University at suitable or free time for both researcher and students and explained the aim of the study at the beginning of the interview.
- The questionnaire sheet was administered to students in small groups (7-10 students) to fill it in the waiting area during students break in between lectures. The researcher was available to students at that time to clarify any question.
- The data was collected by the researcher over a period of three months starting from the first of October to the end of December 2024 through the first term.
- The average time required to fill in a questionnaire sheet by the nursing students extended from 20-25 minutes. The researcher met the nursing students two days a week.
- The number of filled sheets per day ranged between 30-40 sheets. After the students filled the sheet, the researcher ensured that all questions were answered and asked the students to fill any missed questions.

8. Statistical data analysis:

Data was coded, organized, and analyzed using SPSS version 23. Descriptive statistics (mean, standard deviation, and range) were used for

quantitative data, while categorical variables were presented as frequencies and percentages. The chi-square test (χ^2) was used to assess differences between categorical variables.

When the chi-square test was not applicable, Fissure Exact test (FE) was employed. Pearson's correlation coefficient (r) was used to examine the correlation between variables. Statistical significance was set at $p < 0.05$, whereas high statistical significance was set at $p < 0.01$.

Results

Table (1): Distribution of nursing students based on their socio-demographic characteristics.

It illustrates that the students' age was from 20 - 24 years with a Mean $\pm$ SD 20.98 ± 0.96 years. More than three quarters (76.9%) of them their age ranged from 20 to less than 22 years. Regarding the studied participants academic year, 35%, 32.5% & 32.5% were at the second, third, and fourth academic years respectively. Concerning the parents' education & occupation, nearly one third (35.0%) of the mothers of the studied students had secondary education and more than half (55.0%) of them were housewives. While 41% & 42.2% of their fathers had secondary education and were employees respectively, and

more than half (52.1%) of the students had enough family income.

Table (2): Distribution of the studied nursing students according to their knowledge about applications of AI in nursing field.

It reveals that 80.9% of the studied students reported vital signs monitoring as the applications of AI in nursing practice, while 72.1% of them selected the answer that it provides educational programs customized for each student according to his abilities as an application of AI in nursing education and 76.6% of them reported analysis of texts and scientific articles as an application of AI in nursing research.

Table (3): Distribution of the nursing students based on their knowledge about applications of AI in healthcare.

It reveals that 77.6% & 67.1% said medical diagnosis and treatment planning are AI applications in healthcare respectively.

Table (4): Mean and standard deviation of the total score of knowledge of the studied nursing students about AI.

It presents the total mean knowledge score (55.78 ± 19.86) with a range of 11-86 points. Higher mean scores were recorded in areas as AI contribution in healthcare (6.46 ± 3.19), advantages

of AI in nursing (6.14 ± 2.77), AI applications in research (5.35 ± 2.37), while lower mean scores were found in questions as definition of AI (2.08 ± 0.90), and components of AI (2.06 ± 1.21).

Figure (1): The distribution of the nursing students based on their total knowledge levels about AI.

It reveals that nearly half (47.1%) of the nursing students possessed a high level of knowledge about AI. Meanwhile, 32.5% showed a low level of knowledge and 20.4% had a moderate knowledge level about AI.

Figure (2): The nursing students distribution based on their attitude levels regarding AI and its' applications in nursing.

It reveals that the majority (72.2%) of the studied nursing students had a positive attitude toward the applications of AI, while 27.8% had a negative attitude. The mean score of their attitudes score was 86.05 ± 8.63 .

Table (5): The correlation of age, score of total knowledge and score of total attitudes of the studied students toward AI.

It shows that there was a highly statistically significant positive correlation between age of the students and their total score of knowledge as ($P= 0.002$). While there was a

statistically significant positive correlation between age of the students and their attitude score as ($P= 0.015$). Meanwhile, there was no statistically correlation between total knowledge scores and total attitudes scores.

Table (1): Distribution of the studied nursing students according to their socio- demographic characteristics

Socio -demographic characteristics	The studied nursing students (n=800)	
	No	%
Age/years		
-20-	615	76.9
-22-	182	22.7
-Range	20 – 24	
-Mean ± SD	20.980 ± 0.964	
Academic year		
-Second grade	280	35.0
-Third grade	260	32.5
-Fourth grade	260	32.5
Mothers` education		
-Illiterate or read and write	69	8.6
-Elementary education	197	24.6
-Secondary education	328	41.0
-University and post university education	206	25.8
Mothers` occupation		
-House wife	440	55.0
-Employee	360	45.0
Fathers` education		
-Illiterate or read and write	69	8.6
-Elementary education	197	24.6
-Secondary education	328	41.0
-University and post university education	206	25.8
Fathers` occupation		
-Professional	88	11.0
-Technical work	109	13.6
-Employees	338	42.2
-Farmers	135	16.9
-Private work	130	16.3
Monthly income		
-Enough	417	52.1
-Enough and save	193	24.1
-Not Enough	190	23.8

Table (2): Distribution of the studied nursing students according to their knowledge about applications of AI in nursing field

Knowledge of the studied nursing students about AI	The studied nursing students (n=800)	
	No	%
#Applications of AI in nursing practice		
-Vital signs monitoring systems such as the monitor	647	80.9
-Health care monitoring systems provided within hospitals	586	73.3
-Diagnosis and prediction of diseases	437	54.6
-Task management systems and schedule organization	455	56.9
-Assistive robots	484	60.5
-Forecasting health needs	391	48.9
-Mental health support	421	52.6
-Drug management	429	53.6
-Don't know	17	2.1
#Applications of AI in education		
-Providing study plans	575	71.9
-Provides educational programs customized for each student according to his abilities	577	72.1
-Development of self-education	558	69.8
-Provide immediate responses to scientific questions	459	57.4
-Provide many educational resources immediately in the form of texts - videos - illustrative images	536	67.0
-Providing interactive applications such as health applications and	569	71.1
-Don't know	45	5.6
#Applications of AI in research		
-Analysis of texts and scientific articles	613	76.6
-Classification of scientific texts by research topic	563	70.4
-Assists researchers in writing scientific references	577	72.1
-Allows translation from and to different languages	567	70.9
-Save time and effort for researchers in collecting data Large	588	73.5
-Providing research and scientific theses to researchers	575	71.9
-Big Data Analysis	381	47.6
-Predicting clinical research developments such as predicting the results of clinical trials	415	51.9
-Don't know	11	1.4

More than one answer was chosen

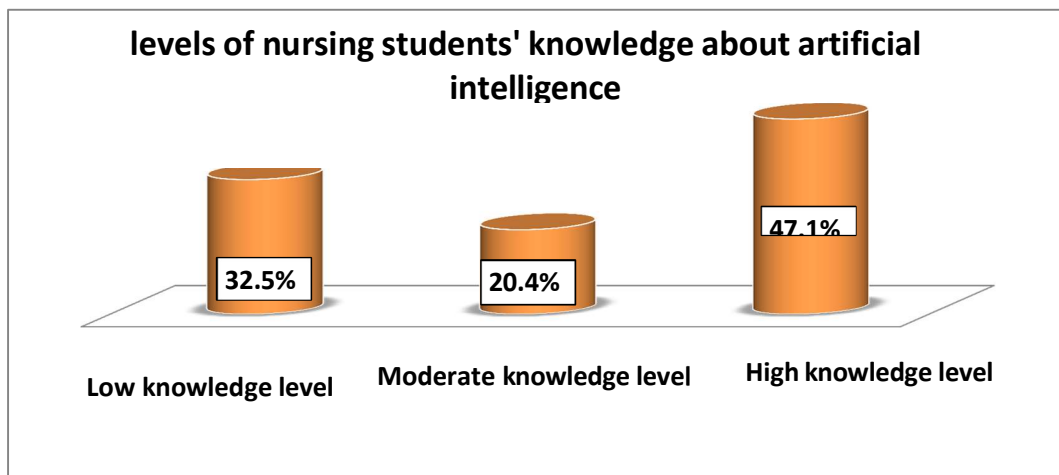
Table (3): The studied nursing students distribution based on their knowledge about applications of AI in health care

Knowledge of the studied nursing students about AI	The studied nursing students (n=800)	
	No	%
#Applications of AI in health care		
-Medical diagnosis	621	77.6
-Treatment planning	537	67.1
-Medical record management	535	66.9
-Epidemic forecasting	334	41.8
-Medical image analysis	457	57.1
-Personalized treatment and recommendations Therapeutic	460	57.5
-Hospital and Healthcare Management	510	63.8
-Preventive medicine	364	45.5
-Clinical decision support	513	64.1
-Drug discovery	379	47.4
-Care for patient with chronic disease	460	57.5
-Don't know	17	2.1

More than one answer was chosen

Table (4): Mean and standard deviation of studied nursing students' knowledge about AI

Knowledge items about artificial intelligence in nursing	The studied nursing students n=(800)	
	Mean $\pm$ SD	Range
-Definition of AI	2.076 $\pm$ 0.895	0 – 3
-Elements (AI workflow)	3.457 $\pm$ 2.034	0 – 6
-Determinants of AI effectiveness and accuracy	5.031 $\pm$ 2.254	0 – 7
-Types of AI that are applied in the field of nursing	2.880 $\pm$ 1.607	0 – 5
-Components of AI	2.061 $\pm$ 1.208	0 – 4
-Importance of AI	3.580 $\pm$ 1.888	0 – 6
-Advantages of AI in nursing	6.137 $\pm$ 2.766	0 – 9
-Disadvantages of AI in nursing	5.305 $\pm$ 2.111	0 – 7
-Obstacles to the development of AI in nursing	4.525 $\pm$ 1.906	0 – 6
-Applications of AI in nursing practice	4.812 $\pm$ 2.331	0 – 8
-Applications of AI in nursing education	4.092 $\pm$ 1.915	0 – 6
-Applications of AI in nursing research	5.346 $\pm$ 2.373	0 – 8
-Domains of AI contribution in health care	6.462 $\pm$ 3.193	0 – 11
-Total knowledge score	55.776 $\pm$ 19.861	11- 86

**Figure (1): Distribution of the studied nursing students according to their total levels of knowledge about AI**

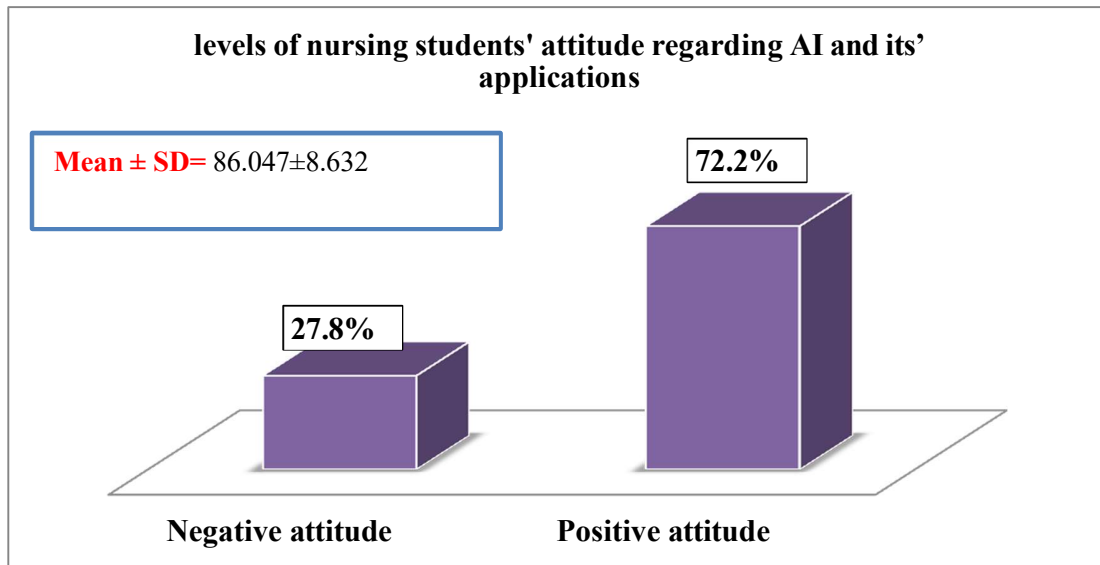


Figure (2): The nursing students distribution based on their attitude levels regarding AI and its' applications in nursing

Table (4): The correlation between age, total score of knowledge and total score of attitude of the studied students toward AI

Variables	Age	Total knowledge score
	R P	R P
-Total knowledge score	0.109 0.002**	-
-Total attitude score	0.086 0.015*	0.028 0.427

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Discussion

In recent years, the integration of AI in healthcare has moved from a theoretical concept to a practical reality influencing how care is delivered, decisions are made, and information is managed. As nursing represents the backbone of healthcare systems, it is directly affected by this shift. Nursing students represent a vital component of education, clinical practice, and research, so assessing their perceptions about AI and readiness to use it is therefore fundamental for identifying educational gaps, designing targeted training programs, and ensuring that future nurses are equipped to work confidently in AI-driven healthcare environments (El Arab et al., 2025; Zamlynskyi, Kalinichenko, Kniazkova, Skrypnyk, & Avriata, 2025). So, the present study aimed to assess the awareness and attitudes of nursing students regarding AI and its applications in nursing.

The current study showed that nearly two thirds of the students had between high to moderate total knowledge levels about AI and only one third of them had low level of knowledge (**Figure 1**). Furthermore, slightly less than three quarters of them had total positive attitudes toward AI (**Figure 2**). This may be explained by unequal

exposure to formal AI education within the curriculum. In addition, the students' age ranged from 20-24 years and distribution across academic years may contribute to differences in their exposure to new technologies. The variations in parents' educational levels and family income might also influence students' access to digital resources, thereby influencing their technological literacy and AI awareness (**Table 1**).

These findings are in consistent with **Mohammed, Salama, and Alsherbeny (2025)**, who studied "Knowledge of nursing students regarding AI and its impact on practical training at the Faculty of Nursing Beni-Suef University" and reported that nearly half of nursing students demonstrated high knowledge level regarding AI, while variability persisted in conceptual depth. This might be due to the variation in the supportive family attitude toward learning AI and adequate economic resources had greater access to digital devices. Similarly, **Khaled, and Elborai (2024)**, who studied "Knowledge and attitude of nursing students regarding AI among nursing students at Ain Shams University", and reported that most nursing students at Ain Shams University

gained moderate level of total AI knowledge.

The positive students' attitudes at the present study may be attributed to students' exposure to AI applications through social media and online resources, which increase awareness of AI benefits even in the absence of formal teaching. Students' attitudes may be shaped by accessibility to technology and perceived usefulness in clinical practice. These findings are in consistent with **Khaled, and Elborai (2024)**, who reported that the majority of nursing students had positive attitudes toward AI as feeling comfort with modern technology.

Similarly, **Sabra, Abd Elaal, Sobhy, and Bakr (2023)**, who assessed "Nurses' perspective and attitudes toward utilization of AI in health care at Qena University Hospitals", and reported that the majority of nurses had positive attitudes toward usage of AI for enhancing quality and efficiency in health care.

Furthermore, the findings of the current study demonstrated that nursing students showed varying levels of awareness across different sections of AI applications, including nursing practice, education, research, and AI applications in healthcare. The high levels of awareness were observed in AI applications as regard

to all domains as nursing practice, AI applications in healthcare, nursing research, and nursing education (**Table 2 & 3**). This awareness may be associated with the degree of students' direct exposure to these applications during their study, clinical training, and daily healthcare activities.

The current study findings reflect that nursing students become more aware and open toward AI applications in various nursing fields. Variations in awareness levels may be influenced by the degree of clinical exposure, academic preparation, and integration of technological concepts within nursing education. The increasing incorporation of digital technologies, nursing informatics, and smart healthcare systems into both educational and clinical settings may contribute to enhancing students' readiness to understand and utilize AI applications in modern nursing practice, education, and research.

These findings are consistent with **Taskiran (2023)**, who studied "The effect of AI course in nursing on students' medical AI readiness", and reported that the majority of the students correctly answered that AI applications can transform all domains of nursing including clinical practice, education, and research. Also, these findings are consistent with

Bakarman, Al-Shammari, and Aboshaiqah (2025), who studied "Nursing students' perception of and readiness for AI", and reported that the majority of nursing students recognized the importance of AI applications in healthcare. This supports the present findings regarding students' recognition of AI across various nursing domains, particularly at the patient and practice levels.

According to the mean of the total knowledge score of the studied students regarding AI, the current study noted that the studied nursing students demonstrated good mean scores regarding AI applications in health care, advantages, applications of AI in nursing research, disadvantages, and determinants of AI. Moreover, students showed understanding regarding the definition and components of AI, as well as, students showed acceptable mean scores in applications of AI in nursing practice and education, importance, and obstacles of AI. (**Table 4**). The total knowledge score reflected a satisfactory level of knowledge about AI between the studied students. This is attributed to frequent exposure to AI terminology through academic study, social media, and technological advancements in healthcare.

This finding is similar to **Bakarman, Al-Shammari, and Aboshaiqah (2025)**, who reported that nursing students demonstrated good awareness regarding AI in healthcare, particularly in relation to its applications, advantages, and overall contribution to nursing practice. Also, this finding is supported by **Khaled and Elborai (2024)**, who reported that the nursing students had a general awareness of AI and its' role in healthcare settings, which reflects adequate awareness of its practical aspects within the field.

Regarding correlation between age, total score of knowledge and total score of attitudes of the students toward AI, the present study showed that students' age was positively associated with both their knowledge and attitudes toward AI (**Table 5**). This finding may be explained by the fact that older students usually have greater academic maturity, wider clinical exposure, and more opportunities to interact with healthcare technologies, which may enhance their understanding of AI and promote more positive attitudes toward its use in nursing practice.

The study findings are consistent with **Al Omari, et al. (2024)**, who found that there was a significant positive association between age, knowledge and attitudes toward AI among nursing

students. In contrast, **Abou Hashish, and Alnajjar (2024)**, who reported no statistically significant association between age and nursing students' knowledge or attitudes toward artificial intelligence. The discrepancy may reflect contextual differences, such as curriculum content, practical exposure, and cultural or institutional influences on students' perceptions.

Conclusion

Based on the findings of the present study, it can be concluded that the nursing students demonstrated an overall satisfactory level of awareness about AI, as the majority of students exhibited moderate and high levels of knowledge and positive attitudes toward the use of AI in nursing. There were no statistical significant relations between students' levels of knowledge and their levels of attitude regarding AI. There were statistically significant associations between nursing students' attitudes, total knowledge toward AI, parents' education and occupation, and their monthly income. There was a statistically significant positive correlation between age of the

students, total knowledge, and attitudes scores.

Recommendations

Based on the findings of the present study, the following recommendations are suggested:

1. Incorporating AI-related content in undergraduate nursing curricula to improve students' awareness and readiness for future healthcare system.
2. Conduct workshops and seminars to increase students' awareness of AI applications in healthcare practice.
3. Encourage interdisciplinary collaboration between facilities of nursing, healthcare sectors and technology companies to develop innovative tools that support nursing education and practice.
4. Nursing educational institutions should provide continuous training programs for nursing students on effective and safe use of AI applications in nursing practice, education, and research.
5. Orientation programs for nursing students should be established by nursing facilities about clear ethical guidelines and regulations to ensure responsible use of AI, while protecting privacy and data security of patients.

References

- Abou Hashish, E. A., & Alnajjar, H. (2024).** Digital proficiency: Assessing knowledge, attitudes, and skills in digital transformation, health literacy, and artificial intelligence among university nursing students. *BMC Medical Education*, 24(1), 508. Available at: <https://doi.org/10.1186/s12909-024-05482-3>
- Al Omari, O., Alshammari, M., Al Jabri, W., Al Yahyaei, A., Aljohani, K. A., Sanad, H. M., ... & Aljezawi, M. (2024).** Demographic factors, knowledge, attitude and perception and their association with nursing students' intention to use artificial intelligence (AI): A multicenter survey across 10 Arab countries. *BMC Medical Education*, 24, 1456. Available at: <https://doi.org/10.1186/s12909-024-06452-5>
- AL-Faraj, E., Al Faraj, N., Alrowdhan, M., Almarbaee, A., Alharbi, W., Alghlwi, W., ... & Alhmed, L. (2024).** Revolutionizing nursing: The role of artificial intelligence in enhancing nursing practices. *Journal of International Crisis and Risk Communication Research*, 7(S9), 897.
- Allam, A., Eltewacy, N., Alabdallat, Y., Owais, T., Salman, S., & Ebada, M. (2023).** Knowledge, attitude, and perception of arab medical students towards artificial intelligence in medicine and radiology: A multi-national cross-sectional study. *European Radiology*, 34(7), 1-14. Available at: <https://doi.org/10.1007/s00330-023-10509-2>
- Bakarman, S. S., Al-Shammari, A., & Aboshaiqah, A. (2025).** Nursing students' perception of and readiness for artificial intelligence in Saudi Arabia. *Nursing Open*, 12(12), e70386. Available at: <https://doi.org/10.1002/nop2.70386>
- Bhambri, P., & Khang, A. (2024).** Managing and monitoring patient's healthcare using AI and IoT technologies. In *Driving Smart Medical Diagnosis Through AI-Powered Technologies and Applications*, 1-23. Available at: Doi: 10.21608/ejhc.2023.312617
- El Arab, R., Alshakihs, A., Alabdulwahab, S., Almubarak, Y., Alkhalifah, S., Abdrbo, A., ... & Sagbakken, M. (2025).** Artificial intelligence in nursing: A systematic review of attitudes, literacy, readiness, and adoption intentions among nursing students and practicing nurses. *Frontiers in Digital Health*, 7, 1666005. Available at:

<https://doi.org/10.3389/fdgth.2025.1666005>

El Hadi, M. (2022). Digital healthcare supported by artificial intelligence with emphasis on Egypt. *Journal of the Egyptian Society for Information Systems and Computer Technology*, 27(27), 5–17. Available at: <https://doi.org/10.21608/jstc.2022.229890>

Fernandes F, Santos P, Sá L, & Neves J (2023). Contributions of artificial intelligence to decision making in nursing: A scoping review protocol. *Nursing Reports*, 13(1), 67-72. Available at: <https://doi.org/10.3390/nursrep13010007>

Hamad, N. I., El-Ashry, A., Ibrahim, I. M., & Hassan, E. (2025). Embracing the future: An insight into nursing students' attitude and perception towards the usability of artificial intelligence in healthcare. *Teaching and Learning in Nursing*, 20(2), e500-e508. Available at: <https://doi.org/10.1016/j.teln.2024.12.017>

Hussein, M., Abed El-Rahman, M., Farouk, M., & Hessien, Y. (2023). Effect of educational program on nurses' knowledge and attitude regarding artificial intelligence.

Egyptian Journal of Health Care, 14(2), 1110-1128.

Kan, C. (2024). Artificial intelligence (AI) in the age of democracy and human rights: Normative challenges and regulatory perspectives. *International Journal of Eurasian Education and Culture*, 9(25), 145-166.

Khaled, E., & Elborai, S. (2024). Knowledge and attitude of nursing students regarding artificial intelligence. *Egyptian Journal of Health Care*, 15(3), 510-523.

Luo, C., Mao, B., Wu, Y., & He, Y. (2024). The research hotspots and theme trends of artificial intelligence in nurse education: A bibliometric analysis from 1994 to 2023. *Nurse Education Today*, 141,106321.

Ministry of Communications and Information Technology (MCIT) (2021). *Egypt's National Artificial Intelligence Strategy*.

Mohammed, M., Salama, T., & Alsherbeny, E. (2025). Assessment knowledge of nursing students regarding artificial intelligence and its impact on practical training at the faculty of nursing Beni-Suef university. *Journal of Health Care Research*, 2(1), 291-305. Available at: Doi: 10.21608/jhcr.2025.337420.1037

- Nashwan, A., Cabrega, J., Othman, M. I., Khedr, M., Osman, Y., El-Ashry, A., ... & Mousa, A. (2025).** The evolving role of nursing informatics in the era of artificial intelligence. *International Nursing Review*, 72(1), e13084. Available at: <https://doi.org/10.1111/inr.13084>
- Ogolodom, M., Mbaba, A., Johnson, J., Chiegwu, H., Ordu, K., Okej, M., ... & Nwodo, V. (2023).** Knowledge and perception of healthcare workers towards the adoption of artificial intelligence in healthcare service delivery in Nigeria. *AG Salud*, 1, 16-16. Available at: <https://doi.org/10.62486/agsalud202316>.
- Pailaha, A. (2023).** The impact and issues of artificial intelligence in nursing science and healthcare settings. *SAGE Open Nursing*, 9, 23779608231196847. Available at: <https://doi.org/10.1177/23779608231196847>
- Park, C., Kim, M., & Han, H. (2025).** Transforming nursing practice through cutting-edge AI in healthcare: Opportunities, challenges, and ethical implications. *Contemporary Nurse*, 61(1), 1-6. Available at: <https://doi.org/10.1080/10376178.2024.2424787>
- Ronquillo, C., Peltonen, L., Pruinelli, L., Chu, C., Bakken, S., Beduschi, A., ... & Topaz, M. (2021).** AI in nursing: Priorities and opportunities from an international invitational think-tank of the nursing and artificial Intelligence leadership collaborative. *Journal of Advanced Nursing*, 77(9), 3707-3717. Available at: <https://doi.org/10.1111/jan.14855>
- Sabra, H., Abd Elaal, H., Sobhy, K., & Bakr, M. (2023).** Utilization of artificial intelligence in health care: Nurses' perspectives and attitudes. *Menoufia Nursing Journal*, 8(1), 253-268. Available at: <https://doi.org/10.21608/menj.2023.297411>
- Sajja, R., Sermet, Y., Cikmaz, M., Cwiertny, D., & Demir, I. (2024).** Artificial intelligence-enabled intelligent assistant for personalized and adaptive learning in higher education. *Information*, 15(10), 596.
- Schepman, A., & Rodway, P. (2020).** Initial validation of the general attitudes towards Artificial Intelligence Scale. *Computers in Human Behavior Reports*, 1, 100014. Available at: <https://doi.org/10.1016/j.chbr.2020.100014>.
- Taskiran, N. (2023).** Effect of Artificial Intelligence Course in nursing on

students' medical artificial intelligence readiness: A comparative quasi-experimental study. *Nurse Educator*, 48(5), E147–E152. Available at: <https://doi.org/10.1097/NNE.00000000000001446>

Yasin, Y., Al-Hamad, A., Metersky, K., & Kehyayan, V. (2024). Incorporation of artificial intelligence into nursing research: A scoping review. *International Nursing Review*, 72(1), e13013. Available at: <https://doi.org/10.1111/inr.13013>

Zamlynskyi, V., Kalinichenko, S., Kniazkova, V., Skrypnyk, N., & Avriata, A. (2025). Healthcare management using artificial intelligence. *In Revolutionizing Medical Systems Using Artificial Intelligence*, 1-24. Academic Press. Available at: <https://doi.org/10.1016/B978-0-443-32862-6.00001-8>

Academic Resilience among Adolescents with Deafness; The Role of Peer Relationship and Perceived Parenting Style

Dalia Elsayed Gomaa Abd El Salam¹, Amal Awad Abd El-Nabi Moussa²,
Rodaina Ahmed Mokbel³, Azza Medhat Aziz Mansy⁴

¹Nursing Specialist at Kafr El Dawar General Hospital.

²Professor of Psychiatric and Mental Health Nursing, Faculty of Nursing, Damanhur University. Egypt.

³Assistant Professor of Pediatric Nursing, Pediatric Nursing, Faculty of Nursing, Damanhur University.

⁴Lecturer of Psychiatric and Mental Health Nursing, Faculty of Nursing, Damanhour University. Egypt.

Corresponding author: Azza Medhat Aziz Mansy.

Email: Azza.mansy@nur.dmu.edu.eg

Abstract

Background: Deaf adolescents face communication boundaries, social challenges, and educational obstacles that may affect their academic adjustment and well-being. Academic resilience helps deaf students handle pressure and hardship and succeed. Parenting and peer interactions may affect it. **Aim:** To assess the role of peer relationships and perceived parenting style on academic resilience among adolescents with deafness. **Research design:** A descriptive correlational research design was utilized. **Subjects:** The study was conducted on 219 students with deafness enrolled in three Al-Amal Schools for the Deaf and Hard of Hearing in Al Behira Governorate, Egypt. **Study tools:** **Tool I:** Structured Socio Demographic Data and Academic Profile Questionnaire, **tool II:** Academic Resilience Scale (ARS), **tool III:** The Peer Relationship Scale for Children and Adolescents (PRS), **tool IV:** Perceived Parenting Style Scale (PPSS). **Results:** Significant positive correlations were found between academic resilience and both of peer relationships and perceived parenting style academic resilience was significantly predicted by total authoritative style score, total permissive style score, total authoritarian style score, and peer relationship. **Conclusion:** Peer relationships and parenting styles affect deaf adolescents' academic resilience. Peer support and good parenting improve psychosocial and academic adjustment. **Recommendations:** Develop school-based counselling programs, promote peer-support activities, and raise parental awareness of positive parenting to boost academic resilience in deaf adolescents.

Keywords: Academic resilience, Deaf adolescents, Parenting style, Peer relationships.

Introduction

Adolescence is a crucial time of emotional, social, and psychological growth that prepares children for adulthood. Due to communication issues and lack of social information, deaf adolescents have higher rates of emotional and psychological issues than their hearing peers (**Naz et al., 2025**). Partial or complete hearing loss is deafness. It can range from mild to severe hearing loss. According to **WHO (2026)**, hearing loss is inability to hear well with hearing thresholds over 20 dB in one or both ears. Conductive, sensorineural, or both can damage hearing. Congenital and genetic diseases, pregnancy and birth issues, chronic otitis media, loud noises, ototoxic drugs, senescence, meningitis, and rubella are the main causes. Public health, immunization, safe listening, and early detection and intervention are showing promise in preventing many hearing losses causes (**Aldè et al., 2025**). Egypt's hearing loss epidemic persists. Hearing impairment affected 16% of Egyptians, with a higher rate among the elderly and young children, according to a national household survey. The main causes were otitis media with effusion, presbycusis, and preventable hearing issues. Hearing

loss is a serious health issue, especially in the elderly, and recent Egyptian studies have shown the need for frequent screening and early intervention. Egypt began statewide newborn hearing screening programs to detect hearing abnormalities in the first month of life and provide timely treatment and rehabilitation. (**Tsimpida et al., 2026**). Deaf adolescents often feel isolated and marginalized, which hinders their access to mainstream education and social networks, delaying language development, low self-esteem, and the risk of developmental psychopathologies like anxiety and depression. Family and parental relationships are crucial to reducing risks and building resilience for these adolescents (**Bizuneh, 2022**). As they overcome communication barriers, social challenges, and limited auditory information, deaf adolescents often develop resilience. Many cope well with these challenges through supportive families, effective communication, and inclusive schools. Self-efficacy, social support, and assistive technology improve psychological well-being and social integration (**McRae et al., 2025**). Additionally, deaf adolescents may be shamed and blamed for their

impairment, which can affect their school performance (**Morris et al., 2021**). Academic resilience allows deaf adolescents to succeed in school despite hearing loss-related learning difficulties. This includes using visual learning and help-seeking with teachers and family support to overcome classroom communication and engagement barriers (**Fellinger et al., 2024**). Deaf adolescents have high test stress and related symptoms, indicating low resilience. Without support to develop coping skills for adversity and school demands, they may struggle academically (**Hou et al., 2021**). Protection requires high expectations and other healthy school qualities. When teachers care and support, academic demands are easier. Knowing their students' backgrounds and experiences helps teachers create a relatable learning environment. Culturally relevant content also improves accessibility (**Najafi & Ebrahimi Belil, 2023**). Peer relationships are complex and affect teens' emotional, social, and academic development. The main domains are peer acceptance, which measures adolescents' likability and inclusion among peers; friendship quality, which includes trust, intimacy, emotional support, and companionship; social

communication skills, which involve initiating, maintaining, and understanding social interactions; peer support, which includes emotional and practical help from friends; and peer conflict (**Yang, Hong, & Gu, 2024**). Research shows that many deaf adolescents struggle to make friends, see themselves as different from hearing teens, and are bullied. Many form meaningful friendships with mutual understanding, shared interests, and emotional intimacy when communication is easy and inclusive (**Libbi et al., 2026**). A student's ability to adapt and succeed academically in difficult or stressful situations is called academic resilience. Academic resilience requires emotional support, motivation, and collaborative learning from positive peer relationships. Peer acceptance and support boost self-confidence, motivation, and academic perseverance in adolescents. Supportive friendships reduce stress and isolation, helping students learn (**Cai & Meng, 2025**). Deaf adolescents' development and well-being depend on their parents' emotional support, guidance, and advocacy. Psychosocial adjustment, communication, and social competence improve with their active

participation. Warm and supportive relationships help adolescents with communication and social issues develop coping skills, independence, and confidence. Parental attachment boosts emotional adjustment, self-esteem, and academic and social resilience **(Castellanos, Pisoni & Kronenberger, 2025)**. Parenting style is the emotional environment parents create for their children. The child's perception of parenting styles is important in studying psychological development, regardless of the parents'. A child's life experiences are shaped by their relationship with their primary carer. A child without this trusting bond often fears the unknown and manages his life alone. Parents and teens must regularly renegotiate their relationships during adolescence **(Garain, 2025)**. Later research added neglectful or uninvolved parenting to authoritative, authoritarian, and permissive parenting. Parenting styles affect child outcomes, particularly emotional development, behavior regulation, and academic performance in adolescence **(Banu, 2025)**. Authoritative parenting is considered best. It is highly responsive and demanding, with clear expectations and boundaries, providing emotional support and fostering independence.

Warmth, support, and clear expectations give adolescents a sense of security and competence, which increases academic resilience **(Rajawat & Chaturvedi, 2024)**. Parents of deaf adolescents deal with emotional pain. Stress and a lack of resources to form a secure attachment can impair emotional regulation and interaction. Communication disruptions can affect attunement and responsiveness, increasing the risk of insecure attachment styles. Secure parental attachment improves psychosocial adjustment, depression, anxiety, and resilience in adolescents, regardless of disability, according to many studies **(Naz et al., 2025)**. Recent research shows that parenting styles affect kids' academic resilience, or ability to persevere. Warm, supportive, authoritative parenting boosts resilience, self-confidence, and problem-solving skills. According to **Shengyao et al. (2024)**, positive parenting boosts motivation and self-efficacy, supporting Social Cognitive Theory's emphasis on supportive environments. Authoritarian and neglectful methods lower student confidence and coping skills, reducing resilience. Family support and positive relationships protect, according to systematic reviews. Communication

and support from parents can boost students' resilience and academic performance (Wei et al., 2025). Through improved communication and therapeutic interactions, the psychiatric nurse helps deaf teens' mental health. These adolescents risk social isolation, anxiety, and depression due to communication issues. Sign language and visual aids can help nurses understand and communicate during comprehensive mental health exams to identify issues quickly. They organize interdisciplinary treatment to help teens cope and form healthy relationships. Social integration requires family psychoeducation, and coordination with diverse providers ensures comprehensive treatment. Deaf adolescents need accessible mental health care and good communication to improve outcomes and quality of life (Hardt et al., 2026). Deaf adolescents face communication, educational, and psychosocial challenges that make resilience important. Family and peer influences shape teens' adaptive abilities. It is well known that parenting and peer relationships affect psychological and educational adjustment (Eichengreen et al., 2021). These factors' role in academic resilience may inform

interventions to improve deaf adolescents' education. Thus, this study examined how peer relationships and parenting style affect academic resilience in deaf teens. These findings can help create culturally and developmentally appropriate mental health interventions, school-based counselling programs, and parental guidance models for deaf adolescents (Qi et al., 2024). The study suggests comprehensive mental health and academic strategies for this marginalized and vulnerable group. However, few studies have examined academic resilience and psychosocial factors. Thus, this study is crucial for understanding academic resilience, peer relationships, and parenting styles in deaf adolescents.

The aim of the study

This study aimed to assess the role of peer relationships and perceived parenting style on academic resilience among adolescents with deafness.

Research questions:

What is the role of peer relationships and perceived parenting style on academic resilience among adolescents with deafness?

Subjects and Method

Research Design:

A descriptive correlational design will be used in this study.

Setting:

The study was conducted at the three schools (Al-Amal Schools) for the Deaf and hard of hearing in Al Behira Governorate that are affiliated to the Ministry of Education in Egypt. These Schools provide (educational, rehabilitative and entertainment) services for all deaf and hard of hearing. The first school is located at Damanhour city for preparatory and secondary stages. The second and third schools are located at Kafr El Dawar and Itay El Baroud for primary, preparatory and secondary stages, while the third school has overnight accommodation for girls and boys.

Study subjects:

All available students who are free from Psychiatric mental disorders that affect the ability to cope or build competent peer relationships; Additional disability, chronic medical condition or neurological problems during the time of data collection at the three previously mentioned schools (preparatory and secondary stage) of both sexes were recruited in this study.

Sampling size:

Based on the official documents from each school, the total number of students is 219. A total population sample size will be utilized to ensure full representation of the accessible

population.

Sampling Technique:

A convenient sample technique was used

Tools of data collection

Four tools were used for data collection:

Tool I: Structured Socio-Demographic Data and Academic Profile Questionnaire.

It was developed by the researcher after reviewing relevant literature to obtain the required data from the study participants, involving: personal data (age, sex, hobbies, and residence...etc), medical history (onset and nature of deafness, other affected family members...etc), academic profile (educational stage, grade class, level ...etc.).

Tool II: Academic Resilience Scale (ARS).

This tool (ARS) was developed in Arabic language by **Al-Hajin (2018)** and consists of 30 items for measuring cognitive, behavioral, emotional, and adaptive responses for academic adversity and the ability to regain fitness for overcoming difficulties and achieving academic success despite this adversity. "For example, I believe that differences in thinking do not spoil a friendship. "Each statement is rated on a four-point Likert-type scale

ranging from 1 to 4, where 1 refers to strongly disagree, 2 disagree, 3 agree, and 4 strongly agree. The total score ranges from 30 to 120. A high score indicates a high level of academic resilience.

Tool III: The Peer Relationship Scale for Children and Adolescents (PRS).

The Peer Relationship Scale for Children and Adolescents was developed in English to measure peer relationships of adolescents by **Aydoğdu (2022)** and consists of 29 items distributed on four sub-dimensions. Intimacy (1-13) measures the ability of adolescents to feel safety and loyalty and share (problems, feelings, thoughts, happiness) with their friends. The highest score that can be obtained from this sub-dimension is 65, whereas the lowest score is 13. Adolescents who score high in this sub-dimension are said to have close relationships with their peers (**Aydoğdu, 2022**).

The popularity subscale (14-17) measures the ability of adolescents to make friends and to have many close friends; the highest score that can be obtained from this subdimension is 20, while the lowest possible score is 4. The trust sub-dimension (18-24) measures the level of adolescents trust

regarding their peers. The highest score that can be obtained from this sub-dimension is 35, which means high level of trust regarding their peers, while the lowest possible score is 7, which indicates low level of trust. Finally, insightfulness (25-29) measures adolescents' ability to (be calm, tell truth all the time and to apologize when misbehaving). The highest score that can be obtained from this sub-dimension is 25 and the lowest possible score is 5. It is a 5-point Likert scale ranging from 1 to 5 (1 = Never, 2 = Very Little, 3 = Sometimes, 4 = Often, 5 = Always). There are no reverse-scored items in the scale, and the level of peer relationships is measured as the total score. The highest score that can be obtained from the total of the scale is 145, and the lowest possible score is 29. The peer relationship scale was used in a Chinese study by **Wang (2022)** and was highly reliable, with the Cronbach's alpha for this scale being 0.947 (**Wang, 2022**).

Tool IV: Perceived Parenting Style Scale (PPSS).

The Perceived Parenting Style Scale was developed in English by **Divya and Manikandan (2013)** to measure the perception of children about their parents' behavior. It consists of 30

items divided into three dimensions: authoritarian, authoritative, and permissive (Divya & Manikandan, 2013). The items of authoritative parents' style involve 10 items (1,4,7,10,13,16,19,22,25,28) constituting open communication between parent and child, providing clear guidelines, encouragement, and expectation upon the adolescents, providing lots of nurturing and love, spending time together, providing the right direction, and encouraging in taking decisions. Authoritarian parents' style involves 10 items (2,5,8,11,14,17,20,23,26,29) that indicate high standards, discipline, comparison between friends, criticizing while doing things, and providing punishment when rules are not obeyed, little comfort and affection, restriction, and not providing solutions to problems. Permissive parents' style type involves 10 items (3,6,9,12,15,18,21,24,27,30) that include few limits imposed, little or no expectation for their children, view children as friends, spend less time with children, no rule or guideline for children, inconsistent and undemanding, allow the child to regulate his or her own activities. Responses are elicited in a five-point Likert scale with response categories

as strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). All the items on the scale are worded positively and scored 5 to 1. All the three perceived parenting styles are scored separately. The style with the highest total score indicates the dominant perceived parenting style as experienced by the adolescent.

Procedure

An official permission for conducting the study was obtained from the Dean of the Faculty of Nursing, Damanshour University, to be forwarded to the Education Directorate in EL-Beheira Governorate to inform them about the aim of the study and to get their permission to conduct the study.

An official letter from the Education Directorate in EL-Beheira Governorate was sent to the administrators of the selected study setting to facilitate conducting the study.

Tool I was developed by the researcher.

Tools II, III and IV was adopted by the researcher to fit the nature of deaf students and their level of understanding and reviewed by a jury of 5 experts in Psychiatric Nursing and Mental Health and Pediatric Nursing Department to check validity and the necessary modifications will be done.

Arabic translation for tool III and IV was done by the researcher and reviewed by a jury of 5 experts in Psychiatric Nursing and Mental Health and the Pediatric Nursing Department to check content validity and the necessary modifications will be done. Arabic version of tool II was used in this study.

A pilot study was carried out on 10% (n= 22) students who were fulfilling the inclusion criteria to assess and ensure the clarity of the tools; as well as to estimate the time needed to complete the questionnaire and to identify any obstacles that may hinder data collection. Any necessary modifications were made; those students were excluded from the actual study subjects if there is any modification needed.

The reliability of the study tools II, III and IV was tested using Cronbach's alpha test.

All students in the previously mentioned schools were recruited for the study.

A self-administered questionnaire was distributed for each student to answer each question and sign their responses. The researcher was seeking help from teachers who are experts in sign language to facilitate communication with deaf students during individual

interviews, in order to explain the aim of the study.

Parents of recruited students were contacted and interviewed either face to face or through telephone calls to explain the aim of the study, and to obtain written informed consent that will be sent to them with the adolescents.

Ethical Considerations:

Plagiarism of the study title was examined from the digital library at Damanhur University.

Informed written consent to participate in the study was obtained from each recruited student and their parents after explaining the aim of the study.

Data confidentiality was assured and maintained.

Privacy and anonymity were respected.

Voluntary participation and students' right to refuse to participate in the study or withdraw at any time were respected and emphasized.

Statistical analysis of the data:

After collecting data, it was revised, coded, computerized, and then analyzed using the IBM SPSS software package version 23.0 and AMOS 23.0.

Descriptive statistics: include number, percent, range (minimum and maximum), mean, and standard

deviation.

Analysis of numeric data:

The Kolmogorov-Smirnov test is used to compare different groups regarding categorical variables.

Independent sample t-test: It is a parametric statistical test that is used to compare the means of two independent groups for numeric data and follows a normal distribution.

F-test (ANOVA): was used for normally distributed quantitative variables to compare more than two groups.

Correlation analysis:

The correlations between two quantitative variables were assessed using the Pearson correlation coefficient (*r*).

Linear regression analysis

Linear regression analysis was used to determine which factors most strongly predict or influence the study variables.

Results

Table (1) presents the distribution of the studied students according to their personal and demographic characteristics. Regarding age, the largest proportion of students (40.2%) were aged 14–<16 years, followed by 30.6% aged 16–19 years, while 29.2% were aged 12–<14 years, with a mean age of 14.9 ± 1.8 years, indicating that

most participants were in middle adolescence.

Concerning the educational stage, slightly more than half of the students (51.1%) were in the preparatory stage, whereas 48.9% were in the secondary stage, reflecting a nearly equal distribution between the two educational levels. With respect to fathers' education, the highest percentage (29.2%) could read and write or had primary education, followed by 21.9% illiterate, 21.0% secondary or diploma education, and 18.7% preparatory education, while only 9.1% had university education, indicating that a relatively small proportion of fathers had higher education.

Regarding fathers' occupations, more than one-third (37.9%) worked in the private sector, followed by 32.9% in governmental jobs, while 21% were engaged in freelance work, and 8.2% were wage workers. In relation to mothers' occupation, the majority of mothers (71.2%) were not working, whereas 14.2% worked in governmental jobs, 9.1% in the private sector, and 5.5% as wage workers, suggesting that most mothers were housewives.

Regarding mothers' education, the largest proportion (31.1%) had read

and write or primary education, followed by 26% illiterate, 18.3% preparatory education, 16.4% secondary or diploma, and only 8.2% had university education, indicating generally moderate to low maternal educational levels. Concerning the number of family members, more than half of the students (58.4%) belonged to families consisting of 4–6 members, while 25.1% had more than six members, and 16.4% had less than four members, suggesting that most students lived in moderately sized families.

Regarding ranking within the family, 40.2% of students were middle children, followed by 30.6% last-born, and 29.2% first-born, showing a relatively balanced distribution among birth order categories. In terms of housing status, the majority of students (74%) reported satisfactory housing conditions, whereas 26% reported unsatisfactory housing conditions.

Finally, concerning residence, the vast majority of students (82.6%) were living with their families, while only 17.4% were living in institutions. Regarding favourite hobbies, the most commonly reported hobby was sporting activities (33.3%), followed by painting (25.6%), music (14.6%), and reading (12.8%). A smaller

proportion (8.2%) reported other hobbies, while 5.5% stated that they did not have hobbies. Overall, the table indicates that most students were mid-adolescents, studying in the preparatory stage, living with their families in moderately sized households, and engaging mainly in physical and artistic hobbies.

Table (2) presents the distribution of the student sample ($n = 219$). Regarding the nature of hearing loss, more than half of the students (58.4%) had partial hearing loss, while 41.6% had total hearing loss. This indicates that partial hearing impairment represents the predominant condition among the participants. Concerning the onset of hearing loss, more than half of the students (56.6%) experienced hearing loss since birth, whereas 43.4% acquired hearing loss later in life. This suggests that congenital hearing loss is slightly more common among the studied group. With respect to family history of hearing loss, the majority of students (73.5%) reported no family history, while only 26.5% indicated the presence of hearing loss among family members. Among those with an affected family member, siblings (brother/sister) represented the highest proportion (15.1%), followed by

mothers (6.4%) and fathers (5%). Regarding academic difficulties, nearly half of the students (46.6%) reported difficulty understanding teachers' explanations, making it the most frequently reported academic challenge. Additionally, 35.6% experienced difficulty following lessons, while 17.8% indicated a need for visual teaching aids, reflecting the importance of adapted instructional strategies for students with hearing impairment. As for personal and social difficulties, the results revealed that communication difficulties were the most commonly reported issue (44.3%). Furthermore, 33.3% of students reported feeling isolated sometimes, and 22.4% experienced difficulty making friends. These findings highlight the social and emotional challenges that students with hearing loss may encounter in their daily interactions and school environments. Overall, the table indicates that students with hearing impairment experience a range of academic and psychosocial challenges, particularly in understanding classroom instruction and maintaining effective communication with others, which may negatively influence their educational experience and social integration.

Table (3) shows that the mean scores and standard deviations of students' academic resilience are 79.12 ± 13.70 . The results indicate that more than half of the students (54.8%) have a moderate academic resilience level. While less than a third of students (32.9%) have a high academic resilience level, and only (12.3%) of them have low academic resilience level.

Table (4) shows the total mean scores of peer relationship dimensions among students ($n = 219$). The results indicate that intimacy had the highest mean score (42.67 ± 7.13), suggesting that students tend to maintain close and supportive relationships with their peers. This was followed by trust (23.00 ± 5.11), reflecting a relatively strong level of confidence and reliability among students in their peer interactions. In contrast, insightfulness (16.19 ± 3.66) and popularity (14.26 ± 3.06) showed comparatively lower mean scores. The total peer relationship score among students was 96.12 ± 17.12 , indicating an overall moderate to relatively high level of peer relationships among the studied students.

Table (5) reveals that the authoritative parenting style had the highest mean score (34.29 ± 4.25), indicating that it

was the most perceived parenting style among the students. This was followed by the authoritarian style with a mean score of (31.04 ± 5.73) , while the permissive style recorded the lowest mean score (29.06 ± 8.07) .

Table (6) demonstrates that academic resilience had a statistically significant negative correlation with authoritarian parenting style ($r = -0.417$, $p < 0.001$) and permissive parenting style ($r = -0.397$, $p < 0.001$), while it showed a significant positive correlation with authoritative parenting style ($r = 0.235$, $p < 0.001$). Moreover, peer relationship score was positively correlated with academic resilience ($r = 0.391$, $p < 0.001$) and authoritative parenting style ($r = 0.428$, $p < 0.001$), whereas it had a significant negative correlation with both authoritarian and permissive parenting styles.

Table (7) the best-fitting multiple linear regression model identified that there is a significant statistical predictor total authoritative style score, total permissive style score, total authoritarian style score, and peer relationship on total academic resilience level.

Table (1): Distribution of students according to personal and demographic characteristics (n=219)

Characteristics	Category	No.	%
Age (years)	12 – <14	64	29.2
	14 – <16	88	40.2
	16 – 19	67	30.6
	Mean ± SD 14.9±1.8		
Educational stage	Preparatory	112	51.1
	Secondary	107	48.9
Father education	Illiterate	48	21.9
	Read & write / Primary	64	29.2
	Preparatory	41	18.7
	Secondary / Diploma	46	21.0
	University	20	9.1
Father occupation	Governmental	72	32.9
	Private sector	83	37.9
	Freelance work	46	21
	Wage worker	18	8.2
Mother occupation	Not working	156	71.2
	Governmental	31	14.2
	Private sector	20	9.1
	Wage worker	12	5.5
Mother education	Illiterate	57	26
	Read & write / Primary	68	31.1
	Preparatory	40	18.3
	Secondary / Diploma	36	16.4
	University	18	8.2
Number of family members	Less than 4 members	36	16.4
	4-6 members	128	58.4
	More than 6 members	55	25.1
Ranking within the family	First	64	29.2
	Middle	88	40.2
	Last	67	30.6
Housing status	Satisfactory	162	74
	Unsatisfactory	57	26
Residence	Living with family	181	82.6
	Institution	38	17.4
Favorite hobbies	Sporting	73	33.3
	Painting	56	25.6
	Music	32	14.6
	Reading	28	12.8
	Other hobbies	18	8.2
	Don't have hobbies	12	5.5

Table (2): Distribution of students according to hearing loss characteristics, academic and personal difficulties (n=219)

Characteristics	Category	No.	%
Nature of hearing loss	Partial	128	58.4
	Total	91	41.6
Onset of hearing loss	Since birth	124	56.6
	Acquired	95	43.4
Family history of hearing loss	Yes	58	26.5
	No	161	73.5
Infected person	Father	11	5
	Mother	14	6.4
	Sister /brother	33	15.1
Common academic and personal difficulties			
Academic	Difficulty understanding teacher explanation	102	46.6
	Difficulty following lessons	78	35.6
	Need visual teaching aids	39	17.8
Personal/Social	Communication difficulties	97	44.3
	Feeling isolated sometimes	73	33.3
	Difficulty making friends	49	22.4

Table 3: Distribution of students regarding academic resilience (n=219)

Total	Students' academic Resilience levels scores	
	No	%
High	72	32.9
Moderate	120	54.8
Low	27	12.3
Total score (Mean ± SD)	79.12 ± 13.70	

Table 4: Total Mean regarding the peer relationship dimensions among students (n=219)

Dimensions	Students' peer relationship scores
	Mean $\pm$ SD
Intimacy	42.67 $\pm$ 7.13
The popularity	14.26 $\pm$ 3.06
Trust	23.00 $\pm$ 5.11
Insightfulness	16.19 $\pm$ 3.66
Total score	96.12$\pm$17.12

Table 5: Total mean regarding students' perceived parenting style scores (n=219)

Dimensions	Students' perceived parenting style among students scores
	Mean $\pm$ SD
Authoritarian	31.04 $\pm$ 5.73
Permissive	29.06 $\pm$ 8.07
Authoritative	34.29 $\pm$ 4.25

Table 6: Correlation between total academic resilience level, peer relationship, and perceived parenting style among students' scores

Items	Total academic resilience score	Total authoritarian style score	Total permissive style score	Total authoritative style score
Total academic resilience score		r = -0.417- P = 0.000**	r = -0.397- P = 0.000**	r = 0.235 P = 0.000**
Total peer relationship score	r = 0.391 P = 0.000**	r = -0.136- P = 0.04*	r = -0.147- P = 0.02*	r = 0.428 P = 0.000**

Correlation is significant at the 0.01 level (2-tailed).

Table 7: Best fitting multiple linear regression model for academic resilience level

	Unstandardized Coefficients		Standardized Coefficients	T	P. Value	95.0% Confidence Interval for B	
	B	Standard error	Beta			Lower Bound	Upper Bound
Peer relationship	.014	.002	.371	5.891	.000**	.009	.019
Total authoritarian style score	-.031-	.009	-.280-	-3.625-	.000**	-.048-	-.014-
Total permissive style score	-.014-	.006	-.181-	-2.247-	.026*	-.027-	-.002-
Total authoritative style score	.018	.010	.119	6.859	.000**	-.001-	.037
ANOVA							
Model	Sum of squares	DF	Mean Square	F	P. value		
Regression	21529.654	18	1196.092	12.354	0.000**		

(**) highly statistically significant at $P < 0.01$. $r\text{-square} = 0.526$
 Model ANOVA: $F = 12.354$, $p < 0.001$

Discussion

Sociodemographic data indicated that most deaf adolescents in the study were aged 14-16, a period marked by identity formation and emotional maturation. These adolescents face unique challenges, including communication barriers and psychosocial stressors impacting academic resilience and relationships. The majority receive special education services, aligning with findings from **Aanondsen et al. (2023)** on similar populations. Additionally, participants reported issues like isolation and bullying, exacerbating mental health problems. This finding contrasts with **Fahim et al. (2025)**, which highlighted a broader age range, showing early developmental challenges associated with hearing loss. The differing outcomes underscore the complexity of hearing impairment and emotional well-being across various developmental stages. The study highlights that fathers of deaf students often have low educational attainment, with most being illiterate or having only secondary education and less than 10% being highly educated. Similar trends were found for mothers. Research indicates that this lower educational level can negatively impact parenting styles and the support provided to deaf

siblings. **Shastri et al. (2025)** noted that less educated parents may struggle more with raising hearing-impaired children, affecting their ability to seek information and communicate with professionals. Additionally, **Wright et al. (2021)** demonstrated that higher parental education correlates with better language development and psychosocial adjustment in deaf children, as educated parents tend to utilize early intervention programs and more effectively engage with educators and healthcare providers. The current sample shows a higher representation of students with partial hearing loss, suggesting improved educational support for these individuals. **Wolbers et al. (2025)** indicate that even mild hearing impairments correlate with poorer educational and communication outcomes among children. In contrast, **Afshar et al. (2022)** found higher rates of severe hearing loss in specialized institutions. Variations in study populations, sampling methods, or diagnostic criteria may explain these discrepancies. Effective educational strategies, including sign language and visual aids, are essential since classroom challenges, such as background noise and teacher communication, hinder understanding. However, factors

like teacher undertraining, overcrowded classrooms, and inadequate resources negatively affect inclusive education, ultimately impacting student confidence and performance. Students with hearing loss face comprehension challenges in classrooms due to poor acoustics and limited access to visual speech cues, as noted by **Vulchanova and Lervåg (2021)**. Visual aids like subtitles are crucial for enhancing understanding and engagement. Communication difficulties often lead to social isolation and emotional distress, reducing peer interaction and participation. **Shukla et al. (2020)** found significant links between loneliness and hearing loss, with many deaf adolescents exhibiting pragmatic communication issues, increasing social exclusion. Despite these challenges, over half demonstrate moderate academic resilience, illustrating their ability to adapt and cope during adolescence. **Rado Vanovic et al. (2020)** established that deaf and hard-of-hearing adolescents exhibit average resilience, self-efficacy, and social support, positively influencing their adaptability. **Johnson et al. (2018)** identified that resilience in deaf individuals often arises from protective factors, particularly

supportive relationships, which are predominantly with deaf peers. **Shao and Kang (2022)** highlighted that moderate to high academic resilience is fostered by parental and peer support, emphasizing the role of strong peer relationships and self-efficacy in enhancing academic resilience and engagement. The current study Findings from the study indicate that deaf students experience high intimacy in peer relationships, which fosters emotional support crucial for their development during middle adolescence. Shared communication through sign language enhances these friendships, while school activities strengthen connections and promote psychological stability. Trust is essential for support-seeking, yet some students struggle with emotional understanding, impacting their popularity. These results align with **Cavicchiolo et al. (2022)**, emphasizing that supportive relationships are vital for psychological and social growth. However, **Lan (2020)** highlighted that perceived popularity may not correlate with emotional closeness, illustrating the complexities of social dynamics among adolescents. Regarding perceived parenting style among deaf adolescents, the study revealed that the authoritative style was most favored, promoting

warmth and open communication, likely due to parents' recognition of communication challenges and the importance of emotional support. In contrast, a significant presence of authoritarian style was observed, reflecting strict disciplinary practices attributed to perceived vulnerabilities of deaf adolescents. This supports findings from **Xiong, Li, and Xia (2020)**, which connect authoritative parenting to positive outcomes like better social skills and self-esteem. However, it challenges **Khadka et al. (2025)**, which linked authoritarian parenting to maladjustment. Overall, the research emphasizes the necessity for nurturing, authoritative parenting to foster healthy adolescent development. The study reveals a significant positive correlation between students' academic resilience and their peer relationship scores, particularly among adolescents with deafness. Supportive peer relationships enhance belonging, self-confidence, and emotional security, aiding academic success. This finding aligns with **Qi et al. (2024)**, which emphasizes the role of peer connectedness in strengthening resilience among deaf and hard-of-hearing adolescents. Moreover, a positive relationship exists between perceived parenting style and

academic resilience; warm and responsive parenting fosters higher resilience levels. This is consistent with **Bizuneh (2022)**, highlighting that supportive parenting enhances psychosocial well-being and adjustment in deaf adolescents, facilitating better coping skills and mental health outcomes as they transition to adulthood.

Conclusion

Based on the results of this study, it can be concluded that Academic resilience in adolescents with deafness is significantly shaped by peer relationships and parenting styles. Supportive friendships and positive parenting enhance emotional stability and social skills, aiding academic coping. Conversely, communication barriers and poor parenting hinder psychosocial adjustment. The study emphasizes the need for supportive environments tailored to adolescents with hearing impairment, highlighting the importance of peer support, inclusive educational practices, and positive parenting to improve resilience and overall well-being.

Recommendation

In light of the results of the present study, the following recommendations were suggested: Develop school-based counseling and psychological support programs

for adolescents with deafness to enhance emotional well-being and academic resilience.

Provide continuous training programs for teachers on inclusive teaching methods and effective communication strategies for students with hearing impairment.

Strengthen collaboration between schools, families, healthcare professionals, and community organizations to provide comprehensive support services for hearing-impaired adolescents.

Promote peer support programs and social integration activities to strengthen friendships and reduce feelings of isolation among adolescents with deafness.

Increase parental awareness regarding the importance of authoritative parenting styles and positive communication with adolescents with hearing impairment.

Organize family counseling and educational workshops to help parents better understand the psychosocial and academic needs of their adolescents.

Limitations of the Study

Several limitations should be acknowledged in this study. The findings of this study on academic resilience in deaf teenagers and peer interactions and perceived parenting style should be interpreted with

some limitations. A cross-sectional approach makes causal links between study variables difficult to establish. Despite significant links, it is unclear whether positive peer interactions and supportive parental methods directly improve academic resilience or whether resilient adolescents evaluate them more positively. Response bias, social desirability bias, and questionnaire comprehension differences may affect self-reported variables in the study. Although data collection methods are accessible, deaf adolescents may still have communication issues that affect their responses. It may also be limited to specific educational settings or areas, restricting its applicability to all deaf teenagers. Peer interactions, parenting, and resilience may be affected by cultural, social, and educational inequalities. Instead of self-esteem, teacher support, school climate, communication competence, family socioeconomic status, and access to educational resources, the study focuses on peer relationships and perceived parenting style. To further understand academic resilience in deaf teenagers, longitudinal studies should include more diverse samples and integrate psychosocial and environmental aspects.

Acknowledgments

The authors would like to express sincere gratitude and appreciation to the deaf students who agreed to participate in this study.

References

- Aanondsen, C., Jozefiak, T., Lydersen, S., Heiling, K., & Rimehaug, T. (2023). Deaf and hard-of-hearing children and adolescents' mental health, quality of life and communication. *BMC Psychiatry*, 23(1), 297. <https://doi.org/10.1186/s12888-023-04787-9>
- Adigun, O., & Ndwandwe, N. (2022). Academic resilience among deaf learners during e-learning in the COVID-19 era. *Research in Social Sciences and Technology*, 7(2), 27–48.
- Afshar, P., Afsharmanesh, J., Eslahi, M., Sheikhbardsiri, H., & Moghadam, M. (2022). Determination risk factors for severe and profound hearing loss in child candidates for cochlear implantation in southeast of Iran during 2014-2020. *BMC Pediatrics*, 22(1), 62. <https://doi.org/10.1186/s12887-022-03124-5>
- Aldè, M., Ambrosetti, U., Barozzi, S., & Aldè, S. (2025). The ongoing challenges of hearing loss: Stigma, socio-cultural differences, and accessibility barriers. *Audiology Research*, 15(3), 46. <https://doi.org/10.3390/audiolres15030046>
- Al-Hajin, A. (2018). Classroom climate and its relationship with academic resilience among high school students. *Assiut College of Education Journal*, 34(7), 384–419. <https://doi.org/10.12816/0054196>
- Ban, Y., Sun, J., Bai, B., & Liu, J. (2023). Parent-adolescent attachment and well-being among Chinese Hearing-Impaired Students: The mediating role of resilience and the moderating role of emotional and behavioral problems. *Journal of Developmental and Physical Disabilities*, 36(1), 111–124. <https://doi.org/10.1007/s10882-023-09899-4>
- Banu, L. (2025). The role of parenting styles in predicting academic resilience among adolescents. *The International Journal of Indian Psychology*, 13(2), 1461–1474.
- Bizuneh, S. (2022). Resilience in deafness, adolescence and gender. *Journal of child & adolescent trauma*, 15(4), 1145–1153. <https://doi.org/10.1007/s40653-022-00468-z>
- Cai, Z., & Meng, Q. (2025). Academic resilience and academic performance of university students: The mediating role of teacher support. *Frontiers in Psychology*, 16, 1463643. <https://doi.org/10.3389/fpsyg.2025.1463643>

- Castellanos, I., Pisoni, D., & Kronenberger, W. (2025).** Parents do understand: Agreement between self- and parent-reported psychosocial adjustment in adolescents with cochlear implants. *Journal of Speech, Language, and Hearing Research: JSLHR*, 68(7), 3385–3400.
https://doi.org/10.1044/2025_JSLHR-24-00497
- Cavicchiolo, E., Lucidi, F., Diotaiuti, P., Chirico, A., Galli, F., Manganelli, S., ... & Alivernini, F. (2022).** Adolescents' characteristics and peer relationships in class: A population study. *International Journal of Environmental Research and Public Health*, 19(15), 8907.
<https://doi.org/10.3390/ijerph19158907>
- Divya, T., & Manikandan, K. (2013).** *Perceived parenting style scale*. Department of Psychology, University of Calicut, Kerala, India.
- Eichengreen, A., Zaidman-Zait, A., Most, T., & Golik, G. (2021).** Resilience from childhood to young adulthood: Retrospective perspectives of deaf and hard of hearing people who studied in regular schools. *Psychology and Health*, 37(3), 331–349.
<https://doi.org/10.1080/08870446.2021.1905161>
- Fahim, D. F. M., Sayed, S. I., Abdelrazic, M. I., & Abuelela, I. S. (2025).** Emotional and behavioral problems in children and adolescents with hearing impairment. *BMC Pediatrics*, 25(1), 369.
<https://doi.org/10.1186/s12887-025-05696-4>
- Fellinger, J., Modersitzky, A., Schütze, G., & Höfer, C. (2024).** Effectiveness of mental health literacy programs for deaf and hard-of-hearing adolescents. *Journal of Adolescent Health*, 74(1), 160–166.
- Garain, S. (2025).** A study on the role of perceived parenting styles in shaping adolescent's resilience. *BMC Pediatrics*, 3(1), 42–49.
- Hardt, B., Heidenreich, T., Hunger-Schoppe, C., Adam, N., Heinen, J., Hopf, J., ... & Michalak, J. (2026).** Barriers and accessibility-improving strategies in mental health services for persons with hearing or vision impairments: Perspectives from professionals and clients-A qualitative interview study. *Psychology and Psychotherapy*, 99(1), 40–59.
<https://doi.org/10.1111/papt.70006>
- Hou, C., Wen, Y., Liu, X., & Dong, M. (2021).** Impacts of regional water shortage information disclosure on public acceptance of recycled water: Evidences from China's urban residents. *Journal of Cleaner Production*, 278, 123965.
- Johnson, P., Cawthon, S., Fink, B., Wendel, E., & Schoffstall, S.**

- (2018). Trauma and resilience among deaf individuals. *Journal of Deaf Studies and Deaf Education*, 23(4), 317–330.
- Khadka, R., Bhatt, A., Thapa, M., Sharma, A., Joshi, M., & Mishra, D. K. (2025).** Relationship of parenting styles on depression, anxiety, stress and self-esteem of adolescents. *PloS One*, 20(12), e0332854.
- Lan, X. (2020).** Grit and peer relationships in early adolescence: A person-centered approach. *Journal of Social and Personal Relationships*, 37(7), 2250–2269. <https://doi.org/10.1177/0265407520921557>
- Libbi, C., Frijns, J., Stronks, H., Eichengreen, A., Koutamanis, A., & Rieffe, C. (2026).** Affordances for deaf and hard of hearing students' social participation in mainstream school environments. *Journal of Environmental Psychology*, 111, 103028. <https://doi.org/10.1016/j.jenvp.2026.103028>
- McRae, R., Backholer, K., Adam, R., David, J., & O'Shea, A. (2025).** “At home, I never felt included, I always felt on the outside”: Deaf peoples' perspectives on how inadequate access to childhood communication influences mental health outcomes. *BMC Public Health*, 25(1), 2392. <https://doi.org/10.1186/s12889-025-23456-y>
- Morris, A. S., Ratliff, E. L., Cosgrove, K. T., & Steinberg, L. (2021).** We know even more things: A decade review of parenting research. *Journal of Research on Adolescence*, 31(4), 870–888.
- Najafi, A., & Ebrahimi Belil, F. (2023).** Investigating the predictability of social support and self-esteem on the resilience of students with chronic illness in the family. *Journal of Education and Health Promotion*, 12, 282.
- Naz, I., Akhtar, S., & Kazim, M. (2025).** Parenting attachment styles and resilience among adolescents with hearing impairment: Role of varying socioeconomic status. *Qlantic Journal of Social Sciences and Humanities*, 6(3), 103–111. <https://doi.org/10.55737/qjssh.vi-iii.25389>
- Qi, L., Zhang, H., Nie, R., & Du, Y. (2024).** Resilience promotes self-esteem in children and adolescents with hearing impairment: The mediating role of positive coping strategy. *Frontiers in Psychology*, 15, 1341215. <https://doi.org/10.3389/fpsyg.2024.1341215>
- Radovanović, V., Šestić, M. R., Kovačević, J., & Dimoski, S. (2020).** Factors Related to Personal Resiliency in Deaf and Hard-of-Hearing Adolescents. *Journal of*

Deaf Studies and Deaf Education, 25(4), 430–437.
<https://doi.org/10.1093/deafed/ena012>

Rajawat, V., & Chaturvedi, M. (2024). Parenting styles and academic stress: The mediating role of resilience and self-efficacy among Indian adolescents. *Journal of Adolescent Mental Health*, 16(2), 45–60.

Shao, Y., & Kang, S. (2022). The association between peer relationships and learning engagement among adolescents: The chain mediating roles of self-efficacy and academic resilience. *Frontiers in Psychology*, 13, 938756.
<https://doi.org/10.3389/fpsyg.2022.938756>

Shastri, U., Prakasan, N., Satheesan, L., Kumar, K., & Kalaiah, M. K. (2025). Parental stress, learned helplessness, and perceived social support in mothers of children with hearing loss and mothers of typically developing children. *Audiology Research*, 15(1), 1.
<https://doi.org/10.3390/audiolres15010001>

Shengyao, Y., Xuefen, L., Jenatabadi, H. S., Samsudin, N., Chunchun, K., & Ishak, Z. (2024). Emotional intelligence impacts on academic achievement and psychological well-being among university students: The mediating role of positive

psychological characteristics. *BMC Psychology*, 12(1), 389.
<https://doi.org/10.1186/s40359-024-01886-4>

Shukla, A., Harper, M., Pedersen, E., Goman, A., Suen, J., Price, C., ... & Reed, N. S. (2020). Hearing loss, loneliness, and social isolation: A systematic review. *Otolaryngology*, 162(5), 622–633.

Tsimpida, D., Sakr, H., Elwishahy, A., Chadha, S., Chitra, C., & Mahmoudian, S. (2026). Situational analysis of health systems for ear and hearing care in the World Health Organization (WHO) Eastern Mediterranean Region: A systematic review and evidence synthesis to inform national policies and strategies. *SSM - Health Systems*, 6, 100170.

Vulchanova, M., & Kjølstad Lervåg, I. (2021). Role of Subtitles in L2 Acquisition and Comprehension: A Pilot Study of Hearing-Impaired Students. *Languages*, 6(1), 17.
<https://doi.org/10.3390/languages6010017>

Wang, H. (2022). The effects of school climate, parent–child closeness, and peer relations on the problematic internet use of Chinese adolescents: Testing the mediating role of self-esteem and depression. *International Journal of Environmental Research and Public Health*, 19(13), 7583.
<https://doi.org/10.3390/ijerph191375>

83.

Wei, J., Gu, W., Xiao, H., & Nie, Y. (2025). How perceived positive parenting style protects against academic procrastination in children: The mediating roles of emotional resilience and school emotional engagement. *Behavioral Sciences (Basel, Switzerland)*, 15(7), 890. <https://doi.org/10.3390/bs15070890>

Wolbers, K., Dostal, H., & Spurgin, K. (2025). Variability in language and literacy outcomes among deaf elementary students in a national sample. *Behavioral Sciences (Basel, Switzerland)*, 15(8), 1100. <https://doi.org/10.3390/bs15081100>

World Health Organization. (2026). Deafness and Hearing Loss Fact Sheet. Geneva: WHO. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss>.

Wright, B., Hargate, R., Garside, M., Carr, G., Wakefield, T., Swanwick, R., ... & Simpson, P. (2021). A systematic scoping review of early interventions for parents of deaf infants. *BMC Pediatrics*, 21(1), 467. <https://doi.org/10.1186/s12887-021-02893-9>

Xiong, R., Li, S., & Xia, Y. (2020). A Longitudinal study of authoritative parenting, Juvenile Delinquency and Crime Victimization among Chinese Adolescents. *International Journal*

of Environmental Research and Public Health, 17(4), 1405.

Yang, Q., Hong, A., & Gu. N., (2024). The relationships among teacher support, peer support, students' resilience and attainment value in a STEAM competition. *Taylor & Francis Online*.

Effect of Benson Relaxation Technique on Clinical Outcomes of Patients Undergoing Arthroscopic Meniscus Surgery

Amina Elsayed Abd alazez¹, Hend Mohamed Elazazy², Waleed Mohamed Ewais³, Reda Abdel Salam Ibrahim⁴, Amany Kamal Mohamed⁵

¹Assistant Lecturer, Medical –Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

²Professor of Medical- Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

³Professor of Orthopedic Surgery, Faculty of Medicine, Tanta University, Egypt.

⁴Assist. Professor of Medical- Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

⁵Assist. Professor of Medical- Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

Corresponding Author: Amina Elsayed Abd alazez.

E-Mail : Amina_Elsayed@nursing.tanta.edu.eg

Abstract

Background: The most common postoperative complaints following arthroscopic meniscus surgery are pain, hemodynamic instability, activity intolerance and sleep difficulties. Benson relaxation technique (BRT) is one of the non-pharmacological methods for reducing postoperative complaints after arthroscopic surgeries. **Aim:** to evaluate effect of patients' clinical outcomes after arthroscopic meniscus surgery. **Design:** Aquasi-experimental study was used. **Setting:** The study was carried out in the orthopaedic departments of Tanta University New Surgical Hospital and Tanta International Education Hospital. **Subjects:** Purposive sample of (60) adult pre-operative arthroscopic meniscal surgery patients were involved in the current study, they were divided into two equal groups. The control group consists of thirty patients who were given standard hospital care. Study group; Consists of thirty patient who perform Benson relaxation technique. Four tools were used as follows. **Tool (I):** Orthopedic patient, Bio Socio- demographic data. It includes two parts: Part1: Patient's Bio-Socio-demographic characteristics, Part 2: Medical History and Vital Signs Measurement. **Tool (II):** - Groningen Sleep Quality Scale. **Tool (III):** Pain Numerical Rating scale. **Tool (IV):** Knee Outcome Survey-Activities of Daily living scale. **Results:** There were statistically significant effects of BRT on decreasing pain intensity, vital signs mean values, activity of daily living and improving quality of sleep among patients after arthroscopic meniscus surgery. **Conclusions:** Following arthroscopic meniscus surgery, The Benson relaxation technique significantly reduces pain, vital sign stability, sleep quality, and daily life activities. **Recommendations:** It's recommended that orthopedic department nursing teams should incorporate Benson Relaxation methods into the nursing care plan for this patient group.

Keywords: Arthroscopic meniscus surgery, Benson relaxation technique, patient's clinical outcomes.

Introduction

The knee joint is a hinge type synovial joint, which mainly allows for flexion and extension of lower limb. It is formed by articulations between the patella, femur and tibia. The most common musculoskeletal problems are knee injuries, which can be brought on by sudden falls or acute traumatic injuries like chronic recurrent overuse injuries **(Hoon, Chillakuru et al., 2025)**.

A meniscus is a crescent-shaped fibro-cartilaginous, In general terms, the term "meniscus" refers to either the medial or lateral meniscus, which is the cartilage of the knee. When the knee experiences tension and torsion, both cartilaginous tissues maintain its structural integrity **(Trivedi, & Jayasuriya, 2022)**.

Meniscal tears are thought to occur roughly 60 times per 100,000 population, and the prevalence of meniscal-related injuries is rising dramatically as a result of greater sports involvement and advanced diagnostic technology. With an incidence of 17 procedures per 100,000 people in the US, meniscus surgery became one of the most popular orthopedic procedures. **(Bhan, 2023)**.

The goals of arthroscopic meniscus surgery are to lower post-operative morbidity, increase range of motion, restore knee stability, and allow patients to resume their prior level of activity. Approximately 60% of individuals have resumed their pre-injury level of activity following arthroscopic surgery. However, 80–90% of patients who undergo arthroscopic meniscus surgery report positive outcomes, including less discomfort, stable knees, and a return to regular activity levels **(Castle, et al., 2023)**.

Recently, alternative and integrative health, which includes yoga, reflexology, massage therapy, relaxation, and coping skills training has drawn a lot of attention from researchers. Numerous nursing treatments are also being used as complementary therapies to aid minimize issues, eradicate a range of harms, and ease suffering. Recent research indicates that alternative and integrative health treatments may reduce patients' pain levels. **(Niyonkuru, et al., 2025)**.

Benson's relaxation technique, initially presented by Harvard physician Herbert Benson in 1975, is among the most widely used relaxation techniques. This method may induce the relaxation response by lessening autonomic nervous

system stimulation (**Khusniyati, et al., 2025**). Benson's relaxation technique has been proposed as a way to improve hemodynamic state and reduce pain. This method is easy to use, practical, affordable, and effective in lowering pain and sleep disturbances as well as the amount of medication required following invasive procedures (**Ali, et al., 2024**).

In nursing practice, minor to severe pain can be lessened by relaxation. It is also an effective method for lowering the use of analgesics. Relaxation has several advantages, including increased energy generation, less pain from muscle pressure, and improved sleep quality (**Vahedparast, et al., 2024**).

Significance of the study:

Post-operative arthroscopic meniscus surgery patients suffer from severe pain which affected their vital signs, sleep quality and their activity of daily living. So, in this study Benson's relaxation technique was used to maintain stable vital sings, improved sleep quality and restore normal activities of daily living. Benson's method of relaxation caused every muscle to completely relax and is an easy method for treatment of sleep disorders. As a kind of subjective stress management, relaxation techniques reduce mood swings, physical

discomfort, autonomic nervous system activity, and at the very least may have an impact on the quality of sleep (**Huggins, 2025**).

The aim of the study is to:

Evaluate the effect of Benson relaxation technique on patients' clinical outcomes after arthroscopic meniscus surgery.

Research hypothesis:

Study group patients who will perform Benson relaxation technique may exhibit less pain, stable vital signs, better sleep quality and normal daily living activities than control group.

Operational definitions:

In this study, **clinical outcomes** for patients undergoing meniscal arthroscopic surgery refer to reducing pain level of the injured knee, maintenance of stable vital signs, improved sleep quality and restore normal activities of daily living.

Subjects and Method

Research design:

The current study utilized a quasi-experimental research design.

Setting:

The study was conducted at orthopedic departments of Tanta International Education Hospital and orthopedic department at Tanta University new surgical hospital connected to Ministry of Higher Education and Scientific Research.

Subjects:

A purposive sample of (60) adult pre-operative arthroscopic meniscal surgery patients were included in the current study, they were split up into two equal groups, each with (30) patients:

A) The control group comprises thirty patients who received standard hospital treatment, including wound dressing, medication administration, vital signs monitoring, and sanitary care.

B) Study group: Consists of (30) patients who perform Benson Relaxation Technique plus the preceding mentioned standard routine of care.

Inclusion criteria of patients.

- Conscious patient.
- Patient aged between 21-60years.
- Both sex.
- Patients diagnosed with meniscus tears and scheduled for elective surgery.

Exclusion criteria of patients:

- Patients with fractures, deformity or osteoarthritis.
- Knee multiple ligamentous injuries.
- Patients with hemiparesis or hemiplegia.
- Patients who reject to participate in study

Data collection tools:

Four tools were used in the study.

Tool (I): Orthopedic patient, Bio Socio- demographic data. It includes two parts:

Part 1) Patient's Bio-Socio-demographic characteristics:

It includes patient code number, age, sex, marital status, educational level, occupation, sleeping pattern, smoking status and drinking caffeine.

Part 2) Medical History and Vital Sings Measurement:

It contains current complaints, prior hospital stays, prior surgeries, the kind of prior surgery, the reason for the injury, and vital sign measurements.

Tool (II): Groningen Sleep Quality Scale (GSQS).

It is a standardized scale which was developed by **Knufinke, et al. (2018)**, and adopted by the researcher for evaluating patient's sleep quality last night. It is composed of fifteen statements about the previous night's sleep.

Scoring system: The total score does not include the first question. For questions (2–7, 9, 11, 13–15), one mark was awarded if the response was "Yes," while for questions (8, 10, 12), one mark was awarded if the response was "No." The sum of the GSQS scores ranges from 0 to 14. Poor sleep the previous night was indicated by a maximum higher score of fourteen points.

The total scores of sleep quality were summed up and categorized as: Good sleep quality: if the score ranged from 0-4.

Fair sleep quality: if the score ranged from 5-9.

Poor sleep quality: if the score ranged from 10-14.

Tool (III): Pain Numerical Rating Scale.

It is a standardised scale adopted from **Chakrabartty (2020)**, to assess intensity of pain among studied patients. It was used to assess pain intensity before and after implementation of Benson relaxation technique. It represents a horizontal line with an (11) numeric range. It started from zero to ten, where 0 indicates no pain and 10 indicates the worst possible pain.

Pain score was divided into four main categories:

Zero: indicates no pain.

1-3 grades: indicate mild pain.

4-6 grades: indicate moderate pain.

7-10 grades: indicate severe pain.

Tool (IV): Knee Outcome Survey-Daily living Activities scale (ADL).

This is a patient self-report survey adopted from **Szczepanik (2023)** and adopted by researcher to evaluate daily living activities of patient's undergoing arthroscopic meniscus surgery repair postoperatively, it consists of 2 parts:

Part (1): Six factors pain, stiffness, swelling, giving way buckling, or shifting of the knee, weakness, and limping are signs and symptoms of the knee that affect the degree of daily activity.

The patient's reaction to the symptoms is scored from 0 to 5.

Part (2): Walking, climbing and descending stairs, standing, and getting out of a chair are the five components of this functional limitation of ADL.

ADL functional limitation questions are rated from 0 (I can't do the activity) to 5 (it's not difficult).

The total score is determined by adding the 11 previously mentioned factors' scores, which range from 0 to 55. An overall ADLS percent rating is calculated by dividing all item scores by 55 and then multiplying the result by 100. Greater percentages correspond to greater functional ability levels.

and calculated as follows:

Less than 31 low ADL.

From 31 to less than 47 moderate ADL.

From 47 to 55 high ADL.

- Ethical and legal consideration:

- a- The code number (572/1/2025) was received with approval from the Tanta University Faculty of Nursing's ethical and research committee.

- b- The study's design did not injure or hurt any of the entire patients.
- c- Each patient gave their informed consent after being told of the study's purpose.
- d- When collecting data, confidentiality and privacy were taken into account by utilizing codes rather than names, storing the data in a private laptop's safe file, and ensuring that the data would only be utilized for the study's objectives.

Validity of Tools:

Five specialists in medical surgical nursing from the nursing faculty and orthopedic field professors evaluated each instrument for content validity and questionnaire clarity, and any necessary modifications were made.

A pilot study:

It was done before the actual study on 10% of patients (6) patients, to evaluate the various tool items' clarity, viability, relevance, and applicability in order to identify any potential obstacles during the data gathering process.

- Reliability of the tool:

Alpha Cronbach's test was used to evaluate the reliability of all study tools. The results showed that, when alpha Cronbach was more than 0.5, the reliability of tools II, III, and IV was 0.845, 0.813, and 0.792, respectively.

- Data Collection:

- Data collection began in March 2025 and continued for nine months, ending in November 2025.

-Data were collected from patient who meet the study criteria.

-Each patient was interviewed four times, first one day pre-operative for explanation of Benson Relaxation Technique to study group. While second, third, and fourth time were carried out at 2nd, 4th and 7th post-operative day. The interview was done in the patient's room in orthopedic wards in addition to measuring patients' vital signs and complete the question concerned with sleep quality, pain level and to evaluate patient knee outcome daily living activities in three-time intervals.

The current study was directed through 4 stages (assessment, planning, implementation and evaluation) as the following:

A. Assessment phases

At the time of patients' admission, Tool (I); parts (1,2) were used to gather standard data and evaluate the patients who satisfied the study's inclusion requirements. Control group data was gathered first, followed by data from the study group to avoid interference and control group interactions.

B. Planning Phase:

Based on data that was gathered from the assessment phase and literature review, the researcher created an instructional handout in simple Arabic language to support the given information. That contained colored pictures with simple designs and simple note about Benson relaxation technique goal, benefits and steps.

C. Implementation phase

Pre-operative day: Every patient from both groups met individually for the first time one day pre-operatively. The interview was conducted at the patient's room. The study group patients were informed about the Benson relaxation technique, including its goals, benefits, steps, and anticipated outcome.

After explaining the technique to the patient, Benson relaxation technique was done as follows: **First**, the patient was advised to sit in a comfortable, relaxed position in low light, close eyes gently, relax muscles from face to feet, stay calm, breathe through nose and pay attention to his breathing. The patient silently repeats a word or phrase in accordance with their belief system while gradually exhaling through their mouth. The patient seeks to maintain relaxed muscles and breathe properly and comfortably.

Then, the patient is directed to open his eyes while sitting down for a few minutes. The patient is advised to sit quietly for a few minutes, first with their eyes closed and then with them open, and to allow relaxation to happen at its own rate rather than worrying about whether a profound level of relaxation has been attained. The patient is urged to make an effort to disregard distractions and show them no concern.

Benson relaxation technique was performed for twenty minutes for all patients in study group. The re-demonstration was applied according to the patient's needs. Each patient in the study group was encouraged to perform this technique for about twenty minutes every eight hours per day, in the morning, afternoon, and night.

D. Evaluation Phase:

Postoperative period: The patients from both groups were evaluated by the researcher on the morning of the second, fourth and seventh postoperative day. Using study tools II, III and IV to assess level of pain, sleep quality at night before and activity of daily living in addition to measuring vital signs after implementation of Benson relaxation technique.

A comparison between study and control groups results for the three postoperative days (second, fourth

and seventh postoperative day) was done to detect the impact of Benson relaxation techniques on level of pain, sleep quality, activity of daily living and vital signs among study group patients.

Results

Table (1) Demonstrate distribution of the patients according to their socio-demographic features among the studied groups. It was noticed that more than half (63.3%) of the patients in study group compared to less than half (46.7 %) of the patients in the control group were in the age group between (21-30) years old. Regarding sex, males predominated in both study and control groups (63.3% and 66.7%, respectively), Concerning occupation, manual workers represented the largest proportion in the study group (56.7%), compared to about quarter (26.7%) in the control group. In relation to education, more than half (53.3% - 66.7%) in study and control group respectively had university education.

Table (2) Displays distribution of the studied patients for their medical data across the studied groups. The results stated that the most frequent complaint among patients was sleep disturbance (80.0% in the study versus. 73.3% in the control). Regarding causes of

injury fewer than half of the patients in the study and control groups respectively reported that (46.7 % and 43.3%). their injury caused by sports.

Table (3) Presents distribution of patients according to their sleeping pattern among the studied groups.

The results found that high proportion of patients in both groups reported night sleep disturbance (80.0% in the study versus. 73.3% in the control), with pain being the main cause (70.0% and 60.0%, respectively). Regarding smoking, over half of the patients in the study and control groups did not smoke (66.7% and 76.7%, respectively). In terms of caffeine intake, less than half (43.3%) of the patients in the control groups and more than half (66.7%) of the patients in the study groups were found to consume caffeine. In the term of action that patients do to fall sleep, it was noticed that more than half of the patients in study group and nearly three quarters of control group were getting out of bed (54.2% and 72.7% respectively).

Table (4) Illustrates mean scores of vital signs of the studied patients throughout period of study. It was found that no significant differences were detected in temperature of both groups across the 2nd, 4th, and 7th post-operative days ($p > 0.05$), while there

were highly significant differences in other vital signs as; heart rate, respiratory rate, systolic and diastolic blood pressure among study group compared to control group at the 4th and 7th post-operative days ($p < 0.05$).

Figure (1) Presents distribution of the studied patients based on their overall quality of sleep across post-operative days (2nd, 4th, 7th). The study revealed that on the 2nd post-operative day, poor sleep quality predominated in both study (50.0%) and control groups (43.3%) with no significant difference ($p = 0.869$). By the 4th day, a significant shift was noted in the study group, where more than half (63.3%) achieved good sleep quality compared with only (23.3%) in the control group ($p = 0.007$). On the 7th day, the improvement became more pronounced, with (80.0%) of the study group reporting good sleep versus (26.7%) in the control group ($p < .001$).

Figure (2) Illustrates distribution of the studied patients related to their post-operative pain levels during (2nd, 4th, 7th post-operative days) using Pain Numerical Rating Scale. The study result found that on the 2nd day, all patients in both groups (100%) suffered from severe pain. By the 4th day, pain markedly decreased in the study group, where only (30.0%) reported mild and (70.0%)

moderate pain, compared to none with mild and 80.0% with moderate pain in the control group. On the 7th day, there was further improvement where 86.7% of the study group had no pain and 13.3% experiences mild pain, compared to none of control group patient who experienced no pain and 40% who had mild pain.

Figure (3) Shows the patients' distribution according to their overall level of daily living activities over the duration of the study, the study discovered that on the 2nd post-operative day, all participants in both groups (100.0%) were at a low level of ADL. By the 4th day, the study group showed clear progress, with 63.3% moving to a moderate level compared to 40.0% in the control group, while low total level of ADL remained higher in controls (60.0%) versus the study group (36.7%). By the 7th day, further improvement appeared in the study group, as 40.0% reached a high ADL total level and 33.3% had moderate level, compared with 10.0% and 40.0% respectively in the control group. The difference between both groups on the 7th day was statistically significant ($p = 0.021$), indicating better knee outcomes recovery in the study group.

Table (5) Describes that in the study group there was no significant

correlation between pain and either sleep quality or total level of ADL on the 2nd post-operative day ($p>0.05$). However, by the 4th day, a significant negative correlation (which means that whenever pain increases sleep quality and activity daily living decrease.) emerged between pain and sleep quality ($r=0.553$, $p=0.002$), while pain was inversely correlated with ADL ($r=-0.365$, $p=0.045$). On the 7th day, these associations became more pronounced showing a strong negative correlation with sleep quality ($r=0.653$, $p<0.001$) and a significant negative correlation with ADL ($r=-0.522$, $p=0.003$). In contrast, no significant correlations were observed in the control group across all time points ($p>0.05$).

Table (6) Illustrated that on the 2nd, 4th and 7th post-operative day, significant correlations were found in the study group between pain scores and all vital signs except temperature. In contrast, the control group showed significance correlation detected only for respiration ($r=0.349$, $p=0.013$), systolic pressure ($r=0.338$, $p=0.016$), and diastolic pressure ($r=0.282$, $p=0.048$) on the 7th day.

Table (1): Patients' distribution according to their sociodemographic characteristics throughout studied groups

Patient demographic and social characteristics	Study (30)		Control (30)		Chi-square	
	No	%	No	%	X ²	P-value
Age						
21 – 30	19	63.3	14	46.7	1.700	0.637
31- 40	6	20.0	9	30.0		
41 -50	2	6.7	3	10.0		
51-60	3	10.0	4	13.3		
Mean±SD	33.67 ± 10.26		34.39 ± 11.58			
Sex						
Male	19	63.3	20	66.7	0.073	0.787
Female	11	36.7	10	33.3		
Marital status						
Married	12	40.0	16	53.3	1.071	0.301
Single	18	60.0	14	46.7		
Occupation						
Not working	5	16.7	8	43.3	2.710	0.438
Office work	4	13.3	7	23.3		
Manual work	17	56.7	13	26.7		
Student	4	13.3	2	6.7		
Level of education						
Read and write	0	0.0	2	6.7	4.081	0.130
Secondary	14	46.7	8	26.7		
University	16	53.3	20	66.7		

Table (2): Distribution of patients according to their medical data among the studied groups

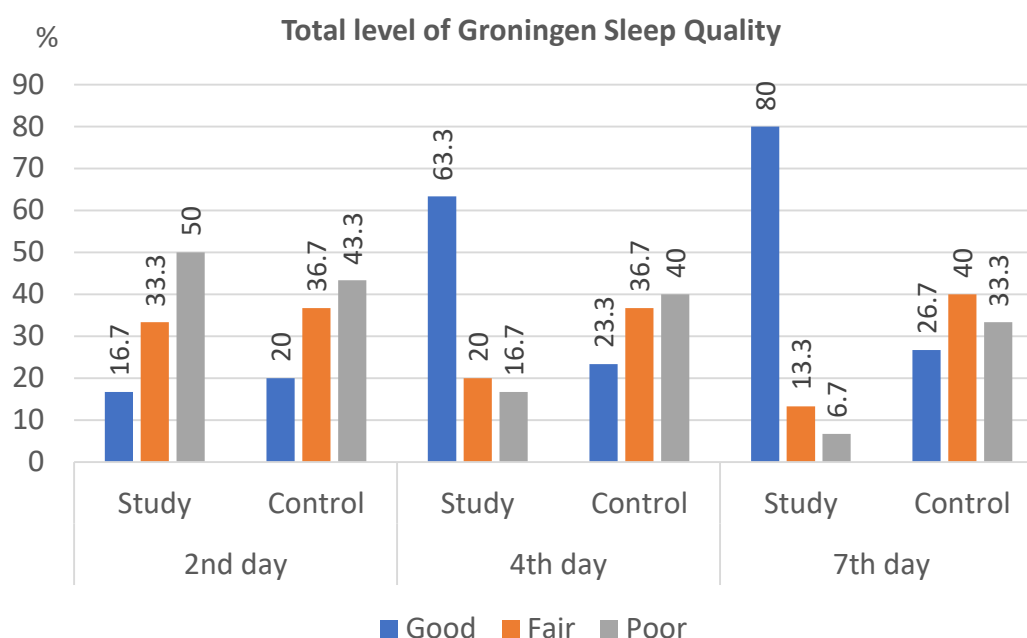
Patient's medical history	Study (30)		Control (30)		Chi-square	
	No	%	No	%	X ²	P-value
What is your present complaints						
Sleep disturbance	24	80.0	22	73.3	0.373	0.542
Sever pain	11	36.7	10	33.3	0.073	0.787
Activity intolerance	8	26.7	12	40.0	1.200	0.273
Swelling	10	33.3	9	30.0	0.077	0.781
Fever	7	23.3	11	36.7	1.270	0.260
Did you admitted to hospital previously						
Yes	6	20.0	2	6.7	2.308	0.129
No	24	80.0	28	93.3		
Duration of hospitalization	2.83±2.14		1.00±0.00		1.151	0.294
Previous surgeries						
Yes	5	16.7	1	3.3	2.963	0.085
No	25	83.3	29	96.7		
Cause of injury						
Sports injuries	14	46.7	13	43.3	1.820	0.935
Sudden change of direction	1	3.3	1	3.3		
Direct contact with object	2	6.7	2	6.7		
Motor vehicle Accidents	6	20.0	5	16.7		
Landing from a jump	1	3.3	1	3.3		
Falling down	5	16.7	8	26.7		
Unknown	1	3.3	0	0.0		

Table (3): Distribution of patients according to their pattern of sleep among the studied groups

Patient's sleeping pattern	Study (30)		Control (30)		Chi-square	
	No	%	No	%	X ²	P-value
Do you experience sleep disturbance at night						
Yes	24	80.0	22	73.3	0.373	0.542
No	6	20.0	8	26.7		
What are the causes of your sleep disturbance						
Pain	21	70.0	18	60.0	0.659	0.417
Go to bathroom	3	10.0	6	20.0	1.176	0.278
Whether	10	33.3	9	30.0	0.077	0.781
Medication	5	16.7	7	23.3	0.417	0.519
Smoking						
Yes	10	33.3	7	23.3	0.739	0.390
No	20	66.7	23	76.7		
Drinking caffeine						
Yes	20	66.7	13	43.3	3.300	0.069
No	10	33.3	17	56.7		
Number of days with sleep disturbances / week.	3.79±1.35		3.23±0.43		T=1.874	0.068
How many sleeping hour do you sleep per night	5.30±0.88		5.63±0.81		T=1.531	0.131
Taking day time naps						
Yes	21	70.0	16	53.3	1.763	0.184
No	9	30.0	14	46.7		
What do you do to get sleep when you have sleep disturbance						
Taking medication	1	4.2	0	0.0	5.834	0.212
Get out of the bed	13	54.2	16	72.7		
Drinking milk	2	8.3	0	0.0		
Taking bath	7	29.2	3	13.6		
Do nothing	1	4.2	3	13.6		

Table (4): Mean scores of vital signs of the studied patients throughout period of study

Vital Signs measurent	Study (30)		Control (30)		T-test	
	Mean	SD	Mean	SD	T	P-value
Temperature						
2 nd post-operative day	37.67	0.70	37.38	0.58	1.706	0.093
4 th post-operative day	37.16	0.41	37.30	0.41	1.359	0.179
7 th post-operative day	36.70	0.65	36.98	0.77	1.522	0.134
Pulse						
2 nd post-operative day	90.97	8.09	85.13	18.29	1.598	0.116
4 th post-operative day	84.53	6.94	89.97	11.75	2.180	0.033*
7 th post-operative day	80.60	6.55	91.00	10.37	4.643	<0.001*
Respiration						
2 nd post-operative day	20.23	1.50	19.80	2.35	0.850	0.399
4 th post-operative day	18.67	1.24	20.30	1.82	4.058	<0.001*
7 th post-operative day	18.17	0.91	19.87	1.57	5.127	<0.001*
Systolic blood pressure						
2 nd post-operative day	116.67	11.55	119.67	9.28	1.109	0.272
4 th post-operative day	107.67	5.04	113.67	10.33	2.858	0.006*
7 th post-operative day	109.33	6.91	116.00	10.37	2.929	0.005*
Diastolic blood pressure						
2 nd post-operative day	72.67	9.80	73.67	9.64	0.398	0.692
4 th post-operative day	72.00	4.07	76.33	6.69	3.032	0.004*
7 th post-operative day	70.00	7.43	78.00	10.95	3.311	0.002*

**Figure (1): Distribution of the studied patients according to their total level of sleep quality across post-operative days(2nd,4th,7th) using Groningen Sleep Quality Scale**

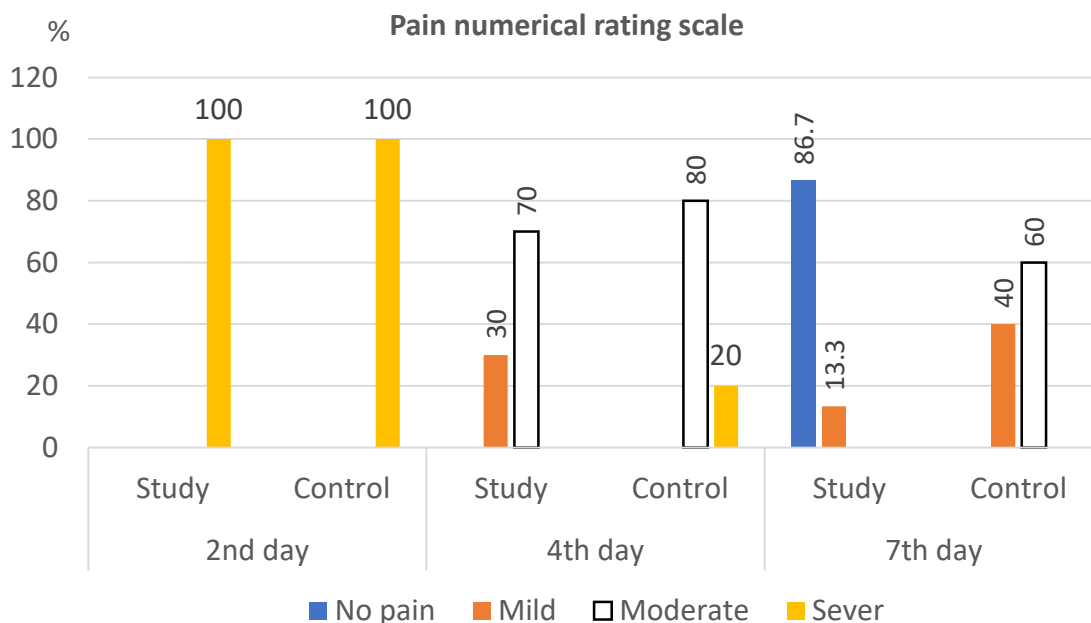


Figure (2): Distribution of the studied patients according to their post-operative pain levels during period of the study (2nd,4th,7th post- operative days) using Pain Numerical Rating Scale

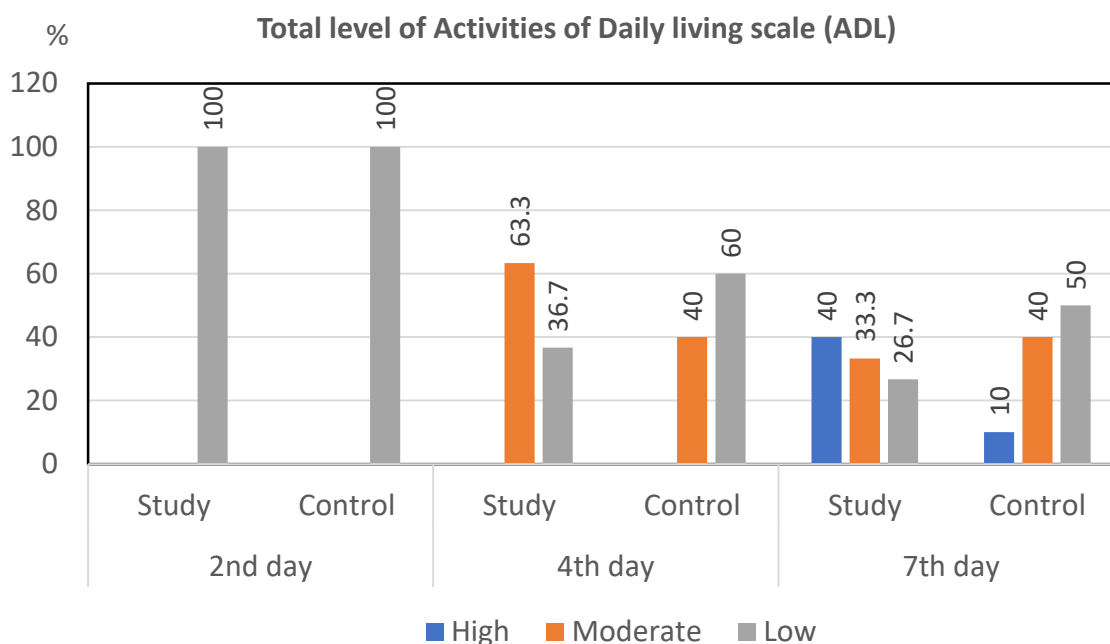


Figure (3): Demonstration of the studied patients in control and study groups regarding their total level of activities of daily living scale (ADL) throughout the period of the study

Table (5): Correlation between pain scores, sleep quality, and ADL levels among studied patients

	Pain numerical rating scale			
	Study (30)		Control (30)	
	r	P-value	r	P-value
2nd post-operative day				
Total Groningen Sleep Quality Scale	-0.277	0.138	-0.019	0.919
Total level of Activities of Daily living scale (ADL)	-0.098	0.605	-0.105	0.581
4th post-operative day				
Total Groningen Sleep Quality Scale	-0.553	0.002*	-0.037	0.846
Total level of Activities of Daily living scale (ADL)	-0.365	0.045*	-0.200	0.288
7th post-operative day				
Total Groningen Sleep Quality Scale	-0.653	<0.001*	-0.284	0.129
Total level of Activities of Daily living scale (ADL)	-0.522	0.003*	-0.163	0.389

Table (6): Correlation between pain scores and vital signs among studied patients

Vital signs	Pain numerical rating scale			
	Study (30)		Control (30)	
	r	P-value	r	P-value
2nd post-operative day				
Temperature	0.020	0.915	0.042	0.825
Pulse	0.354	0.009*	0.185	0.327
Respiration	0.298	0.028*	0.153	0.418
Systolic blood pressure	0.276	0.037*	0.191	0.311
Diastolic blood pressure	0.265	0.044*	0.133	0.482
4th post-operative day				
Temperature	0.169	0.241	0.146	0.312
Pulse	0.230	0.004*	0.272	0.056
Respiration	0.234	0.003*	0.245	0.086
Systolic blood pressure	0.381	<0.001*	0.233	0.104
Diastolic blood pressure	0.169	0.015*	0.203	0.157
7th post-operative day				
Temperature	0.245	0.086	0.005	0.975
Pulse	0.337	<0.001*	0.256	0.072
Respiration	0.378	<0.001*	0.349	0.013*
Systolic blood pressure	0.401	<0.001*	0.338	0.016*
Diastolic blood pressure	0.332	<0.001*	0.282	0.048*

Discussion

The rate of meniscal injuries has increased due to rising sports engagement and more degenerative tears. Nowadays, arthroscopy is the recommended course of action. Because of its smaller incision and faster recovery, arthroscopy is preferred over open treatments. (Elsenosy, et al., 2024). Post-operative patients are under regular nursing intervention, including managing surgical pain and the physiological changes that follow, as well as sleep difficulties. Nurse interventions, like relaxation techniques, have been utilized as an adjunct to treatment and sometimes as a substitute for prescription drugs. (Kulaksızoğlu, et al., 2025). Benson relaxation technique is an excellent choice due to its simplicity and ease of application. Its approach has been shown to improve hemodynamic state and lessen the intensity of pain. In addition to being simple to use, this approach is useful, economical, and efficient in reducing pain and sleep disturbances, thus reducing the quantity of medication needed after invasive procedures. (Gharehbaghi, Mirhosseini, et al., 2024). So, this study evaluates the impact of implementing Benson's relaxation technique on patients' outcome

following arthroscopic meniscus surgery.

Regarding to socio-demographic characteristics of the studied patients. The current study showed that more than half of the patients in study group and less than half in the control group were aged between (21-30) years old. This finding may be due to the greater need to regain a stable knee and return to sports as quickly as possible, particularly for adult active people with high-activity level. According to **Tanel et al. (2025)**, who examined younger age, longer surgical delays, and meniscal tears, most of the patients in this study were between the ages of 20 and 30. In the same way, **Barron et al. (2025)** found that the majority of patients were in the 20–40 age range.

In the other way, **Shamma, et al. (2025)**, who conduct study about arthroscopic meniscal repair using outside-in technique, stated that age of the patients was between 30 and forty years old. This was in the same way with **Sonesson, et al. (2024)**, who studied Knee arthroscopic surgery in middle-aged patients with meniscal symptoms, a 10-year follow-up, reported that patients' age was between 45 and 64 years old.

Regarding sex, the present investigation found that men made

up more than half of the patients in both the study and control groups. This finding may be related to males participating more in sports and activities than female. This result is similar with; **Sonesson, et al. (2024)**, who studied Knee arthroscopic surgery in middle-aged patients, **Andriolo, et al. (2025)** reported that most of the individuals under study were men.

On the other hand, this study is in difference with **Barron, et al. (2025)** who stated that majority of the studied patients were female. **Tsukisaka, et al. (2025)**, who stated that women were more likely than males to suffer a meniscus tear.

Regarding educational level, according to the study's findings, the majority of patients in both groups had college degrees. This is consistent with the findings of **Barron et al. (2025)**; **Sonesson et al. (2024)**, who said that the majority of their sample had a college degree. In contrast, it disagrees with, **Tang et al. (2025)** found that most of the groups under study had only an elementary education.

As regarding to mechanism of injury, the present study's findings showed that sports-related injuries affected around one-third of the patients in the studied groups. This could be caused by hyperextension, abruptly stopping or slowing down

motion, or changing positions when playing sports. This study supports the results of **Andriolo et al. (2025)**, who found that half of the patients' injuries were caused by participating in sports. **Marigi, et al. (2024)**, revealed that playing football was the primary cause of most injuries.

The current study's findings, however, contradict those of **Skou et al. (2022)**, who found that the majority of injuries among the patients under observation were accidental. **Venkataraman, et al. (2022)**, reported that injury among studied patients were due to twisting movements of the knee joint.

Concerning the sleeping pattern across the studied groups, the finding showed that high proportion of patients in both groups reported night sleep disturbance with pain being the main cause. This is in the same way with **LeBrun, et al. (2024)**; **Lowenstein, et al. (2024)**, who reported that the majority of the studied patients in both groups were suffering from severe pain that affects their normal sleeping pattern leadind to sleep disturbance

As regards smoking status, more than half of the patients in study and control group are non-smokers. Agree with **Barron, et al. (2025)**; **Turoń, et al. (2025)**, who reported that more than half of studied patients are non-smoker. In contrary,

it disagrees with **Anaspure, et al. (2024)** who described that majority of studied patients are smokers.

In terms of caffeine intake, it was observed that more than half of the patients in study groups and less than half of the patients in control groups are drinking caffeine which may be due to prevalence of males and traditional Egyptian habits of consuming caffeine specially in the morning. This agrees with **Lowenstein, et al. (2024)**, who revealed that over half of the individuals under study require coffee in order to function. On the other hand, it contradicts **Bhamare et al. (2025)** assertion that most of the patients under investigation do not consume caffeine.

As regards strategies to help sleeping, more than half of the patients in the study group and over three-quarters of the control group were found to be getting out of bed when they experienced sleep disturbances. This could be explained by doing something relaxing until they felt sleepy, which would help them fall back asleep. In the same line with **Goodwin, et al. (2024)** who recorded that more than half of the studied patient performed behavioral measures that help them to sleep which include getting out of bed. In contrast, the result differs from **Haider, et al. (2024)**, who

described that the majority of the studied patients in both groups using hypnotics drugs to sleep.

Regarding patients' sleep quality, the findings of the existing study revealed that on the second post-operative day, poor sleep quality observed in both studied groups with no significant difference. By the fourth day, a significant difference was noted in the study group, where more than half of patients achieved good sleep quality versus less than quarter in the control group. On the seventh day, the improvement became more noticeable with majority of the study group reporting good sleep versus patients in the control group. This indicates statistically significant improvement of sleep quality across study group patients as compared to control group due to the effect of Benson relaxation technique which support study hypothesis. This finding may be attributed to the point that Benson relaxation technique as a one of relaxation technique may improve quality of sleep by relaxing the body, decreasing the blood pressure, stimulating circulation and induce muscle relaxation.

These results agree with **Ibrahim, Ebeid, and Abd El-Aty (2022)**, who investigate how the Benson relaxation technique affects physiological measures, anxiety and

sleep quality in gestational hypertensive women. The result also is in the same line with **Ghandehari, et al. (2025)**, who evaluated Benson's Relaxation impact on Sleep Quality in Patients Undergoing Hemodialysis.

In contrast, the result of the current study disagrees with **Shahin, Osman, and Khalil (2025)**, who compared the effect of Benson's Versus Jacobson's Relaxation Methods on quality of sleep, and reported that Jacobson's Relaxation methods had better effect on sleep quality than Benson Relaxation Methods.

Concerning mean scores of vital signs of the studied patients throughout period of study. It was found that there were highly significant differences in vital signs as; heart rate, respiratory rate, systolic and diastolic blood pressure among study group versus to control group patients, temperature is excluded because no previous proof of the effect of Benson technique on it. This outcome can be explained by the fact that Benson relaxation effectively reduces the intensity of pain, promotes relaxation, enhances the quality of sleep, balances the anterior and posterior regions of the hypothalamus, lowers sympathetic system activity, lessens cardiac

activity and muscle spasms, and controls breathing.

This result agrees with **Vahedparast, et al. (2024)**. Who Studied the efficacy of Benson's Relaxation on anxiety and physiologic parameters after cesarean surgery. Also, **Mahfuz and Romadhon (2025)**, discussed the application of Benson relaxation technique to reduce blood pressure in hypertensive patients.

Regarding post-operative pain levels throughout study period, the result of the present study found that after implementation of Benson relaxation technique there was an improvement on the seventh post-operative day, where the majority of the study group had no pain compared with none of control group patient. This result emphasized the significant and positive effect of Benson relaxation technique on postoperative pain relief among patients after arthroscopic meniscus surgery.

This result might be clarified by the fact that the Benson relaxation technique induce pain relief by reducing muscle tension and stimulating the release of endorphins, which are naturally occurring analgesic neurotransmitters in neural synapses through cortical mechanisms as explained in a previous study

conducted by **Scintya and Sulastini (2023)**.

This results in the same line with, **Fadhila, Primanda and Suprianto (2025)**, Who evaluate the effects of Benson relaxation technique in managing exploratory laparotomy appendicitis patients and reported that Benson relaxation technique had significant effect on postoperative pain relief. On the other hand, the result disagrees with **Diningrat, Purnama and Koto (2024)**, who reported that Benson Relaxation had significant effect on pain level when companied with aromatherapy in post-appendectomy patients.

Regarding knee outcome activities of daily living, the current study's findings showed improvements and a statistically significant difference in the degree to which the groups under examination performed daily living activities. On the seventh post-operative day, patients' ability to carry out their activities increased due to a decrease in knee symptoms and an improvement in knee function, suggesting that the study group's knee outcomes recovered better.

This finding agrees with **Almeida, Bravo, and Santo (2024)**, who investigated the impact of electromyographic biofeedback training on quadriceps strength and health-related quality of life

following meniscectomy. They found that incorporating electromyographic biofeedback into a routine physiotherapy program after arthroscopic partial meniscectomy successfully increases quadriceps strength levels, enabling improved patients' activities of daily living during the first week following surgery. **In addition, Tanel et al. (2025)**, reported that knee symptoms improved as pain decreased within three to seven days post-operative leading to improvement of activities of daily living.

Conversely the result disagrees with **Pujol, et al. (2025)**, who explained that there are multiple rehabilitation recommendations for return to walking, work and sport with time frames often ranging between four and twelve weeks after arthroscopic meniscus surgery.

Regarding Correlation between pain scores, sleep quality and ADL levels among studied patients. The result of the present study showed that there was no significant correlation between pain and either sleep quality or total level of ADL on the second post-operative day of the study group. However, by the fourth day, a significant negative correlation emerged between pain and sleep quality, while pain was inversely correlated with ADL. On

the seventh day, these associations became more pronounced showing a strong negative correlation between pain with sleep quality and ADL. In contrast, no significant correlations were observed in the control group across all time points.

This finding is the same line with **Ebraheim and Ibrahim (2022)**, who studied the impact of the Benson relaxation technique on patients' pain, vital signs, anxiety, and quality of sleep following spine surgery and reported revealed the relationship between pain and sleep quality was highly statistically significant. Also, **Sirati, Pishgooie and Jadid-Milani (2024)**, explained the effect of benson's relaxation technique on the sleep quality of hospitalized patients and reported that there was statistically significant correlation between sleep quality and pain

On the other hand, **Moussa-Chamari, et al. (2024)**, observed the relationship between quality of life, sleep quality, mental health and physical activity in college students and reported that there was no statistically significant correlation between sleep quality, ADL and pain.

Regarding Correlation between pain scores and vital signs among studied patients. The result of the current study found significant

correlations in the study group between pain scores and all vital signs except temperature. In contrast, the control group showed significance correlation only for respiration, systolic pressure and diastolic pressure on the 7th day.

The strong correlation observed can be attributed to the release of catecholamines such as adrenaline and norepinephrine in response to pain. This biological "fight-or-flight" response leads to immediate peripheral vasoconstriction (elevated blood pressure), increased chronotropic effects (elevated heart rate), and a higher metabolic demand for oxygen (increased respiration). The lack of correlation with body temperature is medically consistent. While pain affects the autonomic nervous system's dynamic functions (heart and lungs), core temperature is primarily regulated by the hypothalamus in response to inflammatory mediators or infection, rather than the neural pathways of pain

This finding in the same line with, **Nadr and Mohammed (2022)**, who studied the impact of benson relaxation technique on pain, vital signs, sleep quality and anxiety among patients following spinal surgery, stated that there was highly statistically significant correlation between pain and vital signs except

body temperature. Also, **Bal and Gun (2024)**, studied the impact of acupressure on pain, anxiety and vital signs in patients undergoing coronary angiography and stated that there was statistical significant correlation between pain and vital signs.

On the other hand, the result disagrees with **Meuwissen, et al. (2025)**, who studied the autonomic function associated with pain processing in individuals with chronic pain, reported that in chronic pain, the relationship between the degree of subjective pain complaints and conservative vital signs is often non-existent or statistically insignificant. So, it is clinically incorrect to treat chronic pain by depending on normal vital signs.

Conclusion

The following conclusions can be drawn from the current study's findings: Benson relaxation technique after arthroscopic meniscus surgery has a positive statistically significant effect on improve pain intensity, vital signs values, quality of sleep and daily living activities among the study group as compared to control group. Therefore, it can be used as an effective nursing measure for decreasing pain, improving activity of daily living, vital signs, and quality of sleep after arthroscopic

meniscus surgery. These data validated and supported research hypothesis.

Recommendations

The following suggestions are made in light of the current study's findings:

For nurses: The nursing team should incorporate Benson relaxation technique (BRT) into the nursing care plan for arthroscopic orthopedic patients.

For assurance that nurses are knowledgeable of the (BRT), its advantages, and how to apply it, regular in-service training programs, such as workshops and conferences, should be organized.

Future research: To increase the generalizability of the results, expand the study's geographic scope and sample size.

Inspecting the effect of the Benson relaxation technique on pre and post-operative stress and quality of life.

Compare the effect of Benson relaxation with other relaxation methods in the future.

References

Ali Ahmed, A., Ali Mohamed, A., Hussein Khalil, E. N., Besely, W., & Abdelbaky, M. (2024). Dyspnea, fatigue and sleep quality post cardiac surgeries: Effect of selected relaxation techniques. *Egyptian Journal of Health Care*, 15(2), 1803-1815.

- Almeida, M. B., Bravo, A., & Santo, J. E. (2024).** Effects of Electromyographic Biofeedback Training After Meniscectomy on Quadriceps Strength and Health Related Quality of Life: A Randomized Controlled Trial. *International Workshop on Gerontechnology*, (24-37). Cham: Springer Nature Switzerland.
- Anaspure, O., Patel, S., Baumann, A. N., Anastasio, A. T., Walley, K. C., Kelly, J. D., & Lau, B. C. (2024).** Examining the evidence regarding smoking and patient outcomes for isolated meniscus pathology: A comprehensive systematic review and meta-analysis. *Life*, 14(5), 584.
- Andriolo, L., Marin Fermin, T., Chiari Gaggia, G. M. M., Serner, A., Kon, E., Papakostas, E., & Filardo, G. (2025).** Knee cartilage injuries in football players: clinical outcomes and return to sport after surgical treatment: A systematic review of the literature. *Cartilage*, 16(1), 46-60.
- Bal, S. K., & Gun, M. (2024).** The effects of acupuncture on pain, anxiety and vital signs in patients undergoing coronary angiography: A randomized and sham-controlled trial. *Explore*, 20(1), 101-109.
- Barron, D. W., Gill, V. S., Boddu, S. P., Beckett, N. C., Tummala, S. V., & Chhabra, A. (2025).** Low income, younger age, female sex, and poor mental health are risk factors for diminished access to care among patients with Meniscus Tears. *Arthroscopy, Sports Medicine, and Rehabilitation*, 7(2), 101064.
- Bhamare, D. S., Kamble, S., Kishore, J. V., Kamble, R., Hajare, R., Bhamare, D. S., & Kishore, J. V. S. (2025).** Assessment of safety and functional outcomes of arthroscopic meniscal repair surgery using sure stitch all-inside implant. *Cureus*, 17(8).
- Bhan, K. (2023).** Meniscal tears: Current understanding, diagnosis, and management. *Cureus*, 12(6).
- Castle, J. P., Jildeh, T. R., Chaudhry, F., Turner, E. H., Abbas, M. J., Mahmoud, O., & Lynch, T. S. (2023).** Machine learning model identifies preoperative opioid use, male sex, and elevated body mass index as predictive factors for prolonged opioid consumption following arthroscopic meniscal surgery. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, 39(6), 1505-1511.
- Diningrat, I. P., Purnama, A., & Koto, Y. (2024).** The effect of Benson Relaxation and Aromatherapy on Pain Levels in Post-Appendectomy Patients at Dr. M. Hassan Toto Air Force Hospital in 2024. *Journal of Nursing Education and Practice*, 4(2), 76-92.

- Diningrat, I. P., Purnama, A., & Koto, Y. (2024).** The effect of Benson Relaxation and Aromatherapy on Pain Levels in Post-Appendectomy Patients at Dr. M. Hassan Toto Air Force Hospital in 2024. *Journal of Nursing Education and Practice*, 4(2), 76-92.
- Elsenosy, A. M., Elnewishy, A., & Delewar, R. A. (2024).** Efficacy of Arthroscopic Meniscal Surgery Versus Conservative Management on Knee Pain and Functional Outcomes: A meta-analysis of randomized controlled trials. *Cureus*, 16(11).
- Fadhila, Y. L. N., Primanda, Y., & Suprianto, S. (2025).** The effects of Benson Relaxation Therapy in Exploratory Laparotomy Appendicitis: A case study. *Jurnal Kesehatan Saintika Meditory*, 8(2), 52-62.
- Gharehbaghi, M., Mirhosseini, S., Minaei-Moghadam, S., Salari, M., Grimwood, S., & Vaghee, S. (2024).** Benson relaxation technique to address sleep quality and aggression among patients with bipolar type I disorder: A randomized clinical trial study. *Heliyon*, 10(9).
- Goodwin, T. M., Brazier, B. G., Cien, A. J., Riggle, P. K., Popovich, J. M., Penny, P. C., & Cochran, J. M. (2024).** The effect of postoperative sleeping position on knee extension and range of motion following primary total knee arthroplasty. *Orthopaedic Nursing*, 43(4), 218-222.
- Haider, M. A., Lawrence, K. W., Christensen, T., Schwarzkopf, R., Macaulay, W., & Rozell, J. C. (2024).** Does melatonin improve sleep following primary total knee arthroplasty? A randomized, double-blind, placebo-controlled trial. *The Journal of Arthroplasty*, 39(8), S154-S160.
- Hoon, T., Chillakuru, R., & Ganti, L. (2025).** Tears, Tendons, and Trends: A Bibliometric Analysis on Anterior Cruciate Ligament Research. *Orthopedic Reviews*, 17, 142052.
- Ibrahim, S. S., Ebeid, I. A. S., & Abd El-Aty, E. M. (2022).** Efficacy of Benson relaxation technique on physiological parameters, anxiety and sleep quality among gestational hypertensive women. *Assiut Scientific Nursing Journal*, 10(29), 14-25.
- Khusniyati, N., Herawati, T., Amelia, A., & Dyaningtyas, H. E. (2025).** The effectiveness of Benson Relaxation Technique and Slow Deep Breathing on Sleep Quality in Post-Cardiac Surgery Patients. *Indonesian Nursing Journal of Education and Clinic (Injec)*, 20(1), 18-25.
- Kulaksızoğlu, H., Taylan, S., & Aslan, F. E. (2025).** Mapping the nursing literature on postoperative pain: A bibliometric

- analysis. *Journal of Peri Anesthesia Nursing*, 1(10).
- LeBrun, D. G., Grubel, J., Ong, J., Chiu, Y. F., Blevins, J. L., Haas, S. B., & Chalmers, B. P. (2024).** The John N. Insall Award: does melatonin improve subjective sleep quality after total knee arthroplasty? A randomized, placebo-controlled trial. *The Journal of Arthroplasty*, 39(8), S15-S21.
- Lowenstein, N., Mazzocca, J., Osada, K., Collins, J., & Matzkin, E. G. (2024).** Poster 270: Resolution of pain at night and improved functional outcomes following Arthroscopic Partial Meniscectomy. *Orthopedic Journal of Sports Medicine*, 12(7 suppl2), 2325967124S00237.
- Mahfuz, R., & Romadhon, L. W. (2025).** Application of Benson Relaxation Technique to reduce Blood Pressure in Hypertensive Patients at ICCU Ward of RSD Gunung Jati, Cirebon City. *INDOGENIUS*, 4(2A), 48-53.
- Marigi, E. M., Davies, M. R., Marx, R. G., Rodeo, S. A., & Williams, R. J. (2024).** Meniscus tears in elite athletes: Treatment considerations, clinical outcomes, and return to play. *Current Reviews in Musculoskeletal Medicine*, 17(8), 313-320.
- Meuwissen, I., Quaadvliet, C., Meeus, M., Meus, T., & Mertens, M. G. (2025).** Is Autonomic function associated with (Central) Pain processing in individuals with Chronic Pain? A systematic review. *Int J Pain*, 16, 3-18.
- Moussa-Chamari, I., Farooq, A., Romdhani, M., Washif, J. A., Bakare, U., Helmy, M., ... & Hue, O. (2024).** The relationship between quality of life, sleep quality, mental health, and physical activity in an international sample of college students: A structural equation modeling approach. *Frontiers in Public Health*, 12, 1397924.
- Nadr E. M., & Mohammed I. Z. (2022).** Effect of Benson Relaxation Technique on Pain, vital signs, sleep quality and anxiety among patients after Spinal Surgery. *Egyptian Journal of Health Care*, 13(1), 2204-2222.
- Niyonkuru, E., Iqbal, M. A., Zhang, X., & Ma, P. (2025).** Complementary approaches to postoperative pain management: A review of non-pharmacological interventions. *Pain and Therapy*, 14(1), 121-144.
- Scintya, F., & Sulastini, S. (2023).** Benson Relaxation Technique for post Orif Patient on Indications of Multiple Fractures of Femur, Tibia, and Humerus Dextra: Case study. *Nursing Case Insight Journal*, 1(01), 1-4.
- Shahin, H. E. A., Osman, H. A., & Khalil, A. K. (2025).** Effect of Benson's Versus Jacobson's

- Relaxation Methods on Primigravida Sleep Quality. *International Egyptian Journal of Nursing Sciences and Research*, 6(2), 328-344.
- Shamma, A. E. H., El-kader, A., Gamal, M., & Dewidar, M. E. E. (2025).** Arthroscopic Meniscal Repair using outside-in technique. *Al-Azhar International Medical Journal*, 2025(6), 123-127.
- Sirati, M., Pishgooie, S. A., & Jadid-Milani, M. (2024).** The effect of Benson's sedation on the sleep quality of hospitalized elderly: A randomized controlled trial. *Journal of Nursing Advances in Clinical Sciences*, 1(4), 193-198.
- Skou, S. T., Hölmich, P., Lind, M., Jensen, H. P., Jensen, C., Garval, M., & Thorlund, J. B. (2022).** Early surgery or exercise and education for meniscal tears in young adults. *NEJM Evidence*, 1(2), EVIDoa2100038.
- Sonesson, S., Springer, I., Yakob, J., Hedevid, H., Gauffin, H., & Kvist, J. (2024).** Knee arthroscopic surgery in middle-aged patients with meniscal symptoms: A 10-year follow-up of a prospective, randomized controlled trial. *The American Journal of Sports Medicine*, 52(9), 2250-2259.
- Tanel, L., Fayard, J. M., Mouton, C., Lambrey, P. J., Letartre, R., Graveleau, N., ... & Thaunat, M. (2025).** Younger age longer delays to surgery and meniscal tears are associated with a smaller ACL remnant: An analysis from the registry of the Francophone Arthroscopic Society. *Knee Surgery, Sports Traumatology, Arthroscopy*, 33(5), 1658-1666.
- Tang, F., Xu, P., Jiang, C., Ke, X., Huang, D., Dai, Y., ... & Wang, S. (2025).** Current status and factors influencing Kinesio phobia in patients with meniscus injury: A cross-sectional study. *Journal of Orthopaedic Surgery and Research*, 20(1), 113.
- Trivedi, J., & Jayasuriya, C. T. (2022).** Meniscus tissue engineering and repair. *Musculoskeletal Tissue Engineering* (pp.107-132). Elsevier.
- Tsukisaka, J., Nakamae, A., Tsukisaka, K., Shimizu, R., Yamanashi, Y., Nekomoto, A., & Adachi, N. (2025).** Older age, higher BMI, female sex and meniscal repair are predictors of inferior patient-reported outcomes 1 year after ACL reconstruction. *Knee Surgery, Sports Traumatology, Arthroscopy*, 6(21).
- Turoń, B., Malkowski, D., Zabrzyńska, M., Buczkowski, K., Erdman, J., Wilk, M., ... & Zabrzyński, J. (2025).** Relationships between smoking, high BMI and the results of arthroscopic treatment of isolated

medial meniscus tear—a cross-sectional study. *BMC Musculoskeletal Disorders*, 26(1), 846.

Vahedparast, H., Samsami, K., Hajinezhad, F., Tavallali, F., & Bagherzadeh, R. (2024).

Comparing the efficacy of foot Reflexology and Benson's Relaxation on Anxiety and physiologic parameters after Cesarean Surgery. *Nursing for Women's Health*, 28(4), e1-e12.

Venkataraman, S., Ethiraj, P., Shanthappa, A. H., & Vellingiri, K. (2022).

Association of meniscus injuries in patients with anterior cruciate ligament injuries. *Cureus*, 14(6).

Zorigtbaatar, O., Minjuurdorj, N. E., Sosor, B., Dagvasumberel, G., Gombojav, B., & Lkhagvasuren, N. (2025).

Personalized surgical decision-making in Meniscal Tears: Short-term outcomes of repair vs. partial Meniscectomy in Mongolian Patients. *Journal of Personalized Medicine*, 15(12), 57.

Relation between Parental Phubbing and Cyberbullying among University Students

Afaf Abdlaziz Basal¹, Ahmed Ibrahim Elaghoury², Abdallah Khairy Attia³,
Abdallah Mohammed El-Ahmar⁴, Abdulrahman Mohammad El-Kronz⁵,
Maria Wafeek Eltaweel⁶, Mai Serag Elden El Zayat⁷, Sahar Mahmoud El-
Khedr Abdelgawad⁸, Heba Kamal Obied⁹

¹Professor of Medical Surgical Nursing, Faculty of Nursing, Tanta University, Egypt.

²Assistant Lecturer of Psychiatric and Mental Health Nursing, Faculty of Nursing, Tanta University.

^{3,7}4th Year Nursing Students, Faculty of Nursing, Tanta University, Egypt.

⁸Professor of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt.

⁹Professor of Nursing Administration, Faculty of Nursing, Tanta University, Egypt.

Corresponding author: Heba Kamal Obied

Email: heba.obied@nursing.tanta.edu.eg

Abstract:

Background: Occupied parents with smart phones neglecting their youngsters, can lead to feelings of isolation and detachment, that manifest itself as cyberbullying – a way for teens gain approval from others online and fit in. **Aim** of the study was to explore the relation between parental phubbing and cyberbullying among university students. **Study design:** Present study utilized descriptive correlational design. **Settings:** The study was conducted at Tanta University affiliated to the Ministry of High Education and Scientific research from four faculties of the university were randomly selected. **Subjects:** A sample of 1881 students were randomly selected from the previously mentioned setting. **Tools:** Two tools were used to collect the study data, Faculty Students' Parental Phubbing Questionnaire and Faculty Students' Cyberbullying Scale. **Results:** 44.2% of faculty students reported moderate levels of parental phubbing, also 85.2% had low level regarding total cyberbullying. 81.4% of faculty students had low levels of cyberbullying victimization. **Conclusion:** There was no statistically significant correlation between faculty students' perception regarding parental phubbing and cyberbullying victimization. There was a highly statistically significant positive correlation between faculty students' cyberbullying perpetration and cyberbullying victimization. **Recommendations:** Universities administration need to include digital citizenship and appropriate online behavior in academic courses and apply freshman orientation programs.

Keywords: Cyberbullying, Parental Phubbing, University Students.

Introduction

The widespread use of internet resources by faculty students caused the emergence of Problematic Internet Use (PIU) in their adolescence developmental process, where significant changes arise regarding social, cognitive, emotional as well as behavioral domains (**Özaslan, Yıldırım, Güney, Güzel & İşeri, 2022**). Smartphone utilization invades all aspects of human daily life because of the rapid advancement in technology and data innovation. Smartphone enable persons to use numerous applications ranging from social media, educational, artistic, gaming, in addition to ask for artificial intelligence assistance. In January 2022, mobile connections in Egypt were equal to 93.4% of the country's entire population, according to Intelligence Group Special Mobile Association (GSMA). The number of mobile connections in Egypt increased by 1.9 million between 2021 and 2022 (**Global Digital Insights- Datareportal, 2022**). Smartphones are frequently utilized when spending time with friends and family, that generated a lot of discussions around civility and smartphone utilization (**Molina, 2017**).

The act of ignoring someone in a social situation by staring at phone

instead of paying attention to them is known as phubbing. This phenomenon has become more prevalent and has been associated with damaging effects on interpersonal communication, resulting in unsatisfactory relationships that lack the feeling of personal well-being, which is important for faculty students as adolescents (**Baranova, Kobicheva & Tokareva, 2022**).

Phubbing can be felt as distracting and undermining the benefits of social interactions (**Dwyer, Kushlev & Dunn, 2018**). The harmful effects of excessive smartphone usage on interpersonal connections can influence the faculty students' quality-of-life. Communication skills are crucial competency for nursing students and excessive smartphone use might prevent them from developing interpersonal ties and effective communication skills (**Han, Park & Kim, 2022**). Despite cyberbullying being regarded as a new form of bullying, it is contextualized within the broader bullying literature. It is viewed as intentional, repeated negative unpleasant and hurtful behavior by one or more person directed against a person who has difficulty defending him/herself (**Celik, Hopkins & O'Reilly, 2023; Macaulay, Betts, Stiller & Kellezi, 2022**).

Bullying can be perpetrated in-person or via electronic means. Cyber bullying or online bullying is a form of bullying or harassment using electronic communication technologies means. It includes direct messaging particularly through social media websites, and a range of electronic applications and other websites. Almost one of every two persons worldwide use the internet, and one billion households have internet access. The widespread adoption of information and communication technology, particularly among younger generations, has fundamentally altered the way our society consumes information, and, consequently, the ways in which persons communicate and engage with one another (Martínez, Delgado, García & Ruíz, 2020). Although, the utilization of innovative technologies has some positive effects; it also has certain issues regarding the improper application (Gönültaş, 2022; Martínez, Delgado, García & Ruíz, 2020; Sarfo, Amadu, & Ansah 2023) stated that over 59% of the world's population makes use of the Internet, making it one of the most widely utilized and significant communication channels. Furthermore, this rate can get as high as 95% in developed countries.

Adorjan, Langgartner, Maywald, Karch and Pogarell (2021) found that 99.2% of college students use the Internet, with 24.8% exhibiting online addiction. Also, **Alrajeh, Hassan, Al-Ahmed and Alsayed (2021)** found that 6.8% of them engaged in cyberbullying and 29.2% of them were victims of cyberbullying.

Searching for the link between parent-student phubbing and the prevalence of cyberbullying is crucial. When parents neglect to show consideration to their youngsters, instead opting to preoccupy themselves with phones or other devices, it can lead to feelings of loneliness and disconnection in their teens. This can then often manifest itself as cyberbullying – a way for teens gain approval from others online and fit in. Studies have found that teens exposed extensively to parental technology preoccupation were more likely to experience psychological distress and social exclusion, which in turn cause them to act out within digital spaces increasing the aggression. So, parental Phubbing, as a medium of alienation from one's parent, is acknowledged as a fact to be linked with heightened levels of aggression among teen students in the cyberspace (Aatif & Sujata, 2025; Qu, Lei, Wang, Xie & Wang, 2022;

Ren, Wesselmann & Williams, 2018).

Significance of the study:

Different studies pointed to the impact of parental phubbing on adopting aggressive attitude as cyberbullying among university students. So, it is important to understand the repercussions of parental phubbing on university students. Particularly because parental phubbing does not only affect the teen students but also affect all others who interact with them like families and friends. Moreover, students at universities encounter not only academic but also additional psychological problems because of cyberbullying. It's an international problem that needs to get more attention from the local and global perspectives and take effective steps to keep students safe (Patchin & Hinduja, 2015; Wang, Chen & Liang, 2020; Yang, Zeng & Wang, 2024). To manage the problem, it requires understanding how big the problem has gotten, and the forms of cyberbullying in action. Our study offers an opportunity to elucidate the associations between parental phubbing and cyberbullying among university students.

Aim of the study

The aim of the study was to explore the relation between parental

phubbing and cyberbullying among university students.

Research questions:

1. What are the levels of university students' perception regarding parental phubbing?
2. What are the levels of cyberbullying among university students?
3. What is the relationship between parental phubbing and cyberbullying among university students?

Subjects and Method

Study design:

A descriptive correlational design was utilized in the present study.

Settings:

The study was conducted at Tanta University. Tanta University comprises 13 faculties in addition to a Technical Institute of nursing, affiliated to the Ministry of High Education and Scientific research. The faculties were stratified into two strata which are mainly theoretical and practical. Two faculties (premises) were in turn randomly selected from each stratum.

Subjects:

A sample of 1881 students was randomly selected where 403 students from Faculty of Science, 658 students from Faculty of Nursing, 408 students from Faculty of Education, and 412 students from Faculty of Arts, during the academic year 2022-2023.

The sample size was calculated using Epi-Info software statistical package created by World Health organization and center for Disease Control and Prevention, Atlanta, Georgia, USA version 2002. The criteria used for sample size calculation were as follows:

- 95% confidence limit.
- Expected outcome is 50% with a 5% margin of error.

Tools of data collection:

To achieve the aim of the study, two tools were used.

Tool I: Faculty Students' Parental Phubbing Questionnaire.

It consisted of two parts:

Part one: Students' socio-demographic data: included age, sex, academic year, marital status, residence, parents' education and occupation, and stability of parents' marriage.

Part two: Faculty students' parental phubbing questionnaire:

It was developed by researchers based on Wang et al. (2020); Pancani, Gerosa, Gui and Riva (2021), to assess the levels of parental phubbing behavior among faculty students. It comprised 9 items. It used Likert type scale. Students were asked to give one of the following 5 responses to each item: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), 5 (strongly agree). The total scale score ranges from 9 to 45 with

the higher scores indicate greater levels of parental phubbing.

Scoring system:

- From 9 to 18 represented a very low level of parental phubbing behavior. "Faculty student perceived their parent as rarely using cell phone when they were together and paying attention to them".
- From 19 to 27 represented a low level of parental phubbing behavior. "Faculty student perceived their parent as sometimes using cell phone when they were together, but it does not happen frequently and does not interfere with their interactions".
- From 28 to 36 represented a moderate level of parental phubbing behavior. "Faculty student perceived their parent as using cell phone when they were together more frequently and it sometimes interferes with their interactions".
- From 37 to 45 represented a high level of parental phubbing behavior. "Faculty student perceived their parent as frequently using cell phone when they were together and it significantly interferes their interactions" (Wang et al., 2020).

Tool II: Faculty Students' Cyberbullying Scale

It was developed by Justin, Patchin and Sameer (2015). This scale was used to assess the frequency of cyberbullying perpetration and victimization. It was comprised of

18-items distributed into perpetration subscale (9 items) and victimization subscale (9 items). It used Likert type scale. Students were asked to give one of the following 5 responses for each item: 0 (never), 1 (once), 2 (a few times), 3 (several times), and 4 (many times).

Scoring system:

- For Cyberbullying Perpetration Scale: mild 0-9, moderate 10-18, and severe 19-36.
- For Cyberbullying Victimization Scale: mild 0-9, moderate 10-18, and severe 19-36 (**Justin, Patchin & Sameer, 2015**).

Method

1. An Official letter clarifying the purpose of the study was obtained from Dean of Faculty of Nursing to Deans of the selected Faculties to obtain permission for data collection.

2. Ethical considerations:

- The research proposal was approved by The Scientific Research Ethical Committee, Faculty of Nursing cod no. (283-7-2022).
- Informed consents were obtained from the students after explanation of the purpose of the study.
- The students were reassured about the confidentiality and the privacy of their obtained information.
- The students' right to withdraw at any time during data collection was guaranteed.

- Privacy, humanity and confidentiality of the students' data was assured.
 - The study did not cause any harm to the study participants.
3. The study tools were developed and translated into Arabic by the researcher.
 4. Tools of the study (I and II) were tested for content validity by five experts in psychiatric field.
 5. Suitable statistical test analysis was used for testing the reliability of all tools. The Content Validity Index was 88% and 91% for tools I and II respectively.
 6. A pilot study was carried out on 10% (181 students) of the sample from the previously mentioned settings to test the feasibility and applicability of the tools, it serves to estimate the approximate time required for interviewing the students as well as identifying obstacles that may be faced during data collection. Accordingly, necessary modifications were made and the data obtained was excluded from the study.
 7. Reliability of tools was tested using Cronbach Alpha Coefficient test. Reliability of **tool (I)** was 0.808, and reliability of **tool (II)** was =0.850.
 8. The tools of the study were distributed to the students on a group basis who were asked to fill in the questionnaire in the presence of the researchers to clarify any

misunderstanding for the students. The data collection was carried out in the second semester (from 1 June to 30 August) of the academic year 2022-2023.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS version 20 (Statistical Package for Social Studies) created by IBM, Illinois, Chicago, USA. For categorical variable the number and percentage were calculated and differences between subcategories were tested by chi square (χ^2). When chi square was not appropriate, Monte Carlo exact test. The correlation between two variables was calculated using Pearson's correlation coefficient. The level of significance was adopted at $p < 0.05$.

Results

Table (1): Shows faculty students' socio-demographic data. More than two fifth (42.58%) of students were under 20 years old, with a mean age of 20 ± 1.56 . More than two-thirds (68.79%) of the students were female, while the rest (31.21%) are male. Regarding students' residence, more than half (59.81%) of them lived in rural areas. More than one third (34.88%) of students were enrolled in the first year, followed by more than quarter (25.94%) enrolled in the second year. Majority (95.27%) of the students were single.

Regarding parents' education, the highest percentage (47.63% and 24.67 %) of fathers had secondary and university degrees, and (41.79% and 31.42%) of mothers had secondary and university education, respectively. Students reported high percentage (89.85% and 62.84%) of their fathers and mothers were employed, respectively. Majority (89.58%) of the students reported stable relationships between parents.

Figure (1): Shows distribution of the students according to faculty. The highest percentage (35%) of the students were from Faculty of Nursing, while nearly equal percent (21.9%, 21.7%, and 21.4%) of the students were from Faculty of Arts, Education, and Science respectively.

Figure (2): Illustrates faculty students' perception of parental phubbing. About half (49.5%) of faculty students perceived low levels of parental phubbing, while more than two fifth (44.2%) reported moderate levels, and only less than one tenth (6.3%) had high levels of parental phubbing.

Figure (3): Portrays faculty students' perception levels of total cyberbullying perpetration. Majority (85.2%) of faculty students had low level, while only less than tenth (8.8% and 6%) had high and moderate levels of perpetration

regarding total cyberbullying perpetration respectively.

Figure (4): Demonstrates faculty students' levels of perception regarding cyberbullying victimization. The majority (81.4%) of faculty students had low levels of cyberbullying victimization, while around one tenth (10.2% and 8.4%) of them had moderate and high levels of cyberbullying victimization respectively.

Table 2: Relation between student demographics and parental phubbing. shows there were statistically significant relationships between residency, academic year, father and mother education, mother profession, and parents' relationship and the faculty students' total levels of parental phubbing at $p\text{-value} < 0.001$. While there were no statistically significant relationships between faculty students' age, faculty, sex, marital status and fathers' profession and the students' total levels of parental phubbing.

Table 3: Presents relation between student demographics and cyberbullying perpetration. There were no statistically significant relationships between faculty students' total perception of cyberbullying perpetration and their personal demographics except for marital status and fathers' profession.

Table 4: Shows relation between faculty students' demographics and total cyberbullying victimization. The table shows there were no statistically significant relationships between faculty students' demographics and total cyberbullying victimization except for age, marital status, fathers' profession. At $p\text{-value} \leq 0.05$.

Table 5: Presents correlation between parental phubbing, cyberbullying perpetration, and cyberbullying victimization. The table shows there were no statistically significant positive correlations between faculty students' perception regarding parental phubbing and cyberbullying victimization ($p < 0.002$). Also, there was a highly statistically significant positive correlation between faculty students' cyberbullying perpetration and cyberbullying victimization ($p < 0.001$). While there was weak correlation between parental phubbing and cyberbullying perpetration.

Table (1): Faculty students' socio-demographic data (n=1881)

Faculty students Characteristic data		No.	%	Faculty students Characteristic data		No.	%	
Age	< 20	801	42.6 %	Educational Level of Parents	Father	Illiterate	51	2.7%
	20-<22	718	38.2 %			Read & write	157	8.3%
	≥ 22	362	19.2 %			Preparatory	160	8.5%
	Range (Mean ± SD)	8 (20 ± 1.56)				Secondary	464	24.6%
Sex	Male	587	31.1%			University	896	47.6%
	Female	1294	68.8%			Post grad. Studies	153	8.1%
Resi- dence	Urban	756	40.1%		Mother	Illiterate	111	5.9%
	Rural	1125	59.8%			Read & write	146	7.8%
Academic year	1 st year	656	34.9%			Preparatory	119	6.3%
	2 nd year	488	25.9%			Secondary	591	31.4%
	3 rd year	336	17.9%			University	786	41.8%
	4 th year	401	21.3%			Post grad. Studies	128	6.8%
Profession of	Father Employed	1690	89.8%	Marital status				
	Unemployed	191	10.2%	Single		1792	95.2%	
	Mother Employed	699	37.2%	Married		89	4.7%	
	Unemployed	1182	62.8%	Parents Relation				
				Stable		1685	89.5%	
				Unstable		196	10.4%	

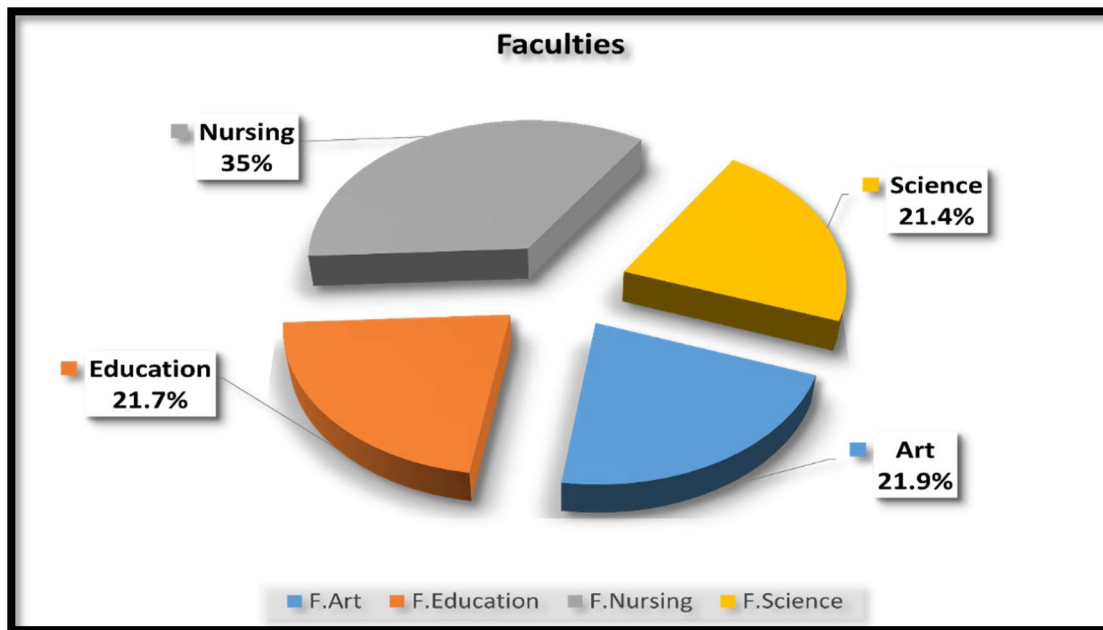


Figure (1): Distribution of the students according to faculty

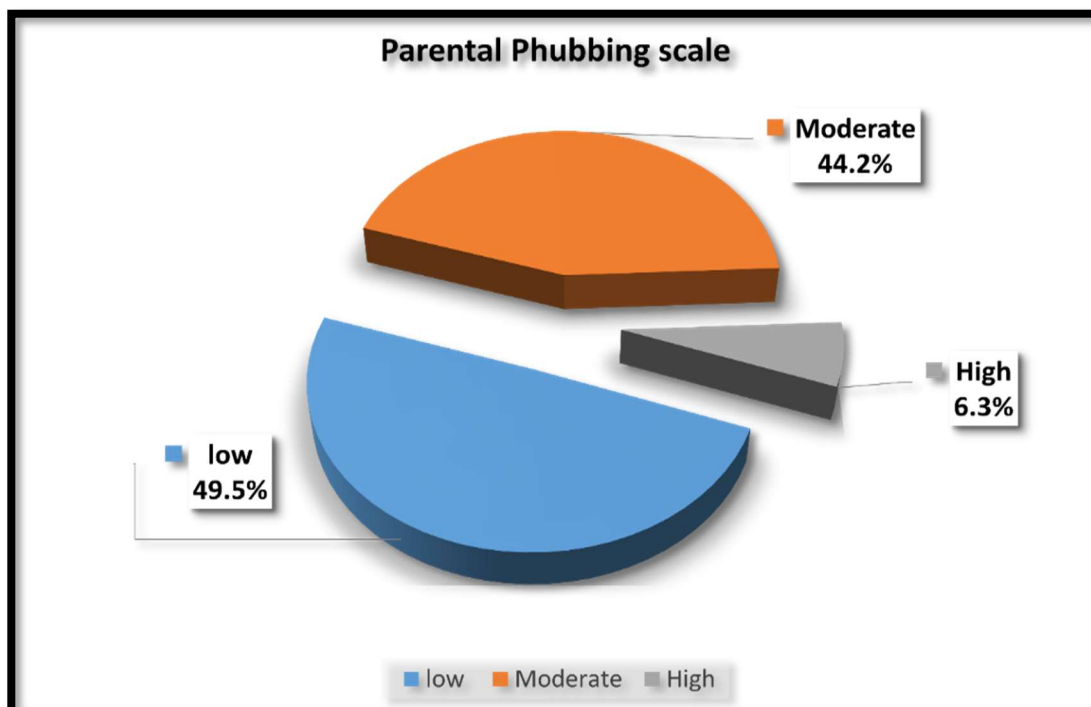


Figure (2): Faculty students' perception of parental phubbing

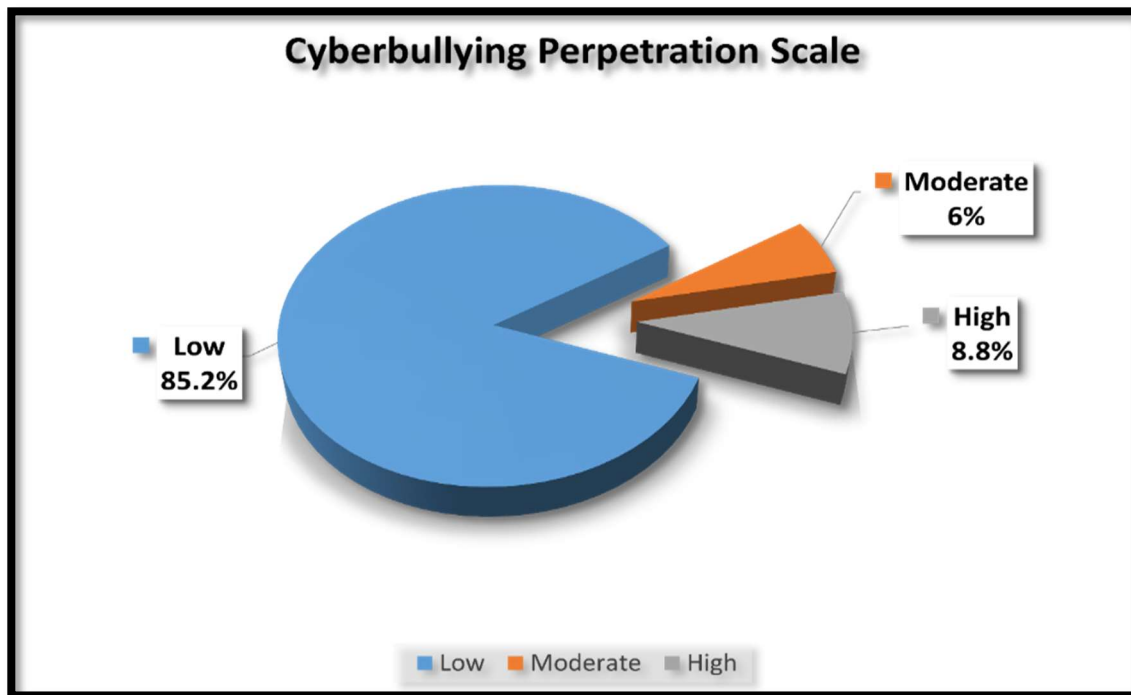


Figure (3): Faculty students' perception levels of total cyberbullying perpetration

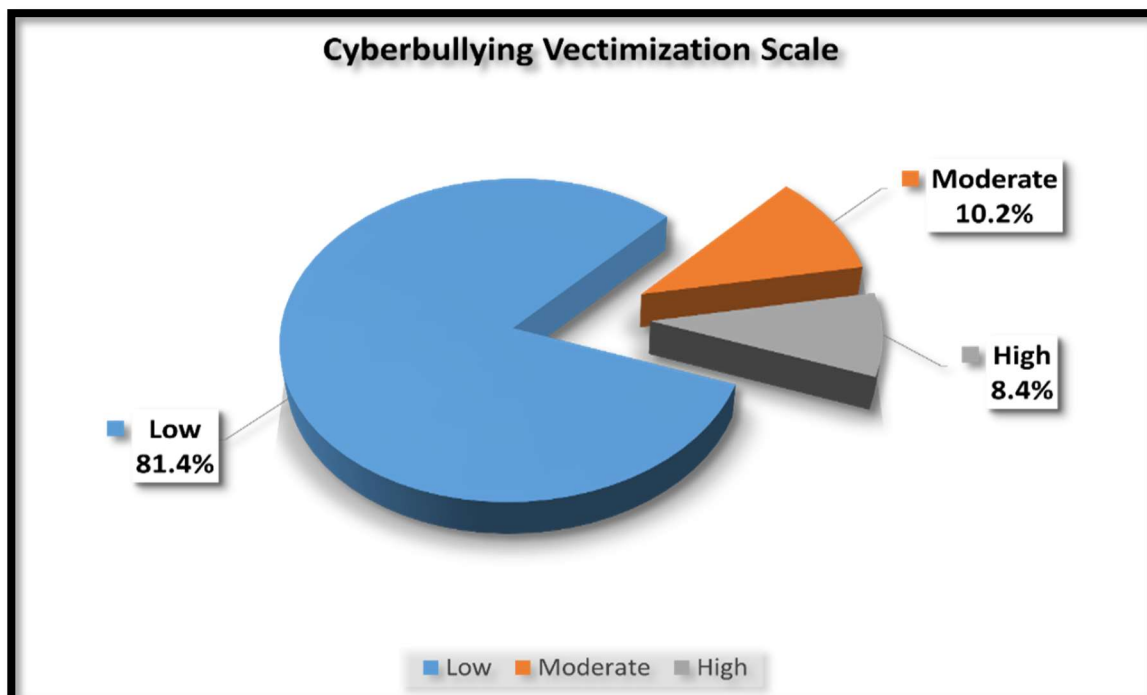


Figure (4): Faculty students' levels of perception regarding cyberbullying victimization

Table 2: Relation between student demographics and parental phubbing (n=1881)

Variables		Parental Phubbing						χ^2 (P)
		Low		Moderate		High		
		No	%	No	%	No	%	
Age	≤ 20	728	66.2%	74	59.7%	397	60.4%	8.421 (0.077)
	20-22	305	27.7%	38	30.6%	216	32.9%	
	23 ≥	67	6.1%	12	9.7%	44	6.7%	
Faculty	Arts	231	21.0%	34	27.4%	146	22.2%	4.023 (0.674)
	Education	245	22.3%	26	21.0%	138	21.0%	
	Nursing	394	35.8%	39	31.5%	224	34.1%	
	Science	230	20.9%	25	20.2%	149	22.7%	
Sex	Female	760	69.1%	78	62.9%	456	69.4%	2.164 (0.339)
	Male	340	30.9%	46	37.1%	201	30.6%	
Residence	Rural	702	63.8%	74	59.7%	349	53.1%	19.584 ($<.001^*$)
	Urban	398	36.2%	50	40.3%	308	46.9%	
Academic year	1st year	421	38.3%	34	27.4%	201	30.6%	22.590 ($<.001^*$)
	2nd year	290	26.4%	38	30.6%	160	24.4%	
	3rd year	171	15.5%	22	17.7%	143	21.8%	
	4th year	218	19.8%	30	24.2%	153	23.3%	
Marital Status	Married	51	4.6%	9	7.3%	29	4.4%	1.925 (0.382)
	Single	1049	95.4%	115	92.7%	628	95.6%	
Father's Educational Level	Illiterate	35	3.2%	1	0.8%	15	2.3%	25.531 (0.004*)
	Others	99	9.0%	12	9.7%	43	6.5%	
	Preparatory	100	9.1%	7	5.6%	52	7.9%	
	Read & Write	108	9.8%	8	6.5%	41	6.2%	
	Secondary	277	25.2%	35	28.2%	152	23.1%	
	University	481	43.7%	61	49.2%	354	53.9%	
Mother's Educational Level	Illiterate	75	6.8%	8	6.5%	28	4.3%	29.868 ($<.001^*$)
	Others	84	7.6%	7	5.6%	38	5.8%	
	Preparatory	78	7.1%	6	4.8%	34	5.2%	
	Read & Write	101	9.2%	5	4.0%	40	6.1%	
	Secondary	351	31.9%	38	30.6%	202	30.7%	
	University	411	37.4%	60	48.4%	315	47.9%	
Father's Profession	Employed	989	89.9%	116	93.5%	585	89.0%	2.334 (0.311)
	Unemployed	111	10.1%	8	6.5%	72	11.0%	
Mother's Profession	Employed	370	33.6%	49	39.5%	280	42.6%	14.525 ($<.001^*$)
	Unemployed	730	66.4%	75	60.5%	377	57.4%	
Parents Relation	Stable	1045	95.0%	113	91.1%	527	80.2%	96.694 ($<.001^*$)
	Unstable	55	5.0%	11	8.9%	130	19.8%	

Table 3: Relation between student demographics and cyberbullying perpetration (n=1881)

Variables		Cyberbullying Perpetration						χ^2 (p)
		Mild		Moderate		Sever		
		No	%	No	%	No	%	
Age	≤ 20	1104	64.1%	6	35.3%	89	62.7%	6.153
	20-22	507	29.4%	9	52.9%	43	30.3%	(0.188)
	23 ≥	111	6.4%	2	11.8%	10	7.0%	
University	Arts	367	21.3%	5	29.4%	39	27.5%	5.362
	Education	379	22.0%	5	29.4%	25	17.6%	
	Nursing	603	35.0%	5	29.4%	49	34.5%	(0.498)
	Science	373	21.7%	2	11.8%	29	20.4%	
Sex	Female	1178	68.4%	15	88.2%	101	71.1%	3.472
	Male	544	31.6%	2	11.8%	41	28.9%	(0.176)
Residence	Rural	1025	59.5%	11	64.7%	89	62.7%	0.713
	Urban	697	40.5%	6	35.3%	53	37.3%	(0.700)
Grade	1st year	601	34.9%	5	29.4%	50	35.2%	7.557
	2nd year	448	26.0%	3	17.6%	37	26.1%	
	3rd year	298	17.3%	6	35.3%	32	22.5%	(0.272 ^b)
	4th year	375	21.8%	3	17.6%	23	16.2%	
Marital Status	Married	80	4.6%	3	17.6%	6	4.2%	6.400
	Single	1642	95.4%	14	82.4%	136	95.8%	(0.041*)
Father's Educational Level	Illiterate	49	2.8%	0	0.0%	2	1.4%	11.267
	Others	140	8.1%	2	11.8%	12	8.5%	
	Preparatory	140	8.1%	4	23.5%	15	10.6%	
	Read & write	141	8.2%	2	11.8%	14	9.9%	(0.337)
	Secondary	421	24.4%	5	29.4%	38	26.8%	
	University	831	48.3%	4	23.5%	61	43.0%	
Mother's Educational Level	Illiterate	96	5.6%	2	11.8%	13	9.2%	11.627
	Others	116	6.7%	1	5.9%	12	8.5%	(0.311)
	Preparatory	110	6.4%	1	5.9%	7	4.9%	
	Read & write	137	8.0%	1	5.9%	8	5.6%	
	Secondary	530	30.8%	7	41.2%	54	38.0%	
	University	733	42.6%	5	29.4%	48	33.8%	
Father's Profession	Employed	1560	90.6%	12	70.6%	118	83.1%	15.048
	Unemployed	162	9.4%	5	29.4%	24	16.9%	(<.001*)
Mother's Profession	Employed	648	37.6%	3	17.6%	48	33.8%	3.621
	Unemployed	1074	62.4%	14	82.4%	94	66.2%	(0.164)
Parents Relation	Stable	1537	89.3%	16	94.1%	132	93.0%	2.304
	Unstable	185	10.7%	1	5.9%	10	7.0%	(0.316)

Table 4: Relation between faculty students' demographics and cyberbullying victimization (n=1881)

Variables		Cyberbullying Victimization						χ^2 (P)
		Mild		Moderate		Sever		
		No	%	No	%	No	%	
Age	≤ 20	995	64.9%	113	59.2%	91	57.6%	9.902 (.042*)
	20-22	448	29.2%	58	30.4%	53	33.5%	
	23 ≥	89	5.8%	20	10.5%	14	8.9%	
University	Arts	321	21.0%	48	25.1%	42	26.6%	8.697 (0.191)
	Education	340	22.2%	34	17.8%	35	22.2%	
	Nursing	550	35.9%	60	31.4%	47	29.7%	
	Science	321	21.0%	49	25.7%	34	21.5%	
Sex	Female	1045	68.2%	135	70.7%	114	72.2%	1.389 (0.499)
	Male	487	31.8%	56	29.3%	44	27.8%	
Residence	Rural	922	60.2%	106	55.5%	97	61.4%	1.731 (0.421)
	Urban	610	39.8%	85	44.5%	61	38.6%	
Academic year	1st year	537	35.1%	63	33.0%	56	35.4%	4.470 (0.613)
	2nd year	406	26.5%	46	24.1%	36	22.8%	
	3rd year	269	17.6%	33	17.3%	34	21.5%	
	4th year	320	20.9%	49	25.7%	32	20.3%	
Marital Status	Married	64	4.2%	16	8.4%	9	5.7%	7.000 (.030*)
	Single	1468	95.8%	175	91.6%	149	94.3%	
Father's Educational Level	Illiterate	44	2.9%	3	1.6%	4	2.5%	13.557 (0.194)
	Others	127	8.3%	10	5.2%	17	10.8%	
	Preparatory	120	7.8%	22	11.5%	17	10.8%	
	Read & write	132	8.6%	11	5.8%	14	8.9%	
	Secondary	379	24.7%	43	22.5%	42	26.6%	
	University	730	47.7%	102	53.4%	64	40.5%	
Mother's Educational Level	Illiterate	86	5.6%	11	5.8%	14	8.9%	15.759 (0.107)
	Others	103	6.7%	8	4.2%	18	11.4%	
	Preparatory	99	6.5%	9	4.7%	10	6.3%	
	Read & write	118	7.7%	20	10.5%	8	5.1%	
	Secondary	477	31.1%	61	31.9%	53	33.5%	
	University	649	42.4%	82	42.9%	55	34.8%	
Father's Profession	Employed	1387	90.5%	172	90.1%	131	82.9%	9.135 (0.010*)
	Unemployed	145	9.5%	19	9.9%	27	17.1%	
Mother's Profession	Employed	562	36.7%	83	43.5%	54	34.2%	3.992 (0.136)
	Unemployed	970	63.3%	108	56.5%	104	65.8%	
Parents Relation	Stable	1379	90.0%	163	85.3%	143	90.5%	4.131 (0.127)
	Unstable	153	10.0%	28	14.7%	15	9.5%	

Table 5: Correlation between parental phubbing, cyberbullying perpetration, and cyberbullying victimization (n=1881)

Items	Parental Phubbing		Cyberbullying Perpetration		Cyberbullying Victimization	
	r	P	r	P	r	P
Parental Phubbing	1		-0.033	0.152	0.069**	0.003
Cyberbullying Perpetration	-0.033	0.152	1		0.683**	<.001
Cyberbullying Victimization	0.069**	0.003	0.683**	<.001	1	

** . Correlation is significant at the 0.01 level (2-tailed).

Discussion

Faculty students as teens require intense attention and guidance from parents to develop different psychosocial capabilities and bear mental and psychological wellbeing. Parental phubbing, and being occupied by smart-phones in the presence of their teen children instead of engaging with them can have damaging irreversible impacts on the faculty students personality (Li, Duan, & Tang 2025; Zhang et al., 2023). Increasingly, the prevalence of cyberbullying has become a common issue globally. Cyberbullying as a form of online bullying or harassment intend to harm others using social media platforms and found to has a lasting traces on mental health across the lifespan (Al-shatnawi et al., 2024; Kasturiratna et al., 2025; von Humboldt et al., 2025). Till now, the impacts of parental phubbing on adolescent cyberbullying and cybervictimization remains underexplored (Jiang et al., 2024). Present study's findings showed that about half of faculty students perceived low levels of parental phubbing, while more than two fifth reported moderate levels, and only less than one tenth had high levels of parental phubbing. Most probably, this can be justified as more than two thirds of the study subject were from

rural areas where there is still a strong cultural boundary that supports family bonds and characterized by family cohesion, with solid emotional ties.

Similar to the results of the present study, **Tang et al. (2024)** revealed that most of the students perceived parental phubbing with low level and it was positively associated with adolescents' smartphone addiction. However, **Zhang et al. (2023)** revealed that large numbers of teens from many studies perceived parental phubbing, and was positively associated with children's internalizing problems and externalizing problems and also **Dixon et al. (2023)** reported that in China, above half rate of adolescents said they experienced parental phubbing on a daily basis. So, this review suggested much higher frequencies experiencing parental phubbing, especially in moderate to high level categories. In the same line with **Mulyaningrum and Kusumaningrum (2022)** reported that about half of students perceived parental phubbing with low rate and about two fifth perceive moderate rate and somehow one tenth perceive high level of parental phubbing.

In contrast with the current study's results, **Wang et al. (2020)** showed that students perceived high level of parental phubbing and they were

likely to have a high level of depressive symptoms, a low level of self-esteem, and a low level of perceived social support and **He et al. (2022)** reported that all elementary and secondary school students in China perceived high level of parental phubbing not low level.

Results of the present study showed a statistically significant relation between students' demographics and parental phubbing, regarding residency, academic year, father and mother education, mother profession, and parents' relationship, and faculty students' total levels of parental phubbing. These results may be due to around half of the study subjects' parents having bachelor's degrees and post graduate studies that made them more oriented with their teen children's needs and pay attention to their parent-child bonds to ensure psychological and emotional wellbeing. This also can be clear as majority of participating faculty students viewed that their parents' relations were stable, as well around two thirds of them declared that their mothers were unemployed so devoted more time to their teen children.

Present study also revealed that there were no statistically significant relationships between faculty students' age, faculty, sex, marital status and fathers' profession and the

students' total levels of parental phubbing. This can be explained as minimal percentage of participating faculty students were married so it had no significant relation with their perception of parental phubbing. Regarding the sex more than two thirds of them were female faculty student, while female teens are more sensitive and can be affected by parental phubbing. Our results showed no statistical difference between students' sex and perception of parental phubbing, so they had adequate support through their family.

The current study result was parallel with the findings of **Tonbuluğlu Altın et al. (2024)**, where, the level of perceived parental phubbing was significantly higher in adolescents whose parents' education level was above high school. Further, **Xi Lin et al. (2024)** revealed that there was a significant positive association among different moderating factors as residency of birth, school year, measurements of parental phubbing or depressive symptoms, and the conception of phubbing. However, **Xi Lin et al. (2024)** declared that there was a significant positive relationship between parental phubbing and gender of adolescents and also **Wang et al. (2022)** found that girls were more likely be affected

by parental phubbing than boys when fathers exhibit phubbing behaviors. Similarly, **Nasrulla and Bhau (2025); Wang et al. (2023)** revealed that there were no significant gender differences in the experiences of parental phubbing among adolescents. The current study also contradicted by **Xie et al. (2019)** revealed that boys were more affected by parental phubbing than girls, especially when influenced by negative peer relationships and **Davey et al. (2018)** showed that phubbing among adolescents and youth in India can be affected by many factors such as the young age group, better sociodemographic and economic status, and that medical, engineering, and commerce college students were most likely be affected by phubbing.

Findings of the present study revealed that relation between student demographics and cyberbullying perpetration. There were no statistically significant relationships between faculty students' total perception of cyberbullying perpetration and their personal demographics except for marital status and fathers' profession. This is most probably due to socioeconomic status can influence exposure to digital platforms and the presence of parental monitoring. Regarding the marital status

variations in coping mechanisms and susceptibility to mental health issues can be the main reasons behind that significant association.

The current study was parallel with **Fletcher et al. (2014); Mohamed Othman et al. (2025); Uludasdemir and Kucuk (2019); Rice et al. (2015)**, reported that there were no statistically significant associations between cyberbullying perpetration and students' sex, socioeconomic status, family structure or parental employment. The result also in this regard contrast with **Al-shatnawi et al. (2024)** revealed that age was negatively associated with cyberbullying perpetration and cyberbullying victimization while being male was associated with increased cyberbullying perpetration among nursing students in Jordan. While, **Malinowska-Cieřlik et al. (2023)** found that boys perpetrated cyberbullying more than girls especially being younger adolescents were more often affected than older ones . However, **Vishwakarma et al. (2024)** showed that that gender, and family types have a major impact on cyberbullying because of variations in coping mechanisms and susceptibility to mental health issues. In the same line, **Vishwakarma et al. (2024)** reported that marital status has a significant impact on students cyberbullying **Nagata et al. (2022);**

Talwar (2022) reported that boys reported higher rates than girls of cyberbullying perpetration.

The existing study findings revealed that majority of faculty students had low level, while around one tenth had high also one tenth had moderate levels of perpetration regarding total cyberbullying perpetration. These results may be due to exposure to behaviors that can normalize them cognitively and emotionally. Also, demographic factors, including urban versus rural background, can affect both behavior and the sense of social responsibility that may moderate faculty students' perception.

The current result was parallel with **Webber and Ovedovitz (2018)**, revealed that college students at U.S. Catholic University experienced cyberbullying perpetration and about less than tenth had moderate and high levels of perpetration. However, **Almeida et al. (2012); Sheikh et al. (2023)**, reported that more than half of the student in high schools and in universities had cyberbullied. While, **Gönültaş (2022); Al-shatnawi et al. (2024)** reported that majority of university students were being involved in cyberbullying in higher rates.

Current study results revealed that the majority of faculty students had low levels of cyberbullying victimization, while around one tenth

of them had moderate and high levels of cyberbullying victimization. Findings from this study shed light on the experience of cyberbullying victimization among university students, and it follows those reported in other geographic areas in both similarity and dissimilarity. Though there was a strong majority indicating only slight incidence of online harassment, there was a notable subgroup expressing moderate to extreme victimization. This indicates that there is indeed cyberbullying present in this university, though not to an extensive degree as found in some adolescent populations.

As university students go through the emerging adult stage, these students often move through digital world whose boundaries intersect those of their class, society, and family responsibilities. Their skills in critical consciousness and digital competency may lower their risk in relation to younger populations; nevertheless, their access to online sites place them at risk for cyber aggression. It is important to note that even moderate experience can have crucial outcomes. Prior studies reflect that cyberbullying has long lasting impacts upon people's well-being and one's academics (**Von Humboldt et al., 2025**).

The societal structure in Egypt is marked by strong familial relationships, intimate peer connections, and a collectivist approach that emphasizes the importance of group cohesion. The strong familial relationships can act as protective mechanisms, providing emotional assistance and direction to students as they navigate online environments. Concurrently, the stigma linked to reporting victimization or the normalization of aggressive interactions in digital spaces may result in underreporting experiences by some students.

Current study findings show there were no statistically significant relationships between faculty students' demographics and total cyberbullying victimization except for age, marital status, and fathers' profession. This can be justified as victimization of students by cyberbullying is more contingent upon situational and relational features of the university students than on demographic characteristics. This lack of an obvious gender gap in specific results is particularly interesting. As research focused on adolescents often emphasizes gender differences, in which females have been occasionally reported as being more victimized, research involving university students often reveals equivalence, in which both male and

female students are highly embedded in digital networking. Similar results by **Al-Shatnawi et al. (2024)** found that students came from financially insecure or less supportive parental home environments showed increased susceptibility to victimization online.

Present study results show there were no statistically significant positive correlation between faculty students' perception regarding parental phubbing and cyberbullying victimization. Also, there was a highly statistically significant positive correlation between faculty students' cyberbullying perpetration and cyberbullying victimization, while there was a weak correlation between parental phubbing and cyberbullying perpetration. **Jiang et al. (2024); Wang et al. (2022); Wang et al. (2023)** found that parental phubbing leads to social anxiety and weakening of self-regulation, and therefore, boosts one's chance of engaging in cyberbullying behaviors and eroding the capacity to endure aggression from peers and hostility online. A recent investigation by **Othman et al. (2025)** found that when students possess a belief in their moral value and have assimilated ethical values, they tend to be less inclined to respond impulsively to online

provocations or to suffer harassment without seeking assistance.

Conclusion

Based on the present study results it was concluded that there was no statistically significant positive correlation between faculty students' perception regarding parental phubbing and cyberbullying victimization. There was a highly statistically significant positive correlation between faculty students' cyberbullying perpetration and cyberbullying victimization. The study points out that, even if the prevalence of students reporting low levels of being victims is high, the presence of medium and high numbers of incidents is worrying and requires intervention from different governmental institutions.

Recommendations

Universities administration needs to:

- Include digital citizenship and appropriate online behavior in academic courses and apply freshman orientation programs.
- Counseling services and student affairs departments need to keep abreast of students' home situations, parental communication styles, and family expectations.
- Establish parental workshops to raise awareness of phubbing and subtle impacts on young adults' sense of belonging and emotional equilibrium.

-Peer support groups on campus might allow students to process experiences of being victimized in an anonymous, although controlled, environment, and thus reduce isolation.

-Policymakers need to consider implementing guidelines for responsible digital behavior, respectful communication, and even codes of online interaction related to university life.

Limitations

- 1-This study used a one-time survey (Cross-sectional design).
- 2-Data was collected through self-reported which may be affected by bias.
- 3-Cultural sensitivity, issues like family neglect and peer victimization can carry stigma. Students may therefore avoid reporting such experiences.

Future research and implications

- Explore students' view of parental phubbing and how it affects emotional experience in family interactions.
- Explore digital moral interaction, fortify, not destroy, the dignity and security of Egypt's university students.

References

- Aatif, N., & Sujata, B. (2025). Relationship between parental phubbing and parent-child relationship quality among

- adolescents. *International Journal of Interdisciplinary Approaches in Psychology*, 3(4), 309-328.
- Adorjan, K., Langgartner, S., Maywald, M., Karch, S., & Pogarell, O. A. (2021). Cross-sectional survey of internet use among university students. *Eur. Arch. Psychiatry Clin. Neurosci.*, 271, 975–86.
- Al-Shatnawi, F., Ababneh, A., Elemery, F., Rayan, A., & Bageas, M. (2024). Prevalence of cyberbullying perpetration and cyberbullying victimization among nursing students in Jordan. *SAGE Open Nursing*, 10, 23779608241256509. <https://doi.org/10.1177/23779608241256509>
- Ameida, A., Correia, I., Marinho, S., & Garcia, D. (2012). Virtual but not Less Real: A study of Cyberbullying and its relations to moral disengagement and empathy. In Q. Li, D. Cross, & P. K. Smith (Eds.), *Cyberbullying in the Global Playground*. 1st ed., (pp. 223–244). Wiley. <https://doi.org/10.1002/9781119954484.ch11>
- Ashatnawi, F., Ababneh, A., Elemery, F., Rayan, A., & Bageas, M. (2024a). Prevalence of cyberbullying perpetration and cyberbullying victimization among nursing students in Jordan. *SAGE Open Nursing*, 10, 23779608241256509. <https://doi.org/10.1177/23779608241256509>
- Baranova, T., Kobicheva, A., & Tokareva, E. (2022). Effect of phubbing on students' performance. In *Networked Control Systems for Connected and Automated Vehicles* Cham: Springer International Publishing. 2 (pp. 849-56).
- Celik, H., Hopkins, L., & O'Reilly, M. (2023). Exploring the perspectives of Turkish adolescents on bullying: A qualitative study. *Psychology in the Schools*.
- Davey, S., Davey, A., Raghav, S., Singh, J., Singh, N., Blachnio, A., & Przepiórkaa, A. (2018). Predictors and consequences of “Phubbing” among adolescents and youth in India: An impact evaluation study. *Journal of Family and Community Medicine*, 25(1), 35. https://doi.org/10.4103/jfcm.JFCM_71_17
- Digital. (2022). Egypt — Data Reportal – Global Digital Insights.” Datareportal, 2022, datareportal.com/reports/digital-2022-egypt.
- Dixon, D., Sharp, C., Hughes, K., & Hughes, J. (2023). Parental technoforce and adolescents' mental health and violent behaviour: A scoping review. *BMC Public Health*, 23(1), 2053.

- <https://doi.org/10.1186/s12889-023-16850-x>
- Dwyer, R., Kushlev, K., & Dunn, E. (2018).** Smartphone use undermines enjoyment of face-to-face social interactions. *J. Exp. Soc. Psychol.*, 78, 233–9.
- Fletcher, A., Fitzgerald-Yau, N., Jones, R., Allen, E., Viner, R. M., & Bonell, C. (2014).** Brief report: Cyberbullying perpetration and its associations with socio-demographics, aggressive behaviour at school, and mental health outcomes. *Journal of Adolescence*, 37(8), 1393–1398. <https://doi.org/10.1016/j.adolescence.2014.10.005>
- Gönültaş, M. (2022).** Cyber bullying and victimization among university students. *International Journal of Psychology and Educational Studies*, 9(2), 297–307. <https://doi.org/10.52380/ijpes.2022.9.2.441>
- Han, J., Park, S., & Kim, Y. (2022).** Phubbing as a Millennials' New Addiction and relating factors among nursing students. *Psychiatry Investigation*, 19(2), 135–45.
- He, Q., Zhao, B., Wei, H., & Huang, F. (2022).** The relationship between parental phubbing and learning burnout of elementary and secondary school students: The mediating roles of parent-child attachment and ego depletion. *Frontiers in Psychology*, 13, 963492. <https://doi.org/10.3389/fpsyg.2022.963492>
- Jiang, Y., Shu, S., Lin, L., Ge, M., Niu, G., Zhao, B., & Hu, R. (2024).** Does parental phubbing increase the risk of adolescent cyberbullying and cyber victimization? The role of social anxiety and self-control. *Children and Youth Services Review*, 157, 107429. <https://doi.org/10.1016/j.childyouth.2024.107429>
- Kasturiratna, K., THartanto, A., Chen, C., Tong, E., & Majeed, N. (2025).** Umbrella review of meta-analyses on the risk factors, protective factors, consequences and interventions of cyberbullying victimization. *Nature Human Behaviour*, 9(1), 101–132. <https://doi.org/10.1038/s41562-024-02011-6>
- Li, Y., Duan, R., & Tang, Y. (2025).** The Vicious cycle? Parental phubbing and adolescent psychological distress: The mediating role of psychological inflexibility across different adolescence stages. *J. Youth Adolescence*, 54, 2794–2811. <https://doi.org/10.1007/s10964-025-02262-0>
- Macaulay, P., Betts, L., Stiller, J., & Kellezi, B. (2022).** An introduction to cyberbullying. In *Cybersecurity*

- and Cognitive Science*. Academic Press. (pp. 197-213).
- Malinowska-Cieřlik, M., Kleszczewska, D., Dzielska, A., řcibor, M., & Mazur, J. (2023).** Similarities and differences between psychosocial determinants of bullying and cyberbullying perpetration among polish adolescents. *International Journal of Environmental Research and Public Health*, 20(2), 1358. <https://doi.org/10.3390/ijerph20021358>
- Martínez, M., Delgado, B., García, J. & Ruíz, C. (2020).** Cyberbullying in the university setting. Relationship with emotional problems and adaptation to the university. *Frontiers in Psychology*, 10, 3074.
- Mohamed Othman, B., Abdelhai, S., Ibrahim, M., Hamed, A. E. M., Barakat, A., & Elsayed, E. (2025).** Unravelling cyberbullying among Egyptian adolescents: The protective influence of self-control and moral identity with gender and socioeconomic dynamics. *BMC Psychology*, 13(1), 389. <https://doi.org/10.1186/s40359-025-02630-2>
- Molina, B. (2017).** When our smartphones leave us out of touch. USA Today, 4 August 2017. Available online: <https://www.usatoday.com/story/tech/news/2017/08/04/smartphones-distracted-walking-iphone-while-parenting-we-out-touch/519452001/>(accessed on 15 August 2021).
- Mulyaningrum, A., & Kusumaningrum, F. (2022).** Parental phubbing and smartphone addiction among adolescents. *INSPIRA: Indonesian Journal of Psychological Research*, 3(1), 23–30. <https://doi.org/10.32505/inspira.v3i1.4178>
- Nagata, J., Trompeter, N., Singh, G., Ganson, K., Testa, A., Jackson, D. B., ... & Baker, F. (2022).** Social epidemiology of early adolescent cyberbullying in the United States. *Academic Pediatrics*, 22(8), 1287–1293. <https://doi.org/10.1016/j.acap.2022.07.003>
- Nasrulla, A., & Bhau, D. (2025).** Relationship between parental phubbing and parent-child relationship quality among adolescents. *International Journal of Interdisciplinary Approaches in Psychology*, 3(4), 309:328-309:328.
- Othman, B., Abdelhai, S., Ibrahim, M., Hamed, A., Barakat, A., & Elsayed, E. (2025).** Unravelling cyberbullying among Egyptian adolescents: The protective influence of self-control and moral identity with gender and socioeconomic dynamics. *BMC Psychology*, 13, 389.

<https://doi.org/10.1186/s40359-025-02630-2>

Özaslan, A., Yıldırım, M., Güney, E., Güzel, Ş., & İşeri, E. (2022). Association between problematic internet use, quality of parent-adolescents relationship, conflicts, and mental health problems. *International Journal of Mental Health and Addiction*, 20(4), 2503-19.

Pancani, L., Gerosa, T., Gui, M., & Riva, P. (2021). “Mom, dad, look at me”: The development of the Parental Phubbing Scale. *Journal of Social and Personal Relationships*, 38(2), 435-458. Doi: 10.1177/0265407520964866

Patchin, J., & Hinduja, S. (2015). Measuring cyberbullying: Implications for research. *Aggression and Violent Behavior*, 23, 69-74.

Qu, J., Lei, L., Wang, X., Xie, X., & Wang, P. (2022). Mother phubbing and adolescent cyberbullying: the mediating role of perceived mother acceptance and the moderating role of emotional stability. *Journal of Interpersonal Violence*, 37(11-12).

Ren, D., Wesselmann, E., & Williams, K. (2018). Hurt people hurt people: Ostracism and aggression. *Current Opinion in Psychology*. 19, 34-38.

Rice, E., Petering, R., Rhoades, H., Winetrobe, H., Goldbach, J., Plant, A., ... & Kordic, T. (2015).

Cyberbullying perpetration and victimization among middle-school students. *American Journal of Public Health*, 105(3), e66–e72. <https://doi.org/10.2105/AJPH.2014.302393>

Sarfo, J., Amadu, M., & Ansah, E. (2023). Internet addiction among college students from 20 countries: Scoping review of risk factors and impact on academic procrastination and sleep quality. *International Journal of Media and Information Literacy*, 8(2), 382-400. Doi: [10.13187/ijmil.2023.2.382](https://doi.org/10.13187/ijmil.2023.2.382)

Sheikh, M., Hossan R., & Menih, H. (2023). Cyberbullying victimization and perpetration among university students in Bangladesh: Prevalence, impact and help-seeking practices. *Journal of School Violence*, 22(2), 198–214.

<https://doi.org/10.1080/15388220.2023.2168681>

Talwar, P. (2022). Potential sociodemographic predictors of cyberbullying behavior among university students. *Malaysian Journal of Psychiatry*, 31(1), 32–38. https://doi.org/10.4103/mjp.mjp_7_22

Tang, Y., Xu, J., Zhao, Y., Davis, T., & Zhang, H. (2024). Parental phubbing and adolescent smartphone addiction: Depression and perceived school climate matter. *Cyberpsychology, Behavior, and*

- Social Networking*, 27(4), 287–293.
<https://doi.org/10.1089/cyber.2023.0300>
- Thumronglaohapun, S., Maneeton, B., Maneeton, N., Limpiti, S., Manojai, N., Chaijaruwanich, J., ... & Srikummoon, P. (2022).** Awareness, perception and perpetration of cyberbullying by high school students and undergraduates in Thailand. *PLOS ONE*, 17(4), e0267702.
<https://doi.org/10.1371/journal.pone.0267702>
- Tonbuloglu Altiner, Ö., Mutlu Karakaş, N., Özbaş, C., Uğraş Dikmen, A., & Özkan, S. (2024).** The relationship between perceived parental phubbing and smartphone addiction in adolescents. Request PDF. *ResearchGate*.
<https://doi.org/10.1093/eurpub/ckae144.2030>
- Vishwakarma, B., Kumari, P., & Vishwakarma, A. K. (2024).** Demographic factors on cyberbullying and victimization among university students. *Indian Journal of Extension Education*, 60(3), 28–32.
<https://doi.org/10.48165/IJEE.2024.60306>
- Von Humboldt, S., Low, G., & Leal, I. (2025).** From words to wounds: Cyberbullying and its influence on mental health across the lifespan. *Behavioral Sciences*, 15(5), 619.
<https://doi.org/10.3390/bs15050619>
- Wang, P., Chen, W., & Liang, Y. (2020).** Development and validation of the Parental Phubbing Scale revised. *Personality and Individual Differences*, 161, 109964. Doi: 10.1016/j.paid.2020.109964
- Wang, H., Zhou, L., Geng, J., & Lei, L. (2022).** Sex differences of parental phubbing on online hostility among adolescents: A moderated mediation model. *Aggressive Behavior*, 48(1), 94–102.
<https://doi.org/10.1002/ab.21994>
- Wang, P., Ouyang, M., Yin, Y., & Li, B. (2023).** Mother phubbing and university students' problematic social networking sites use: The mediating role of perceived burdensomeness and the moderating role of need to belong. *Frontiers in Psychology*, 14, 1098707.
<https://doi.org/10.3389/fpsyg.2023.1098707>
- Wang, X., Gao, L., Yang, J., Zhao, F., & Wang, P. (2020).** Parental phubbing and adolescents' depressive symptoms: Self-esteem and perceived social support as moderators. *Journal of Youth and Adolescence*, 49(2), 427–437.
<https://doi.org/10.1007/s10964-019-01185-x>
- Wang, X., Qiao, Y., & Wang, S. (2023).** Parental phubbing, problematic smartphone use, and

- adolescents' learning burnout: A cross-lagged panel analysis. *Journal of Affective Disorders*, 320, 442–449.
- Wang, X., Wang, W., Qiao, Y., Gao, L., Yang, J., & Wang, P. (2022).** Parental phubbing and university students' cyberbullying perpetration: A moderated mediation model of moral disengagement and online disinhibition. *Journal of Interpersonal Violence*, 37(7–8), NP5344–NP5366.
- Webber, M., & Ovedovitz, A. (2018).** Cyberbullying among college students: A look at its prevalence at a U.S. Catholic University. *International Journal of Educational Methodology*, 4(2), 101–107. <https://doi.org/10.12973/ijem.4.2.101>
- Xi Lin, C., hua Qing, Z., han Yan, C., jiao Tang, S., lei Wang, C., hua Yang, X., & qun Liu, X. (2024).** The relationship between parental phubbing and adolescents' depressive symptoms: A systematic review and meta-analysis. *ResearchGate*, 10, 19–29.
- Xie, X., Chen, W., Zhu, X., & He, D. (2019).** Parents' phubbing increases adolescents' mobile phone addiction: Roles of parent-child attachment, deviant peers, and gender. *Children and Youth Services Review*, 105, 104426. <https://doi.org/10.1016/j.childyouth.2019.104426>
- Yang, F., Sun, J., Li, J., & Lyu, S. (2024).** Coping strategies, stigmatizing attitude, and cyberbullying among Chinese college students during the COVID-19 lockdown. *Current Psychology*, 43(9), 8394–8402. <https://doi.org/10.1007/s12144-022-02874-w>
- Zhang, J., Dong, C., Jiang, Y., Zhang, Q., Li, H., & Li, Y. (2023).** Parental phubbing and child social-emotional adjustment: A meta-analysis of studies conducted in China. *Psychology Research and Behavior Management*, 16, 4267–4285. <https://doi.org/10.2147/PRBM.S417718>

Worker's Knowledge and Practice Related to Occupational Hazards in Medical Waste Disposal

Hagar Mahmoud Abdullah¹, Amal Ibrahiem Fouad², Ola Hussien Abo El-maaty³

¹Demonstrator of Community Health Nursing, Faculty of nursing, El-Fayoum University.

²Professor of Community Health Nursing, Faculty of Nursing, El-Fayoum University.

³Assistant Professor of Community Health Nursing, Faculty of Nursing, Damietta University.

Corresponding author: Hagar Mahmoud

Email: hma28@fayoum.edu.eg

Abstract:

Background: Medical waste disposal workers face constant occupational health hazards. **Aim:** To assess workers' knowledge and practices regarding occupational hazards in medical waste disposal. **Research Design:** Analytical cross-sectional study. **Setting:** Al Fayoum General Hospital. **Subjects:** A purposive sample of 100 medical waste handling workers. **Tools:** Two data collection tools were used: a four-part interview questionnaire (demographics, knowledge of hazards, medical history, and hazard exposure) and an observational checklist to assess the workplace environment and workers' practices. **Results:** The study revealed high exposure rates to occupational hazards: 80% psychological, 78% biological, and 74% physical. Furthermore, 77% of the sample demonstrated inadequate total practice, and 55% had insufficient total knowledge. A highly significant positive correlation ($P < 0.001$) was found between total medical waste management knowledge and total practice. Additionally, knowledge levels were highly significantly related to sociodemographic data. **Conclusion:** The majority of medical waste workers possess inadequate knowledge and unsatisfactory practices, alongside high exposure to physical, psychological, and ergonomic risks. Furthermore, most temporary medical waste storage environments do not meet standard requirements. **Recommendation:** Continuous training programs must be implemented for these workers, alongside establishing standardized protocols for the safe handling, segregation, storage, and disposal of medical waste.

Keywords: Medical waste, Occupational hazard.

Introduction

Medical waste management has emerged as a significant global public health and environmental issue, particularly with the increasing expansion of healthcare services. Healthcare facilities generate a wide range of waste materials, including infectious, pathological, chemical, and sharps waste, a substantial portion of which is considered hazardous. Improper management of such waste poses serious threats not only to healthcare workers but also to patients, waste handlers, and the general community. Inefficient waste disposal practices can lead to environmental pollution, contamination of water sources, and the spread of infectious diseases (World Health Organization) **(Singh et al., 2022)**.

Healthcare workers involved in medical waste handling are at high risk of occupational exposure to various hazards. These include biological hazards such as bloodborne pathogens (e.g., hepatitis B, hepatitis C, and HIV), physical hazards like needle-stick and sharps injuries, and chemical hazards resulting from exposure to disinfectants and pharmaceuticals. Such exposures may result in serious health consequences, long-term illness, or even death if proper

preventive measures are not followed **(Odonkor & Mahami, 2020)**.

The level of workers' knowledge regarding occupational hazards plays a vital role in ensuring safe practices during medical waste handling. Adequate knowledge enhances awareness about potential risks and promotes adherence to safety guidelines, including the proper use of personal protective equipment (PPE), waste segregation, and infection control measures. Conversely, lack of knowledge is often associated with unsafe practices, increasing the likelihood of occupational injuries and disease transmission **(Thakur, & Sharma, 2020)**. In addition to knowledge, the actual practices of workers are critical in determining the effectiveness of medical waste management systems. Even when workers are aware of the risks, poor compliance with safety protocols may still occur due to factors such as workload, lack of supervision, or insufficient resources. Studies have shown that gaps frequently exist between knowledge and practice, highlighting the importance of continuous monitoring and training to ensure adherence to recommended procedures **(Odonkor & Mahami, 2020)**.

The workplace environment also plays an essential role in promoting or hindering safe medical waste management practices. Properly designed and maintained temporary storage areas, availability of color-coded containers, and accessibility of PPE are necessary to support safe waste handling. Inadequate infrastructure, poor ventilation, and lack of appropriate storage facilities can significantly increase the risk of occupational exposure and environmental contamination **(WHO, 2022)**.

Furthermore, effective medical waste management requires the implementation of clear policies, guidelines, and regulatory frameworks. International organizations such as the WHO have developed comprehensive guidelines to ensure safe and sustainable waste management practices. However, in many developing countries, the implementation of these guidelines remains inconsistent due to limited financial resources, lack of training programs, and weak enforcement mechanisms **(Thakur, & Sharma, 2020)**.

Training and education are considered key strategies for improving workers' knowledge and practices. Regular in-service training programs, workshops, and awareness campaigns can significantly enhance

workers' competencies and reduce occupational risks. Additionally, supportive supervision and continuous evaluation are essential to maintain high standards of practice and ensure compliance with safety measures **(Thakur, & Sharma, 2020)**. Assessing the relationship between workers' knowledge and their actual practices is crucial for identifying existing gaps and areas that require improvement. Understanding this relationship can help healthcare administrators and policymakers design targeted interventions aimed at improving occupational safety and enhancing the overall efficiency of medical waste management systems **(Al-Khatib et al., 2020)**.

Given the increasing risks associated with improper medical waste disposal and the vulnerability of workers involved in this process, it is essential to conduct comprehensive assessments of their knowledge, practices, and working environment. Such assessments provide valuable insights that can guide the development of effective strategies to protect workers' health, reduce environmental hazards, and improve the quality of healthcare services **(Singh et al., 2022)**.

Occupational Health Nurses (OHNs) are registered nurses who operate in settings other than healthcare

facilities. Additionally, occupational health nurses monitor working conditions, treat workers, and look for health risks in the workplace (**Onyeador & Umberger, 2023**).

Providing basic first aid, assessing an employee's health, and determining the safety and health risks in the workplace are the responsibilities of an occupational health nurse. Additionally, it creates thorough reports on safety conditions, conducts safety compliance inspections of the workspace and equipment used by individuals, and instructs staff on how to avoid workplace dangers (**Tetzlaff et al., 2025**).

Significance of the study:

Occupational health is a neglected public health issue among healthcare workers. This has exposed healthcare workers to various forms of hazards which have had negative consequences on their well-being and performance at work. These hazards can arise from various sources. As a result, workers in high-risk environments are susceptible to a range of health complications, from minor injuries to life-threatening diseases (**Cao et al., 2023**).

In Egypt, it is estimated that sharp injuries in healthcare settings lead to 66,000 HBV, 16,000 HCV, and 1,000 HIV infections each year. the prevalence of Hepatitis B Virus

(HBV) among healthcare workers (HCWs) approximately 1.1%, which is notably lower than the general population prevalence of 3.67%. Despite the relatively lower infection rate among HCWs, vaccine coverage remains moderate (**Azzam et al., 2023**).

Aim of the Study

The aim of the study is to assess Worker's Knowledge and Practices Related to Occupational Hazards in Medical Waste Disposal through the following:

Objectives:

1. Assessing the level of worker's knowledge regarding occupational hazards in medical waste disposal.
2. Assessing the practices of workers related to medical waste disposal.
3. Assessing workplace environment (temporary storing room) used for medical waste management.
4. Identifying the relationship between worker's knowledge and their actual practice.

Research questions:

1. What is the level of knowledge among medical waste workers regarding occupational health hazards and medical waste management?
2. What are the actual practices of workers when dealing with medical waste?
3. What is the relationship between Socio-demographic characteristics of

medical waste workers and their knowledge?

4. What is the relationship between worker's demographic characteristics and their knowledge and practices?

Subjects and Method

I- Technical Design:

Study includes research design, setting, sampling, and tools of data collection.

A-Research Design:

Analytical cross-sectional research design will be used to achieve the aim of this study and to answer the research questions.

B- Study Setting:

The study was conducted at Al Fayoum General Hospital, a major public healthcare facility affiliated with the Ministry of Health and Population (MOHP). The hospital is located on Al-Nabawy Al-Mohandes Street, near Al-Massallah Square, in the central area of Fayoum City, Egypt. It serves the entire Fayoum Governorate and is considered one of the largest and oldest hospitals in Al Fayoum.

Subjects of the study:

Sample Size:

Total sample of workers at El-Fayoum general hospital (305) workers.

A sample size of 100 workers was calculated using the infinite equation according to Epi info 2000 software

with power of 90 % and precision of 5% at a confidence interval of 95% and effect size of Sample includes an increase of 10% for missing or incomplete data.

Type of the sample:

purposive sampling was used in the study.

Inclusion criteria:

- A. Workers' consent to participate in the study.
- B. The workers must be enrolled in the hospital during collecting the data.
- C. The workers should be dealing with medical waste materials.
- D. The workers must have worked in the hospital for more than six months.

The exclusion criteria:

- A. Workers who worked in the hospital for less than six months.
- B. Workers who refuse to participate in the study.

Tools of data collection:

Data will be collected using the following tools:

First tool: An Interviewing Questionnaire:

created by the researcher following an evaluation of pertinent and current literature on the subject of the study. The instrument, which was created in basic Arabic and utilized for the in-person interview, was used to gather the necessary data.

It Consisted of four parts:

Part I: This part was deal with demographic data for the workers

adopted from (Muluken et al., 2014), which include (age, gender, marital status, education level, years of experience, department, training course attendance, number of training courses attended, and course organizer).

It includes 9 closed end questions.

Part II: Medical history assessment of workers regarding medical waste disposal. Adapted from (Onoja-Alexander et al., 2020), which include (history of chronic illness, both prior to and following employment, medication use, surgery history, immunization type and dosage, and medical examination for employment). It consists of (9 Questions).

Part III:

This part was created to evaluate the workers' knowledge of medical waste, including (meaning of medical waste, types of medical waste, handling medical waste, storing medical waste, final dispose of medical waste and measurements taken to reduce hazard; meaning of occupational hazards, types of biological, chemical, physical, ergonomic and psychological health hazards exposure.) It includes (22 Questions).

Scoring system:

The researcher developed a model key answer that was cross-checked with the workers' responses. "2" was

awarded for a completely correct response, "1" for an incomplete correct response, and "0" for an incorrect or "don't know" response. A percentage score will be generated by adding these scores.

It was classified in three categories:

- Good knowledge if score > 70%.
- Average knowledge if score from 50-70%.
- Poor knowledge if score < 50%.

Part IV: This part was adopted from (WHO, 2019), modified by the researcher to assess previous exposure to any types of occupational health hazards related to medical waste disposal including (Have you ever been exposed to any types of medical waste hazard hazards and post exposure action? It includes (24) questions.

Scoring System:

The researcher developed a model key answer, which was cross-checked with the workers' responses. A "1" was awarded for a right response, and a "0" for a wrong one. The knowledge of all the workers under study was then divided into two categories:

- Exposure (score $\geq$ 60%).
- Not exposure (score < 60%).

Second tool: An observational checklist

Adopted from (CDC, 2019; National Infection Prevention, 2019; Control Manual, Ministry of

Health and Population, 2021) and follows a review of the most recent research, and it will consist of the next two parts.

Part I: The researcher modified this tool to assess medical waste workers' practices, which include (take precautions when handling medical waste, hand washing before and after handling medical waste, separate medical waste according to its types, handle medical waste, interim storage, treatment, and final disposal).

Scoring system:

Each item received a score of "0" for "Not Apply," "1" for "Apply incompletely," and "2" for "apply completely" after the researcher evaluated the practices of medical waste workers. Consequently, the overall assessment of the medical waste worker's practice.

Was categorized into 2 categories:

- Satisfactory; if score $\geq 60\%$.
- Unsatisfactory; if score $< 60\%$.

Part II: In order to assess the work environment (temporary storage room) for medical waste in the hospital, the researcher created this tool, which includes standards for the temporary storage room, the proper temperature for temporary storage, and In order to evaluate the work environment (temporary storage room) for medical waste in the hospital, the researcher created this

tool, which includes standards for the temporary storage room, the proper temperature for temporary storage, and acceptable storage.

storage.

Scoring system:

Upon evaluation of the temporary storage room for medical waste by the researcher, each item was scored "0" for "Not" and "1" for "yes". Accordingly, total standard items of the temporary storage room for medical waste were categorized into:

- Standard 60%.
- Non-standard less than 60%.

II- Operational Design:

The operational design included a preparatory phase, content validity, a pilot study, ethical consideration, and fieldwork.

The preparatory phase:

This phase starts prior to the development of the tool by reviewing up-to-date literature from national and international resources (books, magazines, the internet, and research) related to the study. For data collection and to get acquainted with the various aspects of the research problem.

Pilot Study:

Ten employees (10% of the overall sample size) participated in the pilot study to verify the questions' clarity, the research instruments' applicability, and the time needed to finish them. The final study sample

comprised of the employees that took part in the pilot study.

Content validity:

It was established to assure content validity by a panel of three experts in community health nursing, who revised the tool for clarity, relevance, comprehensiveness, understanding, and ease of implementation, and according to their opinion, minor modifications were applied.

Content reliability:

The tools' reliability was examined to ascertain how the questionnaire items connected to one another.

Reliability and Validity Analysis of the Used Tool

Items	Validity	Alpha Cronbach	f	P-value
Knowledge	0.825	0.864	18.542	<0.001*
Exposure	0.797	0.823	15.209	<0.001*
Practice	0.766	0.782	13.816	<0.001*
Environmental workplace	0.919	0.925	20.437	<0.001*

This table illustrates that all components of the tool demonstrated high internal consistency, as indicated by Cronbach's alpha values exceeding 0.70. Furthermore, the make them aware of the aims and objectives of the research, as well as

IV: Ethical considerations: The Al-Fayoum University Faculty of Nursing's Scientific Research Ethical

validity coefficients confirmed that the instrument was reliable and valid for assessing knowledge, exposure, practice and environmental workplace. The reliability was scaled as follows: <0.25 weak reliability, 0.25-0.75 moderate reliability, 0.75-1 strong reliability and 1 is optimum.

Fieldwork:

The actual fieldwork and data collection were carried out over a period of four months from 1 October to 1 February. At the study location, the data were gathered by alternating between morning and afternoon shifts. The employees who consented to participate in the study were interviewed one-on-one by the researcher. Each employee was given an explanation of the study's purpose and goals by the researcher. The researcher completed the study tools, which each employee took 30 to 40 minutes to finish at the conclusion of the shift.

III. Administrative Design:

An official permission for data collection was obtained from managers. Meetings and discussions were held between the researcher and the manager's personnel to get cooperation during the phases of the research.

Committee granted ethical permission. Every person who consented to participate in the study

also gave their oral consent. Anonymity, confidentiality, and the freedom to leave the study at any moment were all guaranteed. Throughout the study, ethical standards, values, cultural origins, and individual beliefs were also honored.

V: Statistical Design: The current study was statistically presented and analyzed using the mean, standard deviation, chi-square test for comparing qualitative data between groups, and linear correlation coefficient for identifying correlations between two quantitative variables within a single group. by (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Significant level: >0.05 Nonsignificant <0.05 * significant <0.001 * High significant.

Results

Table (1): Presents that all workers were female (100%), with the Mean age 36.51 ± 8.92 . The majority were married (65.0%), and primary education (42.0%) was the most common educational level. In terms of experience, the highest proportion had 10 to <15 years about one third, while inpatient wards employed more than half of the workers (54.0%). Additionally, most participants (86.0%) had attended previous training, with 47.7% attending four or more specialties,

and almost all (97.7%) reported infection control who organized the course.

Figure (1): Illustrate that most workers have poor knowledge (55%), Average knowledge accounts for 27%, while only 18% demonstrate good knowledge regarding occupational health hazards and medical waste management.

Figure (2): Illustrate that exposure to occupational health hazards is high across all categories. Workplace hazards show the highest exposure (82%), followed by psychological (80%) and physical hazards (78%). Biological and chemical hazards also affect a substantial proportion of respondents, with exposure levels of 74% and 77%, respectively. Overall, 78% report exposure to at least one occupational hazard, while only 22% report no exposure.

Figure (3): Shows that the majority of respondents have unsatisfactory practice (77%), while only 23% demonstrate satisfactory practice.

Figure (4): Shows that just over half of the medical waste storage environments met the required standards (52.9%), while 47.1% were considered non-standard.

Table (2): Shows that only three variables demonstrated statistically significant differences in workers' total knowledge: educational level at ($p < 0.001$), years of experience in the

waste field at ($p < 0.001$), and work location within the hospital at ($p = 0.019$). On the other hand, the table presents no significant association between knowledge level and age at ($p = 0.086$), marital status at ($p = 0.507$), or attending previous training programs at ($p = 0.358$).

Table (3): Shows that there was a statistically significant positive correlation between total knowledge and total practice ($r = 0.518$, $p < 0.001$).

Table (1): Socio-demographic characteristics of medical waste workers (n=100)

Socio-Demographic Data of Medical Waste Workers	No	%
Age		
<25	6	6.0
25- <35	20	20.0
35- <45	33	33.0
45 or more	41	41.0
Mean±SD	36.51 ± 8.92	
Gender		
Female	100	100.0
Marital Status		
Married	65	65.0
Divorced	15	15.0
Widowed	17	17.0
Single	3	3.0
Educational Level		
Illiterate	33	33
Primary	42	42
Preparatory	18	18
Secondary	7	7
Years of Experience Working in the Waste Field		
<1	10	10.0
1- <5	15	15.0
5- <10	10	10.0
10 -<15	34	34.0
15 or more	31	31.0
Mean±SD	8.23 ± 6.12	
Your work location within the hospital		
Outpatient clinics	26	26.0
Inpatient wards	54	54.0
Operating rooms	4	4.0
Laboratory	4	4.0
Radiology	8	8.0
Sterilization	4	4.0
Have you attended previous seminars/programs on handling hazardous waste and its associated risks		
Yes	86	86.0
No	14	14.0
If yes, how many training courses have you attended		
1-2	29	33.7
2-4	16	18.6

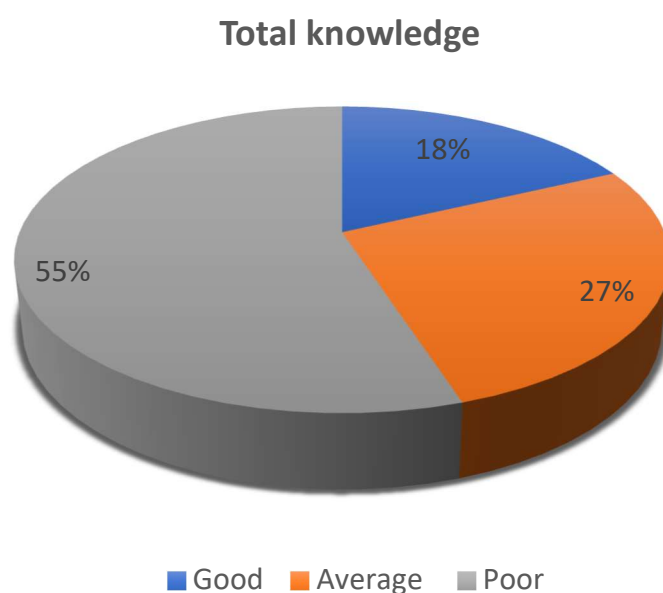


Figure (1): Descriptive of total knowledge of medical waste workers

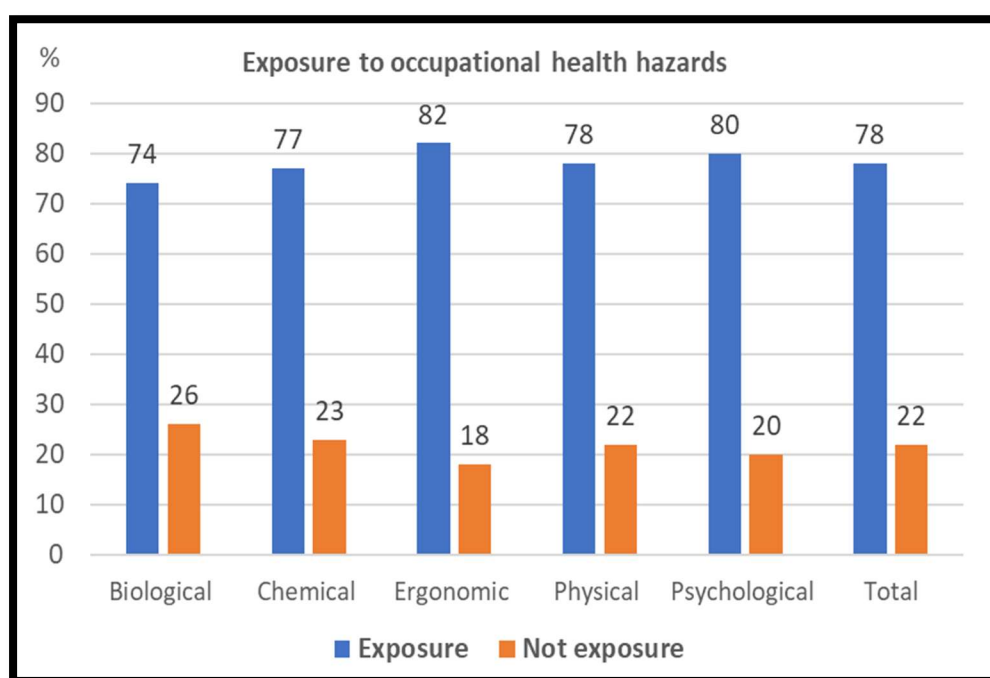


Figure (2): Descriptive of employees' exposure to occupational health hazards

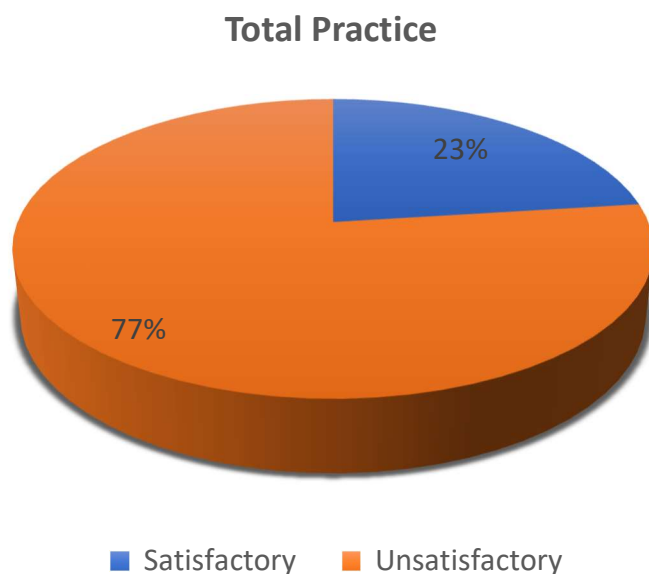


Figure (3): Descriptive of total practice of medical waste workers

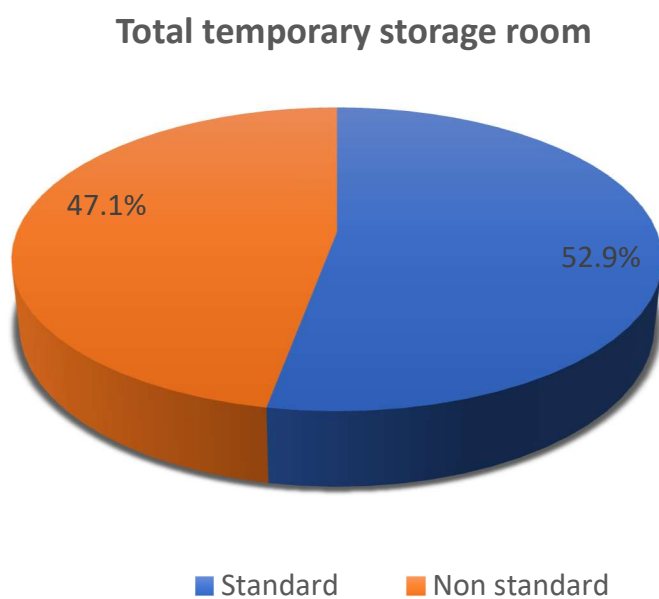


Figure (4): Descriptive of total environmental workplace standards for medical waste storage

Table (2): Relationship Between Socio-Demographic Characteristics and Total Knowledge Among Workers Regarding Medical Waste Hazards

Item	Total knowledge						χ^2	P value
	Good		Average		Good			
	N	%	No	%	No	%		
Age								
<25	0	0.0	29	15.7	12	6.5	MC	0.043*
25- <35	8	44.4	34	18.4	15	8.1		
35- <45	3	16.7	7	3.8	2	1.1		
45 or more	7	38.9	4	2.2	2	1.1		
Marital Status								
Married	14	77.8	52	28.1	18	9.7	6.583	0.037*
Divorced	2	11.1	22	11.9	13	7		
Widowed	2	11.1						
Single	0	0.0	1	0.5	3	1.6	MC	0.000**
Educational Level								
Illiterate	0	0.0	44	23.8	8	4.3		
Primary	7	38.9	6	3.2	10	5.4		
Preparatory	7	38.9	23	12.4	10	5.4		
Secondary	4	22.2	0	0	0	0	MC	0.000**
Years of Experience Working in the Waste Field								
<1	1	5.6	1	0.5	0	0		
1- <5	0	0.0	2	1.1	0	0		
5- <10	2	11.1	65	35.1	0	0		
10 -<15	1	5.6	6	3.2	31	16.8		
15 or more	14	77.8	68	36.8	31	16.8	MC	0.000**
Your work location within the hospital								
Outpatient clinics	2	11.1	2	1.1	0	0		
Inpatient wards	9	50.0	2	1.1	0	0		
Operating rooms	3	16.7	0	0	0	0		
Transactions	2	11.1	2	1.1	0	0		
Manufacturing	2	11.1	72	38.9	29	15.7	MC	0.000**
Sterilization	0	0.0	2	1.1	2	1.1		
Have you attended previous seminars/programs on handling hazardous waste and its associated risks								
Yes	17	94.4	4	2.2	5	2.7	18.323	0.001**
No	1	5.6	7	3.8	10	5.4		
Total knowledge								
	Good	Average	63	34.1	16	8.6		
	N	%	25	13.5	13	7	MC	0.973
Age								
<25	0	0.0	11	5.9	4	2.2		
25- <35	8	44.4	1	0.5	0	0		

Table (3): Correlation Between Total Knowledge and Total Practice

Total practice	Total knowledge	
	r	P-value
	0.518	<0.001*

Discussion

Inadequate handling of waste during generation, collection, storage, transportation, and treatment is referred to as mismanagement of hospital waste. The provision of high-quality healthcare services, people-centered care, patient and worker protection, and environmental preservation all depend on safe healthcare waste management. Safe handling of medical waste lowers healthcare-related infections, boosts service uptake and confidence, improves efficiency, and lowers service delivery costs (Telayneh et al. 2025).

Medical waste handlers face a serious issue because of inadequate understanding, a negative attitude toward the waste management system, incorrect or nonexistent usage of personal protective equipment (PPE), and a lack of training on work-related exposure protection techniques. Therefore, compared to health professionals, they are more likely to get a disease as a result of exposure to numerous

occupational risks during the course of their employment (Telayneh et al., 2025).

Concerning worker's socio-demographic characteristics the present study shows that about one third of age of the studied workers were 35-40 this finding disagreed with Mahamed (2025), who conducted study entitled "Medical Waste Management: Knowledge, Attitudes, and Practices Among Waste Handlers at Hargeisa Group Hospital, Somaliland" were above two third age of workers 30-40.

As regards the mean age the present study showed the studied workers was 36.51 ± 8.92 this finding agreed with Khashaba, El-Gilany, and Denewar (2023) who conducted study entitled "Effect of a waste management intervention program on knowledge, attitude, and practice (KAP) of nurses and housekeepers: a quasi-experimental study, Egypt" found that the mean age of the workers included in the study was $38.4 (\pm 9.5)$ years.

As regard to gender of workers the present study showed that all of workers were females, this finding agreed with **Tolera et al. (2024)**, who conducted study entitled “medical waste generation rate and management practices among government hospitals in Eastern Ethiopia” all of them were females.

Regarding marital status the present study show about two third of the workers were married this finding agreed with **Mahamed (2025)**, who conducted study entitled Medical Waste Management: Knowledge, Attitudes, and Practices Among Waste Handlers at Hargeisa Group Hospital, Somaliland “found that above half of Waste Handlers were married.

Regarding educational level the present study showed that primary education was less than half this finding disagreed with **Mahendran and Mahendran (2025)**, who conducted study entitled “Hazards and Safe Housekeeping Practices among Healthcare Sanitary Workers in South India” The education status of the study participants was two fifth had no formal education.

From view of researcher suggesting that low educational requirements for the job, or socioeconomic factors influencing employment in this sector.

Regarding training courses of workers, the present study shows that majority of workers had attended training courses, on the same line **Das, et al. (2024)**. who conducted study entitled “Frequency of occupational health hazards and factors responsible among the waste handlers at the tertiary care hospitals of Karachi “was less than half of health waste handlers (HWHs) (44 %) had received training course.

Regarding total knowledge regarding occupational health hazards, the current study showed above half the studied workers had poor total knowledge regarding occupational health hazards this finding was agreed with **Kamel, Elahmady, and Atta (2023)**. who conducted study entitled “Occupational Health Hazards among Workers in Marble and Granite Workshops in Benha City” above than half of the studied workers had poor total knowledge regarding occupational health hazards respectively.

Regarding exposure to occupational health hazards, the present study showed that nearly three quarters of the studied sample was exposed to biological hazards. Also, above three quarters of them were exposed to chemical hazards. majority of the studied sample was exposed to ergonomics hazards this

finding was on the same direction with **Tolera, et al. (2024)** who conducted study entitled “Magnitude and associated factors of occupational hazard exposures among sanitary workers: Propose RASM model for risk mitigation for the public hospitals, eastern Ethiopia” were reported occupational hazards exposure among sanitary workers (SWs) were biological (82.44%), chemical (74.76%) and ergonomics hazards (70.92%).

Regarding total exposure to occupational health hazards, the present study showed that the above three quarters of the studied sample exposed to at least one type of occupational health hazards. While less than one quarter of them are not exposed to any occupational health hazards regarding medical waste disposal. **Tolera, et al. (2024)** who conducted study entitled “Magnitude and associated factors of occupational hazard exposures among sanitary workers: Propose RASM model for risk mitigation for the public hospitals, eastern Ethiopia” showed that above than two third 63.65% of the studied sample an exposed to at least one type of occupational health hazards.

Regarding the overall practice score the present study showed that nearly one quarter demonstrated a good practice towards bio-medical

waste management this finding was disagreed with **Rutayisire, Nsabimana, and Habtu (2019)** who conducted study entitled “Knowledge and practice for Bio-Medical waste management among healthcare personnel at Kabgayi district hospital, Rwanda” were above one third 33.5%.

Regarding workplace environment the temporary storage room the current study showed that, above half of the temporary storage rooms are standard related to standard of environmental structure. While less than of them are non-standard. the results were disagreed to those of **Assad, Mohamed and Mohamed (2024)** who conducted study entitled “Occupational Health Hazards among Workers Dealing with Medical Waste Disposal in Outpatient Clinics in Egypt” and found the majority of temporary storage rooms that studded are standard.

Regarding the relation between demographic characteristics of the studied sample and their total knowledge the finding the present study showed that, there were a highly statistically significant relation between the studied sample' knowledge about medical waste management and occupational health hazards and their education level, years of experience in the waste field,

work location within the hospital, this finding was on the same direction with **Assad, Mohamed, and Mohamed (2024)** who conducted study entitled “Occupational Health Hazards among Workers Dealing with Medical Waste Disposal in Outpatient Clinics” that, there were a highly statistically significant relation between the studied sample' knowledge about medical waste management and occupational health hazards and their education level, years of experience and Attendance of previous seminars/ training programs.

Regarding to relation the present study showed no significant association between knowledge level and age, marital status, or attending previous training programs, the results were disagreed to those of **Abdelwahed et al. (2024)** who conducted study entitled “Occupational Safety-Based Medical Waste Management Performance Of Health Care Workers: A Cross-Sectional Study, in Damanhour city in Egypt” shows that the statistically significant independent positive predictor of housekeepers' knowledge scores was their previous training in infection control.

Regarding Medical Waste Handling the current study showed that, only one variable demonstrated a

statistically significant difference in workers' total practice and educational level This result was agreed with **Telayneh et al. (2025)** who conducted study entitled "Safety precaution knowledge, attitude, practice, and associated factors among medical waste cleaners in governmental hospitals, Northwest Ethiopia" , reported that medical waste cleaners with secondary education were 40% less likely to have good safety practices compared to higher educated (AOR=0.60, 95% CI: 0.38-0.97, p=0.03).

Regarding Medical Waste Handling the current study showed that, only one variable demonstrated a statistically significant difference in workers' total practice and educational level This result was agreed with **Telayneh et al. (2025)** who conducted study entitled "Safety precaution knowledge, attitude, practice, and associated factors among medical waste cleaners in governmental hospitals, Northwest Ethiopia" , reported that medical waste cleaners with secondary education were 40% less likely to have good safety practices compared to higher educated (AOR=0.60, 95% CI: 0.38-0.97, p=0.03).

Regarding Medical Waste Handling the current study showed that regarding Correlation between total knowledge and total practices

among studied workers regarding occupational health hazards, the present study showed a statistically significant positive correlation between total knowledge and total practice. this finding was on the same direction with **Kamel, Elahmady, and Atta (2023)**, who conducted study entitled “Occupational Health Hazards among Workers in Marble and Granite Workshops in Benha City” showed significant positive correlation between Total practices Total knowledge $r = 0.512$ p -value 0.000^{**} , regarding occupational health hazards.

Conclusion

According to current study results, illustrate that more than half of workers have poor knowledge (55%), Average knowledge accounts for 27%, while only 18% demonstrate good knowledge regarding occupational health hazards and medical waste management. the study also illustrates those overall practices of medical waste workers. Show statistically significant difference was observed ($p < 0.001$), with more than three quarters of workers demonstrating unsatisfactory practices (77.0%), while only 23.0% showed satisfactory practice levels. Moreover, the study shows that just over half of the medical waste storage environments met the

required standards (52.9%), while 47.1% were considered non-standard.

The study concluded that there is only three variables demonstrated statistically significant differences in workers' total knowledge: educational level at ($p < 0.001$), years of experience in the waste field at ($p < 0.001$), and work location within the hospital at ($p = 0.019$). On the other hand, the table presents no significant association between knowledge level and age at ($p = 0.086$), marital status at ($p = 0.507$), or attending previous training programs at ($p = 0.358$).

Finally, the study shows that only one variable demonstrated a statistically significant difference in workers' total practice: educational level at ($p = 0.009$). On the other hand, the table presents no significant association between practice level and age at ($p = 0.524$), marital status at ($p = 0.784$), years of experience in the waste field at ($p = 0.071$), work location within the hospital at ($p = 0.861$), or attending previous training programs at ($p = 0.403$). shows that there was a statistically significant positive correlation between total knowledge and total practice.

Recommendations

1. Implement regular and continuous training programs for medical waste workers to improve their knowledge

and awareness regarding occupational health hazards and safe medical waste management practices.

2. Establish and enforce clear, standardized guidelines and protocols for safe handling, segregation, storage, and disposal of medical waste.
3. Ensure the availability and proper use of appropriate personal protective equipment and conduct periodic supervision and evaluation of workers' practices to ensure compliance with infection control and safety measures.
4. Upgrade and maintain safe and well-equipped temporary storage areas for medical waste in accordance with recommended safety standards. Conduct further researches to evaluate the effectiveness of intervention programs aimed at improving workers' knowledge and practices.

References

- Abdelwahed, A. Y. (2023).** Occupational safety-based medical waste management performance of health care workers: A cross-sectional study. *Journal of International Crisis and Risk Communication Research*, 6(4), 184–200.
<https://doi.org/10.63278/jicrcr.vi.3224>
- Al-Khatib, I. A., Khalaf, A. S., Al-Sari, M. I., & Anayah, F. (2020).** Medical waste management at three hospitals in Jenin district, Palestine. *Environmental Monitoring and Assessment*, 192(1), 10.
<https://doi.org/10.1007/s10661-019-7992-0>
- Assad A., E., Mohamed M. H., & Mohamed H. M. (2024).** Occupational health hazards among workers dealing with medical waste disposal in outpatient clinics. *Egyptian Journal of Health Care*, 15(1), 290–304.
<https://doi.org/10.21608/ejhc.2024.33929>
- Azzam, A., Khaled, H., Elbohy, O. A., Mohamed, S. A., Mohamed, S. M. H., Abdelkader, A. H., ... & Rizk, S. M. A. (2023).** Seroprevalence of hepatitis B virus surface antigen (HBsAg) in Egypt (2000–2022): A systematic review with meta-analysis. *BMC Infectious Diseases*, 23(1), 151.
<https://doi.org/10.1186/s12879-023-08110-5>
- Cao, Y., Gao, L., Fan, L., Zhang, Z., Liu, X., Jiao, M., ... & Zhang, S. (2023).** Effects of verbal violence on job satisfaction, work engagement and the mediating role of emotional exhaustion among healthcare workers: A cross-sectional survey conducted in Chinese tertiary public hospitals. *BMJ Open*, 13(3), e065918.
<https://doi.org/10.1136/bmjopen-2022-065918>
- Centers for Disease Control and Prevention (CDC). (2003, updated**

- 2019).** Guidelines for environmental infection control in health-care facilities: Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Available at: <https://www.cdc.gov/infection-control/hcp/environmental-control/index.html>
- Das, E., Shaikh, S., Umm-E-Rabab, & Kumar, D. (2024).** Frequency of occupational health hazards and factors responsible among the waste handlers at the tertiary care hospitals of Karachi. *Pakistan Journal of Medical Sciences*, 40(7), 1539–1544. <https://doi.org/10.12669/pjms.40.7.9113>
- Dean, A. G., Sullivan, M. Zubieta, J. (Epi Info 2000).** A database, and statistics program for public health professionals for use on Windows 95, 98, and NT computers.
- Egyptian Ministry of Health and Population. (2021).** Guideline of healthcare-acquired infections surveillance. <https://www.mohp.gov.eg/UserFiles/LibraryFiles/444645.pdf>
- Kamel E. S., Elahmady M. A., & Atta M. W. (2023).** Occupational health hazards among workers in marble and granite workshops in Benha city. *Journal of Nursing Science Benha University*, 4(2), 617-629. <https://doi.org/10.21608/jnsbu.2023.308789>
- Khashaba, E., El-Gilany, A. H., & Denewar, K. (2023).** Effect of a waste management intervention program on knowledge, attitude, and practice (KAP) of nurses and housekeepers: A quasi-experimental study. *Egypt. Journal of the Egyptian Public Health Association*, 98(1). <https://doi.org/10.1186/s42506-023-00140-w>
- Mahamed, A. A. (2025).** Medical Waste Management: Knowledge, Attitudes, and Practices Among Waste Handlers at Hargeisa Group Hospital, Somaliland.
- Mahendran, J., & Mahendran, R. (2025).** Hazards and safe housekeeping practices among healthcare sanitary workers in South India. *Journal of the Scientific Society*, 52(1), 8-13. https://doi.org/10.4103/jss.jss_310_24
- National Institute for Occupational Safety and Health (NIOSH), (2019).** Blood borne pathogens website. Available at: <http://www.CDC.Rov/noish/bbpgg.htm>
- Odonkor, S. T., & Mahami, T. (2020).** Healthcare waste management in Ghanaian hospitals: Associated public health and environmental challenges. *Waste Management & Research: The Journal for a Sustainable Circular Economy*, 38(8), 831-839. <https://doi.org/10.1177/0734242x20914748Si>
- Onyeador, C. C., & Umberger, R. A. (2023).** Scope of practice for occupational health nurses: A

- concept analysis based on Walker and avant methods. *Nursing Forum*, 2023, 17. <https://doi.org/10.1155/2023/7953689>
- Rutayisire, E., Nsabimana, J. A., & Habtu, M. (2019).** Knowledge and practice for bio-medical waste management among healthcare personnel at Kabgayi district hospital, Rwanda. *Journal of Public Health International*, 1(4), 36-44. <https://doi.org/10.14302/issn.2641-4538.jphi-19-3005>
- Singh, H., Nagpal, M., Bindra, P., Singh, H., & Garg, A. (2022).** A study of knowledge, attitude and practices regarding biomedical waste management among health care providers in a tertiary care institute in Punjab. *Indian Journal of Community Health*, 34(4), 511-515. <https://doi.org/10.47203/ijch.2022.v34i04.015>
- Telayneh, A. T., Awudew, D., Endalew, B., Habtegiorgis, S. D., & Aycheh, M. W. (2025).** Safety precaution knowledge, attitude, practice, and associated factors among medical waste cleaners in governmental hospitals, northwest Ethiopia. *Scientific Reports*, 15(1). <https://doi.org/10.1038/s41598-025-22577-z>
- Tetzlaff, E. J., Richards, B. J., Wagar, K. E., Harris-Mostert, R. C., Journeay, W. S., O'Connor, F. K., & Kenny, G. P. (2025).** A content analysis of web-based heat stress materials published by occupational health and safety ministries, associations, and agencies in Canada. *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy*, 34(4), 306-326. <https://doi.org/10.1177/10482911241298948>
- Thakur, V., & Sharma, S. (2020).** Assessment of healthcare solid waste management practices for environmental performance: A study of hospitals in Himachal Pradesh, India. *Management of Environmental Quality: An International Journal*, 32(3), 612-630. <https://doi.org/10.1108/meq-08-2020-0168>
- Tolera, S. T., Assefa, N., Geremew, A., Toseva, E., & Gobena, T. (2024).** Magnitude and associated factors of occupational hazard exposures among sanitary workers: Propose RASM model for risk mitigation for the public hospitals, Eastern Ethiopia. *BMC Research Notes*, 17(1). <https://doi.org/10.1186/s13104-024-06828-2>
- WHO. (2019).** Overview of treatment technologies for infectious and sharp waste from health care facilities. World Health Organization, Geneva. <https://apps.who.int/iris/handle/10665/328146>. Also available: French, Spanish.
- WHO. (2022).** Health care waste management. World Health Organization waste. org. Accessed

on 2019. Available at:
<http://www.healthcare>

World Health Organization. (2024, October 24). Health-care waste.
<https://www.who.int/news-room/fact-sheets/detail/health-care->

Effects of the Unpleasant Symptoms- Relief Program on Pregnant Women at Risk of Preterm Labour

Aya M. Abdelhafez¹, Saleh Omar Abdullah², Safaa H. Mohamed^{3,4}

¹Lecturer of Maternity, Obstetric and Gynecological Nursing, Faculty of Nursing, Assiut University, Egypt.

²Assistant Professor of Psychiatric and Mental Health Nursing, Faculty of Medicine & Health Science, Hodeidah University, Yemen.

³Assistant Professor of Obstetrics and Gynecological Nursing. Faculty of Nursing, Assiut University, Egypt.

⁴Assistant Professor of Obstetrics and Gynecological Nursing, Al-Rayan National College of Nursing, Medina, Al Munawwarah, Saudia Arabia.

Corresponding author: Aya M. Abdelhafez

Email: aya@aun.edu.eg

Abstract

Background: Preterm labor represents a significant issue in maternal and neonatal health, linked to physical discomfort, psychological distress, and compromised emotional regulation. Nonpharmacological nursing interventions have the potential to alleviate these symptoms and enhance the health of expectant mothers who are at high risk. **Aim:** to evaluate the effects of the unpleasant symptoms-relief program on pregnant women at risk of preterm labour. **Design and setting:** A quasi-experimental pretest/posttest study was implemented at Assiut University, Woman's Health Hospital's Antenatal Care Unit. **Subjects:** A purposive sample of 70 women (35 in each study and control group). **Tools of data collection:** Tool I: preterm labour risk assessment sheet. Tool II: The Depression, Anxiety, and Stress Scale (DASS-21) and Tool III: Maternal Physical Discomfort Scale (MPDS) and Tool IV: Difficulties in Emotion Regulation Scale – version (DERS-16). **Results:** Post-intervention, the study group showed significant improvements in psychological distress, physical discomfort, and emotion regulation compared with the control group. Extremely severe anxiety level decreased from 17.1% to 2.9%, while severe depression decreased from 17.1% to 0.0%, and extremely severe stress dropped from 28.6% to 2.9%. The proportion of low-risk discomfort rose from 25.7% to 57.1%, whereas very high-risk discomfort declined from 45.7% to 0.0%. The prevalence of low difficulties in emotion regulation rose from 40.0% to 85.7%. **Conclusion:** The Unpleasant Symptoms-Relief Program significantly alleviated psychological distress and physical discomfort while enhancing emotion regulation in pregnant women who are at risk of premature labor. **Recommendations:** For high-risk women with preterm labor, the program ought to be integrated into routine nursing care, accompanied by training for maternity nurses in psychological support, symptom alleviation, and emotion regulation techniques.

Keywords: Emotion regulation, physical discomfort, pregnant women, preterm labour, psychological distress, unpleasant symptoms.

Introduction

A child's birth is a significant life event that can be joyful, exciting, and full of anticipation (**Murphey et al., 2017**). A pregnancy is considered high-risk if it hurts the mother's and the fetus's health, or both. A high-risk pregnancy can cause the expecting mother to go through a variety of physical, emotional, and psychological experiences (**Isaacs & Andipatin, 2020; Kim & Jun, 2021**). About 40% to 45% of high-risk pregnancies are caused by preterm labor (PTL). Any birth that has happened before 37 full weeks of gestation is referred to as PTL (**Fernandez Turienzo et al., 2021; Ramachandran et al., 2025**).

Although many pre-term newborns do survive, many survivors will be disabled for the rest of their lives, which influences families, communities, and healthcare systems. Prematurity-related problems claim the lives of over a million youngsters annually (**WHO, 2021**). PTL continues to climb in most nations where trustworthy data are available, despite efforts to lower the prevalence, enhance clinical management, and lower neonatal mortality and morbidity, as well as improvements in living conditions and the dissemination of information about prenatal care (**Emms et al., 2025; Mastrolia et al., 2021**).

Only a small percentage of PTLs are classified as iatrogenic or provider-initiated due to maternal or fetal reasons; however, in up to half of the cases, the cause is still unknown and involves multiple and overlapping factors (e.g., chronic diseases, infections, poor obstetric history such as previous PTL or late miscarriages, psychosocial stress, smoking, domestic violence). Nearly two-thirds of PTLs are classified as spontaneous due to the spontaneous onset of labor or preterm prelabour rupture of membranes (PPROM). Therefore, it has been difficult to implement public health interventions to prevent PTL (**Fernandez Turienzo et al., 2021; Ramachandran et al., 2025**).

Spontaneous PTL has been linked to a variety of sociodemographic, biological, dietary, psychological, and environmental factors; its complex and multivariate nature makes it difficult to explain the causative pathways leading to PTL. This subsequently restricts the creation and application of suitable clinical interventions and public health preventative tactics, such as maternity care plans intended to address preterm (**Vogel et al., 2020; Zaid & Liamputtong, 2024**).

PTL is a common public health concern and is linked to high levels of stress and anxiety in pregnant

women (**Li et al., 2025; Mirtabar et al., 2020; Tomfohr-Madsen et al., 2019**).

This study focuses on the theory of unpleasant symptoms, which was created in 1995 and improved in 1997. This idea helps identify the different types of symptoms so that non-pharmacological remedies can be suggested to treat them. In this regard, the theory offers a high-level abstraction framework for defining the extent of a symptom's relevance (**Gomes et al., 2019**).

Significance of the study:

Preterm birth rates are rising in nearly every nation where accurate data is available. The primary cause of death for newborns is prematurity, which is currently the second most common cause of death for children under five after pneumonia (**WHO, 2021**). Research on the experiences of women who are at higher risk of preterm birth is scarce (**Mastrolia et al., 2021**). There is a wealth of medical research on high-risk pregnancies, but women's emotional and psychological experiences are not well recorded. As a result, women with high-risk pregnancies receive far less attention and/or specialized care (**Isaacs & Andipatin, 2020; Mirzakhani et al., 2023**).

Expectant mothers who receive a high-risk pregnancy diagnosis may

find it challenging to accept and manage this new reality, which can have psychological and emotional repercussions. Fear, guilt, shock, grief, frustration, worry, loneliness, and isolation are just a few of the emotional problems that women who are having or have undergone high-risk pregnancies face, according to the research. Further research showed that women are more likely to experience psychological distress when there is a health risk during pregnancy (**Isaacs & Andipatin, 2020**).

A domestic literature review and an overseas intervention study for pregnant women with premature labour both focused on relaxation treatment, such as planned bed exercise, abdominal breathing, meditation, or music. It is a single interventional program focused on psychological aspects. The majority of them, the various needs of the subjects, and the health of high-risk pregnant women, that considers the problem comprehensively, are still insufficient (**Kim & Jun, 2021**). Consequently, pregnant women at high risk may have psychological and physical issues that represent some of the health issues they face. The intervention program that provides integrated nursing care for situational discomfort may require feet (**Kim & Jun, 2021**).

Aim of the study

The purpose of this study was to evaluate the effects of the unpleasant symptoms-relief program on pregnant women at risk of preterm labour.

Study hypothesis**Alternative Hypothesis (H1)**

Unpleasant Symptoms-Relief Program reduces psychological distress and physical discomfort among expectant mothers who are at risk of preterm birth.

Unpleasant Symptoms-Relief Program has a positive effect on emotion regulation among expectant mothers who are at risk of preterm birth.

Null hypothesis (H0)

Unpleasant Symptoms-Relief Program does not influence physical comfort, emotion regulation, and psychological distress among expectant mothers who are at risk of preterm birth.

Subjects and method**Study design:**

In this study, a pre-post-test quasi-experimental research approach was employed.

Setting:

This study was carried out at the Woman's Health Hospital's Antenatal Care Inpatient Unit (ANC) at Assiut University. Pregnant women from across Upper Egypt can receive prenatal care at this hospital, which is

the biggest in the Assiut Governorate.

Study subjects:

Women who volunteered to participate in the study, who were at risk of preterm labor, and were at least 18 years old were included. Women with major illnesses, mental disorders, acute medical conditions, or a lack of time to participate in the study were excluded.

Sampling and sample size estimation

A nonprobability (purposive) sample of 70 pregnant women at risk of preterm labour, 35 of them in the study group who received an unpleasant symptom-relief program & 35 of them were in the control group, received routine hospital care.

Estimation of sample size

Based on the findings of a previous study by **Kim and Jun (2021)**, the sample size was determined using G*Power (version 3.1.9.7). A two-tailed independent samples t-test was used in the analysis to compare the means of two independent groups. With a significance level of $\alpha = 0.05$ and a statistical power of 80% ($1 - \beta = 0.80$), the effect size was found to be 0.71. An equal allocation ratio between the groups was maintained ($N_2/N_1 = 1$). The effect size was calculated based on the post-test preterm labor stress scores reported by Kim and Jun (2021), with the

experimental group exhibiting a mean score of 51.70 ± 9.95 and the control group a mean score of 62.17 ± 18.49 . According to the analysis, each group must have a minimum sample size of 33 individuals, for a total of 66 participants. The final sample size was increased to 70 participants, with 35 individuals allocated to each group, to account for probable attrition and preserve enough statistical power. The final sample size was adequate to detect a statistically significant difference between the two groups, as indicated by the computed actual power of 0.8107177.

Data collection tools

In this research, four tools were employed:

Tool I: Preterm labour risk assessment sheet:

A two-part structured interview questionnaire that the researchers created to get the data from the expected mothers regarding the risk of preterm labour:

Part (1) Demographic data (age, occupation, educational, residence & BMI).

Part (2) Obstetric history & current pregnancy data: which included the number of (gravidity, parity, abortion, stillbirth, live birth), gestational age, whether she had a history of (previous induction of

labor, PPRM, obstructed labor, caesarean section, preterm labor and infection), current medical condition, mode of delivery in the most recent pregnancy, and prior use of contraceptives.

Tool II: Depression, Anxiety, and Stress Scale (DASS-21).

It was first created by **Henry and Crawford (2005)**, and edited by **Lyrakos et al. (2011)**. This 21-item self-reported scale consists of three subscales: stress (items 1, 6, 8, 11, 12, 14, and 18), anxiety (items 2, 4, 7, 9, 15, 19, and 20), and depression (items 3, 5, 10, 13, 16, 17, and 21). Each item was scored by the respondents based on the state of the previous week. On a five-point Likert scale, each item was scored from 0 (did not apply to me at all) to 4 (applied to me very much). The sum of the subscales determines the overall score. Higher scores are indicative of more severe symptoms of stress, anxiety, and depression. The DASS-21 severity is divided into five categories: (1) normal (0–9), mild (10–13), moderate (14–20), severe (21–27), and extremely severe (≥ 28) for depression. (2) normal (0–7), mild (8–9), moderate (10–14), severe (15–19), and extremely severe (≥ 20) for anxiety. (3) normal (0–14), mild (15–18), moderate (19–25), severe (26–33), and extremely severe (≥ 34) for stress. DASS-21 was a

suitable tool for the current investigation because it measured three different components. First, the instrument's psychometric qualities are proven in evaluating stress, anxiety, and depression in both clinical and nonclinical populations, including pregnant women (Brassel et al., 2020; Xavier et al., 2016). Using Alpha Cronbach's test to measure internal consistency, reliability was evaluated. The results showed that the DASS21, depression, anxiety, and stress scores were around 0.82 and 0.87, respectively.

Tool III: Maternal Physical Discomfort Scale (MPDS).

This reliable and valid scale was created by **Jackson et al. (1996)** to measure the type and extent of physical discomfort experienced by mothers. Each of the 33 items had a four-point Likert Scale, with 1 denoting "absent" and 4 denoting "severe". Total score ranged from 33 to 132.

-Low scores (1-44) → minimal discomfort.

-Moderate scores (44-88) → manageable.

Noticeable discomfort & high scores (88-132) → significant discomfort requiring clinical attention.

It has demonstrated strong reliability and both content and construct validity, making it a credible

instrument for clinical and research use.

Tool IV: Difficulties in Emotion Regulation Scale – version (DERS-16).

This scale was designed by **Bjureberg et al. (2016)**. It is a self-report tool that evaluates people's degrees of emotion management challenges. The "Awareness" subscale is removed from the longer DERS-36 (Gratz & Roemer, 2004) to create the DERS-16, which assesses five important facets of emotion regulation:

(1) Nonacceptance of Emotional Reactions (3 items: 9, 10, 13).

(2) Challenges Goal-Directed Behavior (3 items: 3, 7, 15).

(3) Impulse Control Difficulties (3 items: 4, 8, 11).

(4) Limited Access to Emotion Regulation Strategies (5 items: 5, 6, 12, 14, 16).

(5) Lack of Emotional Clarity (2 items: 1, 2).

Every question is answered on a five-point Likert scale, with 1 representing "almost never" and 5 denoting "almost always". The overall score varied from 16 to 80, with higher numbers indicating more challenges controlling emotions. Despite being much shorter than the DERS-36, the DERS-16 has good construct validity, and the scale's link to awareness-related categories was

not considerably weakened by eliminating the emotional awareness subscale. $\rho I = .85$ for the 14-day test-retest reliability. Numerous studies have reported excellent reliability for the overall scale score, .94 (Bjureberg et al., 2016). This indicates that the scale has great internal consistency.

Pilot study

After the study instruments were prepared and revised for validation by three specialists in the field of obstetric and gynecological nursing and medicine, a pilot study was conducted on 10% (7) of women to assess the study tools' viability and clarity. Since there were no changes, the pilot research sample was included in the whole sample.

Ethical considerations

Women who agreed to participate in the study gave their informed consent after being informed about its nature and objectives.

The women were not in danger while the study was being conducted.

The study adhered to standard clinical research ethics.

Anonymity and confidentiality were guaranteed.

At any point during the study, the participating women were free to decline to participate or to leave without explaining.

Procedure

This study is carried out through four phases:

Phase I: Preparatory phase

The Assiut University Faculty of Nursing's ethical committee granted ethical approval during the preliminary phase on June 26, 2022, session 42, Item 404. Then the manager of the Woman's Health Hospital formally agreed to start the study. The researcher contacted women who fit the requirements for potential inclusion.

Phase II: Implementation phase

Data was collected from December 2022 to the end of October 2023. After obtaining informed consent from the participating women, the researcher gave a brief introduction and described the purpose of the study. To maintain secrecy, each participant was interviewed one-on-one by the researcher in a different room. This phase involved the implementation of an educational program regarding pre-term labour. The researcher provided education to each small group of women, consisting of 2 to 5 participants, over eight sessions, with each session lasting approximately 10 to 15 minutes. **The initial session** aimed to establish rapport between the researchers and women to reduce their fear and gain their trust. **In the second session**, each pregnant

woman in both control and study groups was assessed before the program using study tools: tool I: preterm labour risk assessment sheet, which included (personal data, obstetric history & current pregnancy data), tool II: (DASS-21) scale, tool III: maternal physical discomfort scale, and tool IV: difficulties in emotion regulation scale. **In the third session**, the study group was provided with an educational program about preterm labour. **The fourth session** involved a detailed explanation and practice of the strategies used to reduce the psychological stress of preterm labour. **The 5th session** was about coping with emotions and social support. **The sixth session** included sleep hygiene during pregnancy. **The seventh session** included information about healthy nutrition and exercise. In **session eight**, the researcher clarified the warning symptoms during pregnancy and reviewed the program.

The detailed schedule content of these sessions:

The scheduling of the sessions varied slightly depending on the needs and availability of the participants and the researcher.

Session 1: Introduction & building trust.

- The researcher introduced the program

- Obtained informed consent
- Provided an overview of the program

Session 2: Assessed the participant's needs and concerns.

Session 3: Education about pre-term labour.

- Discussed pre-term labour.
- Provided information about (definition, causes, complications, and prevention of preterm labour).
- Reviewed signs and symptoms of preterm labour.
- Answer any questions or concerns.

Session 4: Relaxation techniques

- Instructed the women in relaxation methods such as progressive muscle relaxation, deep breathing, visualization, and meditation.
- Discussed the benefits of relaxation and how it can reduce anxiety, stress, and physical discomfort.
- Practiced relaxation exercises.

Session 5: Coping with emotions and social support.

- Discussed emotions that are common during pregnancy, such as anxiety, depression, and fear.
- Teach coping strategies, such as mindfulness and cognitive-behavioral techniques.
- Practiced coping exercises.

- Provided resources for additional support.
- Discussed the importance of social support during pregnancy.
- Teach skills for accessing support from family, friends, and healthcare professionals.
- Addressed any concerns or barriers to seeking support.
- **Session 6: Sleep hygiene**
- Discussed the importance of sleep during pregnancy.
- Teach strategies for improving sleep hygiene, like setting up a sleep schedule and furnishing a relaxing sleeping space.
- Addressed any concerns or issues related to sleep.

Session 7: Nutrition and Exercise

- Discussed the value of a healthy diet and regular exercise throughout pregnancy.
- Teach healthy eating habits and appropriate exercise regimens.
- Addressed any concerns or barriers to implementing a healthy lifestyle.

Session 8: Goal achievement & review the program.

- Clarified the warning symptoms during pregnancy.
- Reviewed progress and goals achievement.
- Discussed strategies for maintaining progress after the program ends.

- Provide resources for ongoing support.

Methods of implementation of these sessions:

The Unpleasant Symptoms-Relief Program for expectant mothers who are at risk of premature delivery is typically implemented using a combination of methods. These methods included:

1.Individual sessions: Firstly, during assessment, the program is often delivered on a one-to-one basis with the researcher. This allowed for personalized attention to the needs and concerns of the participant.

2.Group sessions: The program is also delivered in a group format, allowing participants to share experiences and provide mutual support. This was an effective way to create a sense of community and reduce isolation.

3.Teletherapy: The program is delivered via tele-therapy platforms, such as sending videos or phone calls. This was particularly useful for participants who have limited mobility or live in remote areas for follow-up.

4.Self-help materials: The program included self-help materials, such as handouts or audio recordings, that participants used outside of sessions to reinforce what they had learned.

5.Homework assignments: Participants are given homework

assignments after leaving the hospital to practice and reinforce the skills and strategies they have learned.

Phase III: Evaluation phase

This phase involved monitoring the participants' progress throughout the program and providing feedback on their performance.

Phase IV: Follow-up phase

A follow-up occurred after two weeks of program implementation. During this phase, each pregnant woman in both the control and study groups was evaluated using the following tools: tool II: (DASS-21) scale, tool III: maternal physical discomfort scale, and tool IV: difficulties in emotion regulation scale to measure the effect of the education on the study and control groups' physical discomfort, psychological distress, and emotion regulation.

Statistical analysis

SPSS 20 statistical software was used to analyze data. Range, mean, and standard deviation are used to describe quantitative variables, while frequency and percentages are used to express qualitative variables. Qualitative characteristics were compared between the two groups using the chi-square test, while quantitative variables were compared using the independent t-test. The significance level is defined as $P < 0.05$.

Results

Table (1) Demonstrates that the majority of the participants in both the study and the control group were under 30 years old, in the study group, all participants of study group (100%, $n = 35$) were housewives; while in the control group, 91.4% ($n = 32$) were housewives, there is no statistically significant difference in residence (rural vs. urban) between the study and control groups ($p = 0.621$), The study and control groups' educational levels do not differ statistically significantly ($p = 0.632$). The study and control groups' BMI distributions differ slightly, with slightly more obese people in the study group and more overweight people in the control group.

Table (2) Illustrates how the participants' obstetric and medical data were distributed, showing that over 75% of the women in the two groups were multigravida, with no statistically significant difference between the groups. The study and control groups' parity (57.1% in the study group and 71.4% in the control group) did not differ statistically significantly ($p = 0.436$) (1-3). Women with a history of caesarean section differed statistically significantly between the study and control groups, with the study group having a greater rate (71.4% vs. 48.6%).

Table (3) Demonstrates the relationship between the study and control groups with respect to the preterm birth risk assessment; the chi-square test ($p = 0.181$) and the t-test ($p = 0.268$) indicate that there is no statistically significant difference between the two groups with respect to the risk category distributions.

Table (4) Shows the relationship between study and control groups as regards depression, anxiety, and stress scales. According to the anxiety, in the pretest, there is no significant difference between the groups ($p = 0.141$), but there is a significant change ($p = 0.044$) in the post-test, where the study group's normal anxiety increased from 28.6% to 71.4%. In the depression level, in the pre-test: a statistically significant difference ($p = 0.022$), with more "Extremely Severe" cases in the control group. In the post-test, the study group shows a dramatic improvement, with 82.9% in the "Normal" range, compared to only 37.1% in the control group. Severe and extremely severe cases disappeared in the study group in the post-test. The stress level in the pre-test has no significant differences ($p = 0.951$). In the post-test, the study group saw a large improvement. Normal stress increased to 48.6%, and severe/extremely severe stress levels dropped sharply. The control

group still had 22.9% severe stress and only 17.1% "normal stress". Therefore, it is clear from the results that the intervention given to the study group had a statistically significant and clinically meaningful effect on lowering stress, anxiety, and depression levels. These outcomes confirm that the intervention was useful.

Table (5) Illustrates the relationship between study and control group regarding discomfort during pregnancy before and after education; It reveals that the educational intervention was successful in lowering pregnancy-related discomfort. Despite the study group experiencing greater high-risk discomfort, a significant improvement occurred (p . value = 0.032) after the program. Statistically significant & mean score decreased from 41.54 to 20.4.

Table (6) Verify the relationship between the study and control groups' difficulties with controlling their emotions both before and after the program. In the pre-intervention, the study and control groups' most prevalent emotion difficulties were moderate (51.4 & 42.9), without no statistically significant difference ($P = 0.385$). Post intervention, the study group showed an increase in the 'Low' difficulty from 40.0% to 85.7% while the control group revealed a

moderate increase in 'Low difficulty in emotion regulation ' (37.1% to 51.4%) but still had 8.6% High category (P value = 0.006), with a highly significant difference between both groups. This indicates that the intervention had a significant effect on improving emotional regulation.

Table (7) Displays the correlation coefficients (Pearson's r) between anxiety, depression, stress, discomfort during pregnancy, and emotion regulation following the intervention in both the study and control groups. In the study group, the table reveals a very strong positive correlation between depression & anxiety ($r = .815$), a strong positive of stress and depression & anxiety ($r = .798, .705$) respectively. A moderately positive correlation was found between discomfort & stress ($r = .546$), and emotion regulation with stress & discomfort were strongly positive ($r = .618, .763$). In the control group, there are strong emotional inter-correlations of (depression, anxiety & stress), but show very weak or even negative correlations between discomfort and emotion. This suggests that the control group may not recognize or integrate the

connection between physical discomfort and emotional difficulties as clearly as the study group. It may reflect less emotional insight or awareness, which the educational intervention in the study group likely improved.

Table (8) demonstrates the coefficient correlation between the preterm birth risk and medical data for the study and control groups prior to the program. In the study group, there was a moderately positive correlation with prior labor induction and contraceptive use ($r = 0.488, p = 0.003$) and ($r = 0.422, p = 0.012$), respectively. Delivery method showed a somewhat favorable correlation in the control group ($r = 0.342, p = 0.044$).

Table (9) illustrates the correlation coefficient between depression, anxiety, and stress with medical data for the study and control group before the program. It reveals that the emotional distress (anxiety, depression, stress) in pregnant women is significantly influenced by specific medical history factors, particularly in the study group. The history of preterm labor shows a moderate positive relationship with depression, suggesting that past obstetric complications may contribute to depressive symptoms in the control group.

Table (10) shows the correlation coefficient between discomfort during pregnancy with medical data for the study and control group before the program reveals the presence of moderate positive correlations with (previous abortion, induction of labor & contraceptive use) within the study group. Within the control group, moderate positive correlations are present, showing greater discomfort among women with infections and current illnesses. No significant relationships were found with gravidity, parity, gestational age, or most birth histories in both groups.

Table (11) Demonstrates the presence of a coefficient correlation between difficulties in emotion regulation and medical data for the study and control group before the program, in which it discloses that there is a strong negative correlation between the history of medication and emotion regulation difficulties in the study group. There is a moderate negative correlation with the number of living children, where the women with more children had fewer emotion regulation difficulties, and a moderate positive correlation appeared in the history of infection, $r = 0.343$, $p = 0.043$, indicating that women with infections showed greater difficulties in regulating emotions in the control group.

Table (1): Distribution of participant demographics (n = 70)

	Study		Control		X ² /T	P .value
	No	%	No	%		
Age group						
< 30 years	23	65.7	20	57.1	0.54	0.461
≥ 30 years	12	34.3	15	42.9		
Mean±SD (range)	28.21±6.12		29±4.89		-0.60	0.551
Residence						
Rural	21	60.0	23	65.7	0.25	0.621
Urban	14	40.0	12	34.3		
Occupation						
Housewife	35	100.0	32	91.4	3.13	0.077
Employed	0	0.0	3	8.6		
Educational level						
Uneducated	19	54.3	17	48.6	0.23	0.632
Educated	16	45.7	18	51.4		
BMI						
Normal	15	42.9	14	40.0	1.39	0.500
Overweight	13	37.1	17	48.6		
Obesity	7	20.0	4	11.4		
Mean±SD(range)	29.28±6.36		27.76±3.71		1.23	0.225

- Chi-square test for qualitative data

- Independent T-test quantitative data

*Significant level at P value < 0.05, **Significant level at P value < 0.01

Table (2): Distribution of the participants' medical and obstetric data (n = 70)

	Study		Control		X ² /T	P .value
	No	%	No	%		
Gravidity						
Primigravida	8	22.9	4	11.4	1.61	0.205
Multigravida	27	77.1	31	88.6		
Parity						
None	7	20.0	4	11.4	1.66	0.436
1 - 3	20	57.1	25	71.4		
> 3	8	22.9	6	17.1		
Gestational age						
< 28 weeks	15	42.9	10	28.6	2.80	0.247
28 - 34 weeks	14	40.0	21	60.0		
> 34 weeks	6	17.1	4	11.4		
Mean± SD (range)	28.8±5.03		28.21±6.39		0.43	0.671
Number of living children						
None	8	22.9	8	22.9	0.13	0.936
1 - 3	22	62.9	23	65.7		
> 3	5	14.3	4	11.4		
Number of abortions						
None	20	57.1	24	68.6	1.01	0.602
Once	9	25.7	7	20.0		
Two and more	6	17.1	4	11.4		
History of previous induction of labor						
Yes	9	25.7	13	37.1	1.06	0.303
No	26	74.3	22	62.9		
Previous pre-labor rupture of membranes						
Yes	9	25.7	13	37.1	1.06	0.303
No	26	74.3	22	62.9		
History of previous obstructed labor						
Yes	5	14.3	8	22.9	0.85	0.356
No	30	85.7	27	77.1		
History of previous caesarean section						
Yes	25	71.4	17	48.6	3.81	0.051
No	10	28.6	18	51.4		
History of previous preterm labor						
Yes	9	25.7	15	42.9	2.28	0.131
No	26	74.3	20	57.1		
History of infection						
Yes	2	5.7	5	14.3	1.43	0.232
No	33	94.3	30	85.7		
Previous contraceptive use						
Yes	17	48.6	22	62.9	1.45	0.229
No	18	51.4	13	37.1		
Current medical disease						
Yes	17	48.6	19	54.3	0.23	0.632
No	18	51.4	16	45.7		

- Chi-square test for qualitative data between the two groups

- Independent T-test quantitative data between the two groups

*Significant level at P value < 0.05, **Significant level at P value < 0.01

Table (3): Relationship between the study and control groups with respect to the assessment of preterm birth risk (n=70)

	Score	Study		Control		X2/T	P. value
		No	%	No	%		
The preterm birth risk assessment scale							
Low Risk	0-22	6	17.1	6	17.1	4.88	0.181
Mild To Moderate Risk	32-35	7	20.0	9	25.7		
High Risk	36-49	12	34.3	17	48.6		
Very High Risk	50-69	10	28.6	3	8.6		
Mean±SD (range)	69	38.66±13.87(15-63)		35.17±12.18(7-55)		1.24	0.268

Chi-square test for qualitative data

- Independent T-test quantitative data between the two groups

*Significant level at P value < 0.05, **Significant level at P value < 0.01

Table (4): Depression, anxiety, and stress scales (DASS-21) before and after the program: a comparison between the study and control groups (n=70)

	Pretest				X2/T	P. value	Posttest				X2/T	P. value
	Study		Control				Study		Control			
	No	%	No	%			No	%	No	%		
Anxiety Level												
Normal	10	28.6	4	11.4	6.90	0.141	25	71.4	14	40.0	9.80	0.044*
Mild	1	2.9	6	17.1			4	11.4	3	8.6		
Moderate	11	31.4	14	40.0			5	14.3	13	37.1		
Severe	7	20.0	7	20.0			0	0.0	2	5.7		
Extremely Severe	6	17.1	4	11.4			1	2.9	3	8.6		
Depression Level												
Normal	4	11.4	9	25.7	11.49	0.022*	29	82.9	13	37.1	15.83	0.003*
Mild	13	37.1	5	14.3			3	8.6	7	20.0		
Moderate	11	31.4	8	22.9			2	5.7	10	28.6		
Severe	6	17.1	5	14.3			0	0.0	1	2.9		
Extremely Severe	1	2.9	8	22.9			1	2.9	4	11.4		
Stress Level												
Normal	2	5.7	3	8.6	0.71	0.951	17	48.6	6	17.1	17.82	0.001**
Mild	7	20.0	5	14.3			9	25.7	4	11.4		
Moderate	9	25.7	8	22.9			8	22.9	14	40.0		
Severe	7	20.0	8	22.9			0	0.0	8	22.9		
Extremely Severe	10	28.6	11	31.4			1	2.9	3	8.6		

Chi-square test for qualitative data between the two groups

- Independent T-test quantitative data between the two groups

*Significant level at P value < 0.05, **Significant level at P value < 0.01

Table (5): Pregnancy-related discomfort before and after program: a relationship between the study and control groups (n=70)

	Pretest						Posttest					
	Study		Control		X2 /T	P. valu e	Study		Control		X2 /T	P. valu e
	No	%	No	%			No	%	No	%		
Scale for discomfort during pregnancy												
Low risk	9	25. 7	6	17 .1	17. 84	0.00 0**	20	57 .1	9	25 .7	8.7 8	0.03 2*
Moderate risk	1	2.9	12	34 .3			11	31 .4	20	57 .1		
High risk	25	71. 4	17	48 .5			4	11 .4	6	17 .1		
Mean± SD (range)	41.54±18.53 (9-66)		35.4±14.24 (5-74)		1.5 5	0.12 5	20.4±13.02 (0-43)		29.91±11.81 (4-66)		- 3.2 0	0.00 2**

Chi-square test for qualitative data

- Independent T-test quantitative data

*Significant level at P value < 0.05, **Significant level at P value < 0.01

Table (6): Relationship between the study and control groups in terms of emotional regulation difficulties before and after the program (n=70)

	Pre						Post					
	Study		Control		X2/ T	P. value	Study		Control		X2/ T	P. value
	N o	%	N o	%			N o	%	N o	%		
Difficulties in Emotion Regulation Scale (DERS-16)												
Low	14	40.0	13	37.1	1.91	0.385	30	85.7	18	51.4	10.26	0.006**
Moderate	18	51.4	15	42.9			5	14.3	14	40.0		
High	3	8.6	7	20.0			0	0.0	3	8.6		

Chi-square test for qualitative data between the two groups

*Significant level at P value < 0.05, **Significant level at P value < 0.01

Table (7): Correlation coefficient for study and control group following education on the risk of preterm birth, depression, anxiety, stress, discomfort during pregnancy, and emotion regulation (n=70)

Correlation	Study					Control				
	A1	A2	A3	A4	A5	A1	A2	A3	A4	A5
Anxiety	1					1				
Depression	.815**	1				.775**	1			
Stress	.705**	.798**	1			.748**	.690**	1		
Discomfort during pregnancy	.526**	.479**	.546**	1		-.018	-.075	.100	1	
Emotion regulation strategies	.492**	.443**	.618**	.763**	1	.338*	.385*	.636**	-.148	1

*Statistically Significant Correlation at P. value <0.05

**Statistically Significant Correlation at P. value <0.01

Table (8): The correlation coefficient of the preterm birth risk with medical data for the study and control group before the program (n=70)

Correlations	The Preterm Birth Risk			
	Study		Control	
	r	P	r	P
Gravidity	0.107	0.539	0.093	0.594
Parity	0.106	0.545	0.073	0.676
Gestational age	0.110	0.530	0.074	0.671
Number of living children	0.067	0.702	0.086	0.625
Number of abortions	0.247	0.153	0.091	0.604
History of previous induction of labor	.488**	0.003	-0.090	0.608
Previous pre-labor rupture of membranes	-0.033	0.850	0.186	0.285
History of previous obstructed labor	0.136	0.437	0.015	0.932
History of previous caesarean section	0.007	0.967	0.291	0.090
History of previous preterm labor	0.249	0.149	0.257	0.136
History of infection	0.240	0.164	-0.033	0.851
History of medication	-0.271	0.116	-0.092	0.597
Mode of delivery	0.007	0.967	.342*	0.044
Previous contraceptive use	.422*	0.012	-0.043	0.805
Current medical disease	0.242	0.162	0.223	0.197

**Statistically Significant Correlation at P. value <0.01

*Statistically Significant Correlation at P. value <0.05

Table (9): Correlation coefficient of depression, anxiety, and stress with medical data for the study and control group before education (n=70)

Correlations	Depression Anxiety Stress Scales Before											
	Study						Control					
	Anxiety		Depression		Stress		Anxiety		Depression		Stress	
	R	P	r	P	r	P	r	P	r	P	r	P
Gravidity	0.153	0.381	-0.130	0.455	0.033	0.851	0.115	0.509	0.087	0.619	-0.130	0.456
Parity	0.144	0.408	-0.254	0.140	0.011	0.951	0.171	0.325	0.181	0.298	-0.042	0.809
Gestational age	0.087	0.619	0.136	0.436	0.137	0.432	0.038	0.831	0.108	0.536	0.052	0.765
Number of living children	0.123	0.480	-0.212	0.221	-0.014	0.935	0.172	0.324	0.024	0.889	-0.004	0.982
Number of abortions	.358*	0.035	0.120	0.493	0.235	0.175	0.308	0.071	-0.050	0.777	0.063	0.721
History of previous induction of labor	.373*	0.027	.409*	0.015	.482**	0.003	0.082	0.639	-0.196	0.260	-0.057	0.746
Previous prelabor rupture of membranes	0.050	0.777	.344*	0.043	0.041	0.814	-0.028	0.871	-0.092	0.597	-0.043	0.807
History of previous obstructed labor	-0.055	0.752	0.116	0.508	0.109	0.531	0.313	0.067	0.222	0.200	0.333	0.050
History of previous caesarean section	0.111	0.526	-0.117	0.505	-0.017	0.921	-0.164	0.348	-0.158	0.364	-0.044	0.803
History of previous preterm labor	0.282	0.100	0.193	0.267	0.167	0.337	0.295	0.085	.360*	0.034	0.272	0.114
History of infection	0.040	0.821	0.013	0.942	0.030	0.862	0.292	0.089	0.104	0.551	0.141	0.419
History of medication	-0.151	0.386	0.011	0.952	-.374-*	0.027	-0.207	0.233	-0.088	0.615	-0.209	0.227
Mode of delivery	0.111	0.526	-0.117	0.505	-0.017	0.921	0.008	0.963	-0.003	0.988	0.119	0.496
Previous contraceptive use	0.264	0.125	0.022	0.899	0.230	0.183	0.305	0.074	0.183	0.293	0.085	0.628
Current medical disease	0.264	0.125	-0.186	0.285	0.106	0.543	0.184	0.291	0.251	0.146	0.050	0.775

**Statistically Significant Correlation at P. value <0.01

*Statistically Significant Correlation at P. value <0.

Table (10): Correlation coefficient of discomfort during pregnancy with medical data for the study and control group before the program (n=70)

Correlations	Discomfort during pregnancy			
	Study		Control	
	R	P	r	P
Gravidity	0.182	0.296	-0.232	0.181
Parity	0.222	0.200	-0.151	0.388
Gestational age	0.001	0.995	-0.148	0.395
Number of living children	0.128	0.463	-0.103	0.555
Number of abortions	.386*	0.022	0.325	0.057
History of previous induction of labor	.459**	0.006	0.164	0.348
Previous prelabor rupture of membranes	-0.089	0.611	0.062	0.722
History of previous obstructed labor	0.010	0.954	0.174	0.319
History of previous caesarean section	0.171	0.326	0.062	0.724
History of previous preterm labor	0.226	0.192	0.185	0.287
History of infection	0.188	0.279	.349*	0.040
History of medication	-0.311	0.069	0.018	0.920
Mode of delivery	0.171	0.326	0.119	0.496
Previous contraceptive use	.416*	0.013	0.110	0.528
Current medical disease	0.293	0.087	.378*	0.025

**Statistically Significant Correlation at P. value <0.01

*Statistically Significant Correlation at P. value <0.05

Table (11): Correlation coefficient of difficulties in emotion regulation with medical data for the study and control group before the program (n=70)

Correlations	Difficulties in emotion regulation			
	Study		Control	
	R	P	r	P
Gravidity	0.031	0.861	-0.319	0.062
Parity	-0.002	0.991	-0.241	0.164
Gestational age	0.068	0.700	-0.172	0.324
Number of living children	-0.072	0.681	-.356*	0.036
Number of abortions	0.234	0.176	0.058	0.739
History of previous induction of labor	0.316	0.064	-0.050	0.777
Previous prelabor rupture of membranes	-0.186	0.285	0.052	0.768
History of previous obstructed labor	0.065	0.711	0.083	0.634
History of previous caesarean section	0.020	0.910	-0.124	0.476
History of previous preterm labor	0.053	0.761	0.164	0.345
History of infection	-0.026	0.883	.343*	0.043
History of medication	-.517**	0.001	-0.067	0.701
Mode of delivery	0.020	0.910	-0.008	0.961
Previous contraceptive use	0.208	0.231	0.007	0.969
Current medical disease	0.216	0.212	0.295	0.085

**Statistically Significant Correlation at P. value <0.01

*Statistically Significant Correlation at P. value <0.05

Discussion

Because pre-term birth is linked to higher rates of infant illness, mortality, and long-term developmental problems, it continues to be a significant worldwide health concern. With recent pooled cohort data demonstrating a direct correlation between maternal anxiety and lower gestational age, psychological factors like stress and anxiety are becoming more widely acknowledged as significant contributors to unfavorable pregnancy outcomes, including premature birth (**Emms et al., 2025**). To reduce psychological suffering during pregnancy, support—which is broadly described as emotional, informational, and pragmatic support from partners, family, medical professionals, and community networks—is essential. Low social support appears to increase the risk of unfavorable outcomes among those experiencing high stress levels, suggesting a buffering role of support in the stress-preterm birth pathway, despite previous meta-analyses finding no direct association between social support and preterm birth for all women (**Grzesik-Gąsior et al., 2025; Ross et al., 2023**).

The present study strongly suggests that the intervention administered to the study group had a statistically significant and clinically meaningful

impact on reducing levels of anxiety, depression, and stress. These results supported the effectiveness of the intervention and agreed with the results of **Kim and Jun (2021)**. They came to the conclusion that preterm labor anxiety, stress, and situational discomfort were effectively reduced by the unpleasant symptom-relief program. Additionally, the current study's findings were consistent with **Choi and Park (2010)**, whose research revealed that for expectant mothers experiencing preterm labor, relaxation treatment can be a useful nursing intervention. Additionally, the findings of the current study align with the research carried out by **Park and Kim (2025)**, who demonstrated the effectiveness of virtual reality-based prenatal education in hospitalized patients experiencing preterm labor in the physical, emotional, and educational domains. This result is consistent with **Ozberk et al. (2021)**, who discovered that in women with impending preterm labor, relaxation-focused nursing care was observed to lower cortisol levels, increase knowledge, and lessen worry. Thus, in cases of impending preterm labor, relaxation-focused nursing care is advised. These findings align with **Park (2021)**, who found that abdominal breathing relaxation therapy improved stress and anxiety.

Therefore, it might be a useful nursing intervention for expectant mothers who are going into preterm labor. These findings concurred with **Yu and Song (2010)**, who discovered that for expectant mothers in premature labor, abdominal breathing is a successful nursing intervention. These outcomes were in line with **Ariöz Düzgün and Ege (2017)**, whose research findings indicate that relaxation techniques can help pregnant women who are about to go into premature labor manage their stress and worry.

According to the current study, there was a statistically significant difference in the level of discomfort between the groups prior to the program, even though the mean score was not significantly different. The study group had more participants in the high-risk category, indicating higher discomfort than the control group, which had milder to moderate risk. Following the program, the intervention group showed significant improvement, with the high-risk category falling from roughly three-quarters to just 17.1%. Additionally, the control group experienced little but noticeable improvement. This finding aligned with **Begjani et al. (2025)**. They conducted a study on emotion management training for moms of preterm newborns and found no

significant baseline differences in emotion regulation indices between the intervention and control groups. Additionally, these results did not align with the outcome of **Kim and Jun (2021)**, who noticed that their physical discomfort was not lessened by the unpleasant symptom-relief program. From the perspective of the researcher, this discrepancy might be explained by a variety of factors, including their disparate geographic location or limited sample size.

However, not all studies consistently show that educational interventions alone can significantly reduce physical suffering. **Alizadeh-Dibazari et al. (2023)** concluded that although prenatal education considerably reduces psychological distress and anxiety of delivering, the quality of evidence for physical discomfort and other maternal outcomes is still inconsistent because of different study designs and outcome measurements. Moreover, systematic reviews of prenatal education indicate that while education may lessen psychological symptoms, the effects on objective physical discomfort measures or pain intensity are less consistent across trials, suggesting that outcomes may vary depending on participant characteristics, intervention intensity, and content specificity. These differences demonstrate that

although the results of the current study are consistent with research demonstrating significant psychological benefits, some research indicates that not all discomfort or stress outcomes respond consistently to educational interventions, especially when assessed as separate components without integrated psychological or support elements.

According to the current findings, there was no statistically significant difference in emotion regulation difficulties between the study and control groups prior to the educational intervention. However, following the intervention, the study group showed a significant improvement in emotion regulation: the percentage of women classified as having low difficulties increased significantly, while the control group also showed some improvement, but crucially remained in a high difficulty category. When compared to usual care, the post-intervention P value of 0.006 shows that the difference between groups was highly significant, indicating that the educational intervention was successful in enhancing emotional control among women with preterm birth. This result matches up with current research that shows tailored emotion control therapies can enhance pregnant women's

emotional outcomes (**Masoumi et al., 2026**).

The present study demonstrated a highly significant improvement in psychological outcomes among the study group following the educational intervention, as reflected by depression, Anxiety, and stress scales. Before the intervention, most participants experienced moderate to extremely severe levels of anxiety, depression, and stress, with only a small proportion falling within the normal range. Post-intervention findings revealed a marked shift toward normal levels across all three domains. Anxiety showed a substantial improvement, with normal cases increasing, while severe and extremely severe cases nearly disappeared. Similarly, depression demonstrated a strong reduction as normal levels increased. Stress levels also improved significantly, with normal cases rising and extremely severe stress declining. These findings indicated that educational intervention was both statistically significant and clinically meaningful in improving mental health outcomes. The significant improvements in emotional regulation observed in this study after the targeted educational intervention for women with preterm labour, evidenced by a significant post-intervention shift from higher to

lower difficulty categories, are consistent with several contemporary studies highlighting the efficacy of structured psychological and educational programs in reducing anxiety and enhancing coping skills during preterm birth. **Bialas et al. (2025)** showed that PTB women were shown to have higher anxiety levels than term birth women. Additionally, their capacity to handle stress and generalized self-efficacy were statistically considerably poorer. Therefore, a mother-focused support program built on individual resources should assist moms to better cope with challenging circumstances pertaining to the treatment and care of preterm birth children. **Yousefi et al. (2025)** revealed that a psychoeducational life skills program taught by a midwife considerably decreased anxiety, stress, and depression among pregnant teenagers. These effects persisted across follow-up evaluations, highlighting the significance of structured, skills-based education in lowering emotional distress. On the other hand, some studies show more contradictory findings. A recent study by **Camoni et al. (2025)** found that while prenatal education programs were somewhat successful in lowering anxiety and depressive symptoms during pregnancy, the

effects were negligible and did not last into the postpartum phase. This suggests that educational interventions by themselves are insufficient to result in long-lasting changes in emotional regulation unless they are incorporated into more comprehensive psychosocial support frameworks. Furthermore, systematic reviews of internet-based psychosocial interventions have demonstrated varying efficacy in lowering stress and anxiety in pregnant populations in general, noting less consistent effects among women at risk of preterm labor. This underscores the importance of delivery method and content specificity in determining the success of interventions. When considered collectively, these results imply that while targeted and interactive educational interventions—particularly those that incorporate psychological coping strategies—align with the current study's findings and can successfully improve emotion regulation and lower anxiety, more widespread prenatal education programs may produce less significant or inconsistent benefits.

Conclusion

The program effectively reduced pregnancy-related physical discomfort, as evidenced by a significant decrease in high

discomfort levels among women in the study. Following the intervention, more women were classified as low risk, and the very high-risk discomfort category was erased. This indicates that the program helped women manage and cope with discomforts tied to high-risk pregnancy and preterm labor.

The unpleasant symptoms-relief program significantly improved psychological well-being in pregnant women at risk of preterm labor, leading to notable reductions in stress, anxiety, and depression.

The study revealed a significant enhancement in emotion regulation among women who underwent the intervention, with an increase in those experiencing low difficulties and a decline in those facing moderate to high difficulties. This suggests that the training improved women's ability to manage emotions, cope with challenging pregnancy-related situations, and adapt more effectively to hospitalization and the risk of premature labor.

Overall, the findings support that the unpleasant symptoms-relief program is a successful nursing intervention for enhancing physical, psychological, and emotional outcomes among pregnant women at risk of premature labor.

Recommendations

The following suggestions are made in light of the current study's findings:

1. Integrate a symptom-relief program into prenatal care for expectant mothers at risk of preterm labor in inpatient and high-risk clinics.
2. Train maternity and obstetric nurses on non-pharmacological interventions, including psychological support and stress reduction techniques.
3. Create educational resources like booklets and posters to inform pregnant women about preterm labor and self-care.
4. Improve emotional support services in antenatal units by regularly assessing mental health among high-risk pregnant mothers.
5. Encouraging a treatment plan for women at risk of preterm labor should include family involvement, as social support can enhance coping and reduce emotional distress.
6. Future studies should be conducted with larger, randomized samples to improve generalizability and strengthen the evidence of the program's effectiveness.
7. The program should be implemented in various maternity care settings, both rural and urban, to evaluate feasibility across diverse populations.

8. Additionally, future evaluations should consider neonatal and obstetric outcomes, including gestational age, birth weight, neonatal intensive care admissions, and maternal satisfaction.

References

- Alizadeh-Dibazari, Z., Abdolalipour, S., & Mirghafourvand, M. (2023b).** The effect of prenatal education on fear of childbirth, pain intensity during labour and childbirth experience: A scoping review using systematic approach and meta-analysis. *BMC Pregnancy Childbirth*, 23(1), 541.
- Ariöz Düzgün, A., & Ege, E. (2017).** Effects of relaxation exercises on the ways of coping with stress and anxiety level in primiparous pregnant women diagnosed with preterm labor. *Journal of Human Sciences*, 14(4).
- Begjani, J., Fomani, F.K., Beiranvand, F., & Rajabi, M. M. (2025).** The effect of peer-led education on the quality of life of mothers of premature infants in neonatal intensive care units: A quasi-experimental study. *BMC Res Notes*, 18(1), 327.
- Bialas, A., Kamecka, K., Rasmus, P., Timler, D., Kozlowski, R., & Lipert, A. (2025).** Anxiety, coping, and self-efficacy as a psychological adjustment in mothers who have experienced a preterm birth. *J Clin Med*, 14(12).
- Bjureberg, J., Ljótsson, B., Tull, M.T., Hedman, E., Sahlin, H., Lundh, L.-G., ... & Gratz, K.L. (2016).** Development and validation of a brief version of the difficulties in emotion regulation scale: The DERS-16. *Journal of Psychopathology and Behavioral Assessment*, 38(2), 284-96.
- Brassel, A., Townsend, M.L., Pickard, J.A., & Grenyer, B.F.S. (2020).** Maternal perinatal mental health: Associations with bonding, mindfulness, and self-criticism at 18 months' postpartum. *Birth*, 41(1), 69-81.
- Camoni, L., Mirabella, F., Gigantesco, A., Calamandrei, G., Stefana, A., & Perinatal Mental Health Network, g. (2025).** Effects of antenatal education on maternal anxiety and depression in pregnancy and postpartum period in Italy: Modest and transient symptom reductions. *Front Psychol*, 16, 1724202.
- Choi, M.S., & Park, Y.J. (2010).** The effects of relaxation therapy on anxiety and stress of pregnant women with preterm labor. *Korean J Women Health Nurs*, 16(4), 336-47.
- Emms, A., Pilarski, N., & Hodgetts-Morton, V. (2025).** Preterm labour and birth: Prevention strategies and preparation for delivery. *Obstetrics*,

Gynaecology & Reproductive Medicine, 35(7), 193-98.

Fernandez Turienzo, C., Rayment-Jones, H., Roe, Y., Silverio, S.A., Coxon, K., ... & Sandall, J. (2021).

A realist review to explore how midwifery continuity of care may influence preterm birth in pregnant women. *Birth*, 48(3), 375-88.

Gomes, G.L.L., Oliveira, F.M.d., Barbosa, K.T.F., Medeiros, A.C. d., Fernandes, M. G.M., & Nóbrega, M. L.d. (2019). Theory of Unpleasant Symptoms: Critical analysis. *Texto & Contexto - Enfermagem*, 28.

Gratz, L., Kim, , & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, 26(1), 41-54.

Grzesik-Gąsior, J., Zalewska, K., Pieczykolan, A., Kowalski, S., Żak-Kowalska, K., Niewiadomska, I., & Bień, A.J. M. (2025). The mediating role of social support between pregnancy anxiety and emotional suppression in women with threatened preterm Labor. 14.

Henry, J. D., & Crawford, J. R. (2005). The short-form version of the depression anxiety stress scales

(DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, 44, 227-39.

Isaacs, N.Z., & Andipatin, M.G. (2020). A systematic review regarding women's emotional and psychological experiences of high-risk pregnancies. *BMC Psychology*, 8(1).

Jackson, M.L., Rosier, M.J., & Walkley, J.W. (1996). Development of a scale to measure discomfort during pregnancy. *J Psychosom Obstet Gynaecol*, 17(2), 85-92.

Kim, G.N., & Jun, E.Y. (2021). Effects of the unpleasant symptom-relief program on preterm labor stress, anxiety, physical discomfort, and situational discomfort among hospitalized high-risk pregnant women: A nonrandomized controlled trial. *Journal of The Korean Society of Maternal and Child Health*, 25(4), 269-81.

Li, T., Patel, V.P., Szabo, S.M., Rochon, H., Kourmaeva, E., & Rood, K. (2025). The clinical burden of preterm labour: A systematic literature review. *Reproductive, Female and Child Health*, 4(3).

Lyrakos, G.N., Arvaniti, C., Smyrnioti, M., & Kostopanagiotou, G. (2011). Translation and validation study of

the depression anxiety stress scale in the Greek General Population and in a psychiatric patient's sample. *European Psychiatry*, 26, 1731.

Masoumi, N., Kazemi, F., Tiznobaik, A., & Ahmadpanah, M. (2026).

The effect of emotional self-regulation counseling on anxiety and fear of childbirth in first-time pregnant women: A clinical trial study. *Health Sci Rep*, 9(2), e71781.

Mastrolia, S.A., Fernandez Turienzo, C., Silverio, S.A., Coxon, K., Brigante, L., Seed, P.T., ... & Sandall, J. (2021).

Experiences of maternity care among women at increased risk of preterm birth receiving midwifery continuity of care compared to women receiving standard care: Results from the POPPIE pilot trial. *Plos One*, 16(4), e0248588.

Mirtabar, S.M., Faramarzi, M., Khazaei, R., & Dini, M. (2020).

Efficacy of psychotherapy for anxiety reduction in hospital management of women successfully treated for preterm labor: A randomized controlled trial. *Women & Health*, 60(10), 1151-63.

Mirzakhani, K., Ebadi, A., Faridhosseini, F., & Khadivzadeh, T. (2023).

Pregnant women's experiences of well-being in high-risk pregnancy: A qualitative study. *J Educ Health Promot*, 12, 6.

Murphey, C., Carter, P., Price, L.R.,

Champion, J.D., & Nichols, F.

(2017). Psychological distress in healthy low-risk first-time mothers during the postpartum period: An exploratory study. *Nursing Research and Practice*, 2017, 1-12.

Ozberk, H., Mete, S., & Bektas, M.

(2021). Effects of relaxation-focused nursing care in women in preterm labor. *Biol Res Nurs*, 23(2), 160-70.

Park, S.A. (2021). The effect of a breathing relaxation therapy for pregnant women with preterm labor pain: A systematic review and meta-analysis. *Keimyung Medical Journal*, 40(1), 39-47.

Park, S., & Kim, H. (2025).

Development and effect of prenatal education programs using virtual reality for pregnant women hospitalized with preterm labor: Experimental study. *J Med Internet Res*, 27, e75585.

Ramachandran, A., Perez, D., Gordon, A., & Hyett, J. (2025).

Reframing spontaneous preterm birth as a preventable adverse outcome-A clinical audit of a preventative toolbox. *Acta Obstet Gynecol Scand*, 104(5), 906-12.

Ross, K.M., Mander, H., Rinne, G., Okun, M., Hobel, C., Coussons-Read, M., & Dunkel Schetter, C.

(2023). Pregnancy-specific anxiety and gestational length: The mediating role of diurnal cortisol

indices.

Psychoneuroendocrinology, 153, 106114.

Tomfohr-Madsen, L., Cameron, E.E., Dunkel Schetter, C., Campbell, T., O'Beirne, M., Letourneau, N., & Giesbrecht, G.F. (2019). Pregnancy anxiety and preterm birth: The moderating role of sleep. *Health Psychology*, 38(11), 1025-35.

Vogel, J., Fernandez Turienzo, C., Bick, D., Briley, A.L., Bollard, M., ... & Sandall, J. (2020). Midwifery continuity of care versus standard maternity care for women at increased risk of preterm birth: A hybrid implementation–effectiveness, randomised controlled pilot trial in the UK. *PLOS Medicine*, 17(10), e1003350.

WHO. (2021). Born-too-soon-the-global-action-report-on-preterm.

Xavier, S., Bento, E., Azevedo, J., Marques, M., Soares, M.J., Freitas, V., ... & Pereira, A.T. (2016). Validation of the Depression, Anxiety and Stress Scale–DASS-21 in a community sample of Portuguese pregnant women. *European Psychiatry*, 33(S1), s239-s39.

Yousefi, S., Montazeri, S., Javadifar, N., & Ghanbari, S. (2025). Psychosocial support during pregnancy: Perceptions and expectations among pregnant

teenagers in Ahvaz, Iran-a qualitative content analysis. *Reproductive Health*, 22(1).

Yu, W.J., & Song, J.E. (2010). Effects of abdominal breathing on state anxiety, stress, and tocolytic dosage for pregnant women in preterm labor. *J Korean Acad Nurs*, 40(3), 442-52.

Zaid, F.A., & Liamputtong, P. (2024). Determinants of Health, Health Promotion, and Illness Prevention. In P. Liamputtong (Ed.), *Handbook of Concepts in Health, Health Behavior and Environmental Health* (pp. 1-19). Springer Nature Singapore.

https://doi.org/10.1007/978-981-97-0821-5_159-2