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Effect of Implementing Nursing Interventions for Bed Bathing on Occurrence of Adverse Events among Mechanically Ventilated Patients

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Abstract

Background: Mechanically ventilated patients are highly vulnerable to adverse events during routine nursing care, especially bed bathing. Structured nursing interventions during bed bathing are essential to improve patient safety and outcomes. **Aim**: evaluate the effect of implementing nursing interventions for bed bathing on the occurrence of adverse events among mechanically ventilated patients. **Study design**: Quasi-experimental research design. **Setting:** The study was conducted at the Anesthetic Intensive Care Unit in Tanta Emergency Hospital. **Subjects**: A purposive sample of 80 mechanically ventilated adult patients. **Tools**: Two tools were used: tool(I) a Mechanically Ventilated Patient Assessment Tool (demographics, clinical data, ventilator parameters), and Tool (II) an Adverse Events Regarding Bed Bathing Assessment Sheet. **Results:** The results revealed that mechanically ventilated patients in the study group experienced significantly fewer hemodynamic, technical, and pain-related adverse events compared to the control group during bathing. The control group had higher heart rate (105.8 ± 5.0 vs 93.7 ± 4.8 bpm) and lower oxygen saturation (88.9 ± 2.0% vs 94.9 ± 0.9%) than the study group. Adverse events, including accidental device removal (35.0% vs 2.5%), device dysfunction (47.5% vs 0%), and pain scores (8.95 ± 1.18 vs 4.65 ± 0.83) were significantly higher in the control group. **Conclusions:** Nursing interventions for bed bathing reduced adverse events among mechanically ventilated patients than patient on control group **Recommendations:** Standardized bed-bathing interventions should be integrated into ICU routine care, supported by continuous nurse training, and further tested on larger samples across different ICU settings.

Keywords: Adverse events, Bed bathing, mechanically ventilated patients, nursing interventions.

Introduction

Mechanical ventilation is an essential, life-saving therapy for patients with critical illness (**Walter, 2021)**. Epidemiological studies revealed that as high as 40% of patients admitted to the intensive care unit (ICU) require mechanical ventilation at some point during their stay in ICU **(Fordyce et al., 2020).** Mechanically ventilated patients in intensive care units (ICUs) are at greater risk for skin colonization and infection because of the presence of significant comorbidities, immunodeficiency, exposure to antibiotics, and breaks in skin integrity related to the use of invasive devices. Therefore, it is important to provide critically ill patient with effective personal hygiene **(Huang et al., 2021; Blot et al., 2022)**.

Bathing is a fundamental nursing care activity performed for or with the self-assistance of critically ill patients **(Happ et al., 2020)**. Adverse events (AEs) during nursing hygienic practice for mechanically ventilation patients are frequent in ICU. Most of the patients (85.9%) usually affected by at least one AE according to **Lesny et al., (2020).** Turning the patient during bed bathing can result in hemodynamic, respiratory, and/or neurologic changes that may be deleterious or even dangerous for the patient and associated with a risk of accidental displacement/movement of the medical devices necessary for the patient's care **(Decormeille et al., 2020).**

Prevention of critical incidents associated with nursing care procedures for patients, such as bed bathing in (ICU), constitutes a vital responsibility of the critical care nurse. The implementation of interventional patient hygiene constitutes a nursing action plan that is explicitly aimed at enhancing the host defenses of patients. This approach is grounded in evidence-based care and involves a systematic evaluation of the client's responses to various interventions, all with the objective of preventing complications associated with immobility **(Mohamed, 2022; Vollman, 2023).**

Significance of the study:

Patients who are mechanically ventilated in critical care units typically rely on their nurses for assistance with bathing activities in a comprehensive manner. In order to uphold patient safety, enhance the quality of care, and mitigate errors or harm associated with nursing practice, it is imperative that critical care nurses demonstrate proficiency in a diverse array of advanced skills. Among these skills is bed bathing, which is integral to their professional

competencies **(Vollman, 2023; Cremer et al., 2023).** A significant proportion of critically ill patients experience adverse events during the daily bed bathing procedure, as noted by **Lesny et al. (2020).** Consequently, the objective of this research is to assess the impact of the implementation of nursing interventions related to bed-bathing on the incidence of adverse events in patients who are mechanically ventilated.

The aim of this study was to determine the effect of implementing nursing interventions for bed-bathing on occurrence of adverse events among mechanically ventilated patients.

Research Hypothesis:

Mechanically ventilated patients in study group who exposed to nursing interventions for bed-bathing are expect to exhibit reduction in adverse events than mechanically ventilated patients in control group who will not expose.

Research design was quasi-experimental. **Setting**: Anesthetic Intensive Care Unit of Tanta Emergency served as the study's site. **Subjects:** 80 adult patients on mechanical ventilator who fulfilling inclusion criteria were selected divided into two equal groups, 40 patients in each group as follow. **Control group** was received their routine bed bathing as provided by ICU nurses. **Study group** was received their nursing interventions for bed bathing that was developed and implemented by researcher after agreement of the treating physician in the Anesthetic Intensive Care Unit.

Tools of data collection: Two tools were used in this study:

Tool (I): Mechanically Ventilated Patient Assessment Tool.

This tool was developed by the researcher after reviewing of the related literature **(Decormeille et al., 2021)** and it included the following parts: **Part (1) patient's biodemographic characteristics:** As patient's age, sex and body mass index. **Part (2) Patient clinical data included** current diagnosis, Glascow Coma Scale (GSC) score on admission and Ventilator parameter

Tool (II): Adverse Events Regarding Bed Bathing Assessment sheet

This tool was developed by the researcher after reviewing of the related literature **(Möller & Magalhães, 2015; Lesny et al., 2020);** it included the following parts:

Part (A): Hemodynamic adverse events:

- Hypertension (SAP > 160 mmHg or increasing > 30%).

- Hypotension (SAP < 90 mmHg or decreasing > 30%)
- Arrhythmia Tachycardia (HR > 140 bpm)
- Bradycardia (HR < 50 bpm)
- Bradypnea (RR < 12 C\m)
- Tachypnea (RR > 25 C\m)
- Desaturation (decrease in oxygen saturation < 95% SpO2).

Part (B): Technical and Mechanical ventilation adverse events

De synchronization between patient and ventilator, accidentally removal of invasive device/catheters, dysfunction of invasive device/ catheters, skin dryness and patient's falling

Part (C) pain experience related to bed bathing by using behavioral pain scale (BPS) (Payen et al., 2001). The behavioral pain scale (BPS) was an adapted version of Campbell's (2000) to assess the severity of pain. BPS had internal consistency and a reliability coefficient (Cronbach alpha) of 0.882. The behavioral pain scale involved three items for assessment (facial expression, upper limb and compliance with ventilation).

Scoring system was as follow:

- No pain equal score (3)
- Mild pain score ranges from 4-6.
- Moderate pain ranges from 7-9
- Sever pain ranges from 10-12

Methods

- Official Permission to carry out the study was obtained from the responsible authorities at the study setting. Informed consent was obtained from the patients or first-degree relatives to participate in the study after explaining the purpose of the study.
- Withdrawal from the study was reserved at any time and the nature of the study didn't cause any harm for the participated patients.
- The developed tools were tested for content validity by seven experts in the field of Critical Care Nursing and anesthetic department.
- A pilot study was carried out on 10% patients and nurses to test the feasibility and applicability of the tools.
- Collection of the data was within a period of 9 months.

This study was conducted on three phases:

Phase (1): Assessment phase: - Assessment was done for both control and study groups on admission to obtain baseline data by using tools I and II

Phase (2): Implementation phase:

A- Control group patients received their routine bed bathing as provided by ICU nurses.

B- Study group patients received their nursing interventions for bed bathing that was developed by researcher after reviewing of related literature **(AACN, 2013 & Vollman, 2023).** Then nursing interventions was implemented by the researcher and agreed by the treating physician in the anesthetic intensive care units, guidelines included the following:

1. **Nursing interventions before bed bathing.**
   - Explain procedure for the patient
   - Request for help with assistant nurse
   - Prepare environment
   - Checking of necessary equipment
   - Checking of the patient's connected tubes, devices, intravenous fluids & position.
   - Checking of cardiac monitor and ventilator
   - Checking vital signs & monitoring of hemodynamic parameters
   - Hyper oxygenation by 100% oxygen
   - Determine bath time based on patient preference and clinical stability.

2. Nursing interventions during bed bathing

- Adhere to safety nursing interventions during turning and mobility the patient on bed.
- Use disposable basins and dispose of them after one use to reduce risk of bacterial contamination.
- Expose only the part that will be bathed
- Avoid use of unfiltered tap water, sterile or distilled water or filtered water from faucets.
- Warm water (around 106 degrees Fahrenheit) (41° C)
- Use no-rinse pH balanced cleansers, which are superior to alkaline soaps that require wash-rinse cycles.
- Gently handling of the patient's connected tubes, devices, intravenous fluids
- Checking of cardiac monitor and ventilator
- Monitoring of hemodynamic parameters

3. Nursing interventions after bed bathing

- Apply emollients after bath to prevent dry skin.
- Checking of cardiac monitor and ventilator
- Checking vital signs &monitoring of hemodynamic parameters
- Hyper oxygenation with 100% oxygen after bathing
- Checking the patients' connection.

Phase (3): Evaluation phase:

Assessment of adverse events regarding bed bathing was done three time 15 minutes before bed bathing,

during bed bathing and 15 minutes after bed bathing by using tool (II).

Results

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

Concerning age, this result sowed that Patients aged 50–60 years represented the largest age category in both the control group (35.0%) and the study group (37.5%). The mean age was comparable between groups (42.70 ± 12.11 years in the control group versus 42.93 ± 11.38 years in the study group; P = 0.932). Regarding gender, males constituted 55.0% of the control group compared to 50.0% of the study group, with no significant difference (P = 0.823). In relation to body mass index, normal weight patients accounted for 42.5% of the control group and 40.0% of the study group, whereas overweight patients represented 35.0% and 42.5%, respectively. The mean BMI showed no statistically significant difference between the control and study groups (25.67 ± 3.70 kg/m² versus 27.03 ± 4.35 kg/m²; P = 0.138).

Figure (1): Distribution of the studied mechanically ventilated patients regarding their consciousness level and ventilator modes. Concerning level of consciousness, the figure demonstrates that semi-conscious patients represented the highest proportion in both groups (52.5% in the control group vs. 57.5% in the study group), whereas comatose patients accounted for 47.5% and 42.5% in the control and study groups, respectively**.**

Regarding ventilator modes, assist-control (AC) ventilation was the most frequently used mode (45.0% in the control group vs. 37.5% in the study group), followed by synchronized intermittent mandatory ventilation (SIMV) (32.5% vs. 37.5%). Pressure support ventilation was the least commonly applied mode (22.5% in the control group vs. 25.0% in the study group). No statistically significant differences were observed between both groups (P > 0.05).

Table (2): Distribution of the studied mechanically ventilated patients regarding their clinical data. Regarding diagnosis, this table revealed no statistically significant differences between the control and study groups regarding clinical characteristics, indicating baseline homogeneity (P > 0.05). Traumatic brain injury was the most common diagnosis in both groups (60.0% vs. 57.5%).

Table (3): Assessment of hemodynamic parameters of the studied mechanically ventilated

patients among the studied groups throughout periods of intervention. This table shows significant changes in heart rate, respiratory rate, oxygen saturation, and temperature during bathing in both groups (P=0.000), while systolic and diastolic blood pressure showed no significant differences (P>0.05). In the **control group**, heart rate increased from 89.58±3.99 to 105.83±5.01 bpm, respiratory rate from 18.65±1.33 to 24.35±2.42 breaths/min, and oxygen saturation decreased from 96.55±1.06% to 88.88±2.02% during bathing. Temperature dropped from 37.17±0.18°C to 36.36±0.32°C. In the **study group**, changes were less pronounced: heart rate increased from 88.45±3.90 to 93.68±4.83 bpm, respiratory rate from 18.23±1.29 to 20.60±1.65 breaths/min, and oxygen saturation decreased from 97.25±1.10% to 94.90±0.90%, with faster return to near baseline after 15 minutes.

Table (4): Assessment of technical and mechanical ventilation adverse events of the studied mechanically ventilated patients among the studied groups throughout periods of intervention. This table shows that adverse technical and mechanical ventilation events occurred predominantly during bathing, especially in the **control group.** During bathing, 92.5% of control patients experienced decreased tidal volume, 92.5% had chest indrawing and discomfort, 92.5% showed increased work of breathing, and 100% triggered ventilator alarms (P=0.000). Additionally, 65% had accidental removal of invasive devices and 52.5% experienced device dysfunction. In contrast, the **study group** demonstrated markedly lower incidences during bathing: decreased tidal volume (7.5%), chest discomfort (12.5%), increased work of breathing (12.5%), ventilator alarms (10%), and accidental device removal (2.5%), with no reported device dysfunction.

Figure (2): Assessment of behavioral pain severity of the studied mechanically ventilated patients among the studied groups throughout periods of intervention. This figure shows that in the control group, 100% of patients were painless before bathing; however, during bathing, 62.5% experienced moderate pain and 2.5% mild pain. After 15 minutes, 100% reported mild pain. In the study group, 95% were painless before bathing and 5% had mild pain. During bathing, 100% experienced only mild pain with no moderate pain reported. After 15 minutes, 97.5% returned to a painless state and 2.5% had mild pain.

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

Characteristics	The studied critically ill patients (n=80)				χ^2 P
	Control group (n=40)		Study group (n=40)		
	N	%	N	%	
Age (in years)					
(21-<30)	8	20.0	6	15.0	
(30-<40)	8	20.0	9	22.5	0.380
(40-<50)	10	25.0	10	25.0	0.944
50-60)	14	35.0	15	37.5	
Range **Mean ± SD**	**(22-60)** **42.70±12.115**		**(22-60)** **42.93±11.382**		t=0.007 P=0.932
Gender					
Male	22	55.0	20	50.0	FE
Female	18	45.0	20	50.0	0.823
Body mass index (kg/m^2)					
Normal weight (18.5–<25)	17	42.5	14	35.0	
Overweight (25–<30)	16	40.0	17	42.5	0.572
Obesity (≥30)	7	17.5	9	22.5	0.751
Range **Mean ± SD**	**(20.06-33.20)** **25.67±3.703**		**(21.13-39.54)** **27.03±4.348**		t=2.251 P=0.138

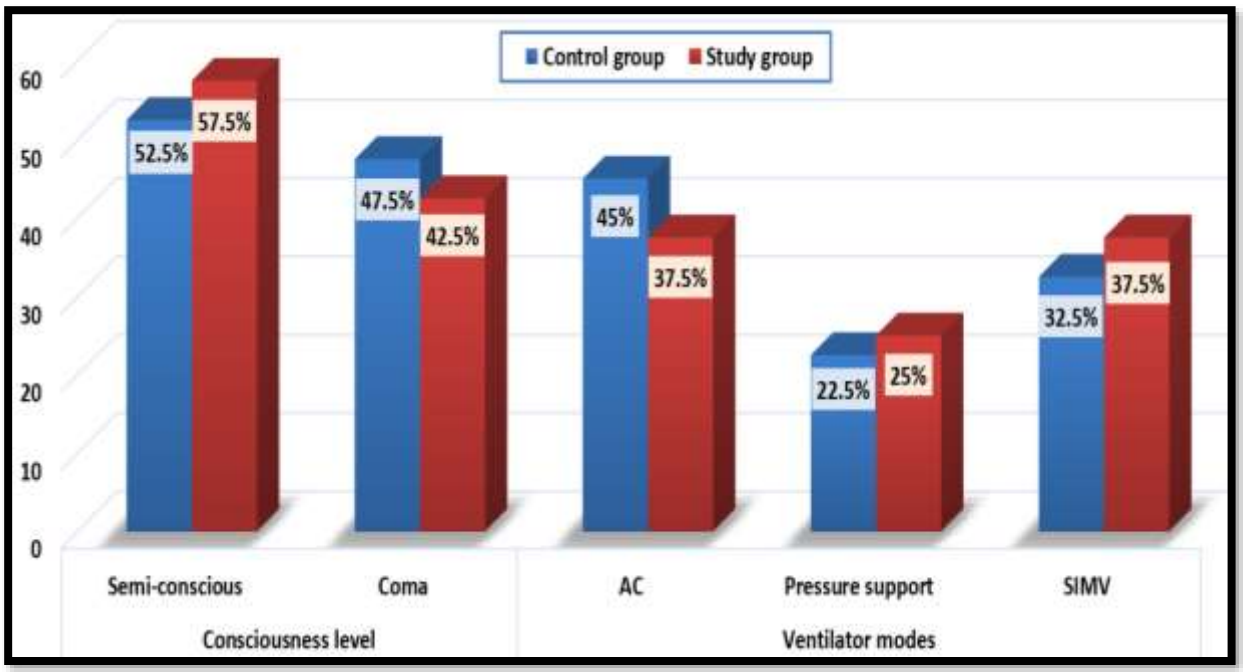

Figure (1): Distribution of the studied mechanically ventilated patients regarding their consciousness level and ventilator modes.

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

Clinical data	The studied critically ill patients (n=80)				χ^2 P
	Control group (n=40)		Study group (n=40)		
	N	%	N	%	
Diagnosis					
Traumatic brain injury	24	60.0	23	57.5	
DKA	4	10.0	2	5.0	**18.601**
Acute respiratory failure	4	10.0	4	10.0	**0.046***
post-operative disorders	8	20.0	11	27.5	

* Statistically significant level at P<0.05

Table (3): Assessment of hemodynamic parameters of the studied mechanically ventilated patients throughout periods of intervention.

	The studied critically ill patients (n=80) Range Mean ± SD							
	Control group (n=40)			F P	Study group (n=40)			F P
	Before 15 min	During bathing	After 15 min		Before 15 min	During bathing	After 15 min	
Blood pressure								
Systolic	(100-145) 120.60±11.723	(82-153) 122.45±21.346	(92-145) 120.03±14.720	0.238 0.789	(104-130) 120.55±7.636	(100-138) 122.08±12.164	(100-134) 121.00±8.927	0.258 0.773
Diastolic	(62-95) 76.93±9.169	(52-102) 78.25±14.270	(58-95) 76.20±10.128	0.332 0.718	(60-90) 75.08±6.639	(56-95) 76.30±9.140	(60-93) 74.98±7.495	0.355 0.702
Heart rate	(80-99) 89.58±3.993	(95-115) 105.83±5.012	(82-102) 92.50±4.350	**150.087** **0.000***	(80-96) 88.45±3.896	(85-102) 93.68±4.827	(80-98) 89.45±4.188	**16.478** **0.000***
Respiratory rate	(16-22) 18.65±1.331	(19-29) 24.35±2.424	(17-22) 19.95±1.568	**105.966** **0.000***	(16-20) 18.23±1.291	(18-25) 20.60±1.646	(16-20) 18.28±1.176	**38.379** **0.000***
O2 saturation	(94-98) 96.55±1.061	(84-93) 88.88±2.015	(92-98) 94.23±1.291	**271.238** **0.000***	(95-99) 97.25±1.104	(93-97) 94.90±0.900	(95-99) 96.80±1.067	**58.958** **0.000***
Temperature	(36.9-37.5) 37.17±0.182	(36-37.3) 36.36±0.319	(36.5-37.5) 36.94±0.212	**115.752** **0.000***	(36.6-37.5) 37.12±0.219	(36.4-37.2) 36.88±0.233	(36.6-37.4) 37.06±0.196	**12.701** **0.000***

Table (4): Assessment of technical and mechanical ventilation adverse events of the studied mechanically ventilated patients throughout periods of intervention.

Adverse events	The studied critically ill patients (n=80)													
	Control group (n=40)						χ^2 P	Study group (n=40)						χ^2 P
	Before 15 min		During Bathing		After 15 min			Before 15 min		During bathing		After 15 min		
	N	%	N	%	N	%		N	%	N	%	N	%	
1. Decrease of tidal volume														
▪ None	40	100.0	3	7.5	40	100.0	**126.95**	40	100.0	37	92.5	40	100.0	**6.75**
▪ Decrease	0	0.0	37	92.5	0	0.0	**0.000***	0	0.0	3	7.5	0	0.0	**0.034***
2. chest in drawing and patient's discomfort														
▪ Normal	40	100.0	3	7.5	40	100.0	**126.95**	40	100.0	35	87.5	39	97.5	**8.15**
▪ Discomfort	0	0.0	37	92.5	0	0.0	**0.000***	0	0.0	5	12.5	1	2.5	**0.017***
3. increased work of breathing														
▪ None	40	100.0	3	7.5	40	100.0	**126.95**	40	100.0	35	87.5	39	97.5	**8.15**
▪ Increased	0	0.0	37	92.5	0	0.0	**0.000***	0	0.0	5	12.5	1	2.5	**0.017***
4. Ventilator alarms														
▪ None	40	100.0	0	0.0	40	100.0	**152.76**	40	100.0	36	90.0	39	97.5	**6.210**
▪ Alarm	0	0.0	40	100.0	0	0.0	**0.000***	0	0.0	4	10.0	1	2.5	**0.045***
5. Accidentally removal of invasive device/catheters														
▪ No	40	100.0	14	35.0	40	100.0	**73.64**	40	100.0	39	97.5	40	100.0	2.21
▪ Yes	0	0.0	26	65.0	0	0.0	**0.000***	0	0.0	1	2.5	0	0.0	0.331
6. Dysfunction of invasive device/ catheters														
▪ Normal	40	100.0	19	47.5	40	100.0	**55.94**	40	100.0	40	100.0	40	100.0	-
▪ Dysfunction	0	0.0	21	52.5	0	0.0	**0.000***	0	0.0	0	0.0	0	0.0	
7. Skin dryness														
▪ No	40	100.0	0	0.0	0	0.0	**152.76**	40	100.0	40	100.0	40	100.0	
▪ Yes	0	0.0	40	100.0	40	100.0	**0.000***	0	0.0	0	0.0	0	0.0	
8. Patient's falling														
▪ None	40	100.0	37	92.5	40	100.0	**6.75**	40	100.0	40	100.0	40	100.0	-
▪ Falling	0	0.0	3	7.5	0	0.0	**0.034***	0	0.0	0	0.0	0	0.0	

* Statistically significant level at P<0.05

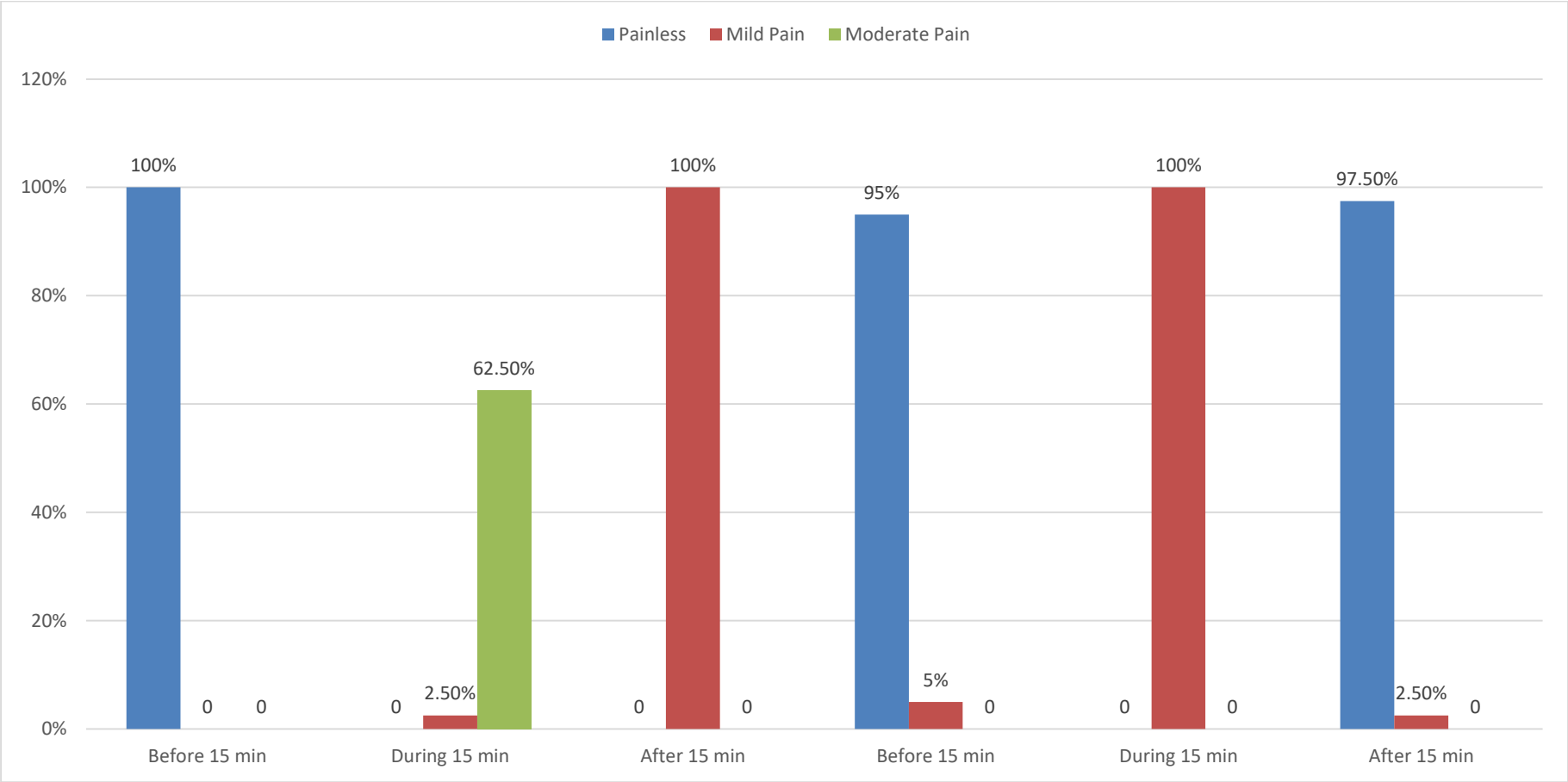

Figure (2): Assessment of behavioral pain severity of the studied mechanically ventilated patients throughout periods of intervention

Discussion

Mechanically ventilated patients represent one of the most vulnerable populations in intensive care units (ICUs), as they are frequently exposed to invasive procedures, immobility, and altered levels of consciousness that increase their susceptibility to complications. Routine nursing care particularly hygiene-related procedures such as bed bathing plays a crucial role in maintaining patient comfort, preventing infection, and promoting overall physiological stability. However, these interventions may also provoke significant physiological changes, pain responses, or unintended adverse events if not performed using evidence-based practices. Research has shown that critically ill patients often experience variations in vital signs and increased discomfort during bed bathing, emphasizing the need for careful assessment and preparation before performing such procedures **(Kurt & Zaybak, 2022; Lopes et al., 2022).**

Regarding age: The present study was in agreement with **Muller et al. (2021)** in the study titled "Adverse Events in Intensive Care and Continuing Care Units during Bed-Bath Procedures." which examined mechanically ventilated adults receiving high-dependency care during bed bathing. The researchers reported that the ICU population was largely composed of older patients with complex health conditions requiring continuous monitoring during hygiene procedures. The study further emphasized that advanced age is often associated with higher care demands and greater susceptibility to procedure-related complications, supporting the present finding that middle-aged and older adults represented the largest proportion of the studied sample.

The result of current study also goes in line with **Scozzo et al. (2022)** in the study "Changes in Vital Signs Before, During and After Bed Bathing in the mechanically ventilated Patient." which evaluated adult ICU patients undergoing routine bed bathing and identified noticeable physiological fluctuations during the procedure. The authors highlighted that many participants were older adults requiring respiratory and hemodynamic support, reinforcing the concept that this age group frequently necessitates intensive nursing interventions. This alignment strengthens the interpretation that the predominance of older patients in the current study reflects the typical demographic profile of individuals exposed to bed-bathing procedures in critical care settings.

As regard gender: This result was supported by **Muller et al. (2021)** in the study titled "Adverse Events in

Intensive Care and Continuing Care Units During Bed-Bath Procedures: The Prospective Observational Nursing during Critical Care." which reported a higher proportion of male patients among mechanically ventilated adults undergoing routine nursing procedures such as bed bathing. The authors suggested that men are more frequently admitted to ICUs due to the greater incidence of acute respiratory conditions and cardiovascular disorders, necessitating advanced supportive therapies and continuous nursing care. This supports the present study's observation of male predominance within the control group.

The result of current study also goes in line with **Kurt and Zaybak (2022)** in the study "Pain Behavior Experienced during Nursing Interventions by Patients on Mechanical Ventilation" which examined mechanically ventilated ICU patients during routine nursing care activities. The researchers found that male patients constituted a slightly larger proportion of the sample, emphasizing that gender distribution in critical care often mirrors the epidemiology of severe medical conditions rather than procedural factors. This alignment reinforces the interpretation that the observed gender pattern is consistent with typical ICU demographics.

In relation to body mass index: This result was in the same line with **Sakr et al. (2021)** in the study titled "Being Overweight Is Associated with Greater Survival in ICU Patients." which reported that a substantial proportion of critically ill adults were either of normal weight or overweight, while fewer patients fell into the obese category. The authors emphasized that overweight patients frequently represent a large segment of ICU admissions and may demonstrate different physiological responses to critical illness compared to individuals with normal BMI. This supports the present study's observation of predominance of normal and overweight categories among mechanically ventilated patients.

The result of current study also goes in line with **Buscher et al. (2022)** in the study "Body Mass Index and Mortality in Patients with Acute Respiratory Distress Syndrome." which found that most patients receiving advanced respiratory support were distributed between normal and overweight BMI ranges, with comparatively smaller proportions classified as obese. The researchers highlighted that BMI influences lung mechanics, oxygen

demand, and the complexity of nursing care, reinforcing the importance of assessing weight status when planning routine interventions. This alignment strengthens the interpretation that the BMI pattern identified in the current study reflects typical characteristics of critically ill populations requiring ventilatory support.

Concerning consciousness level: The result in the same line with **Bardají-Carrillo et al. (2025)**, who studied Epidemiological Trends of Mechanically Ventilated Acute Respiratory Distress Syndrome in the Twenty-First Century: A Nationwide, Population-Based Retrospective Study and reported that mechanically ventilated patients often present with altered levels of consciousness depending on the severity of illness and underlying conditions. In the present study, more than half of patients were semi-conscious, while only a small minority were comatose, reflecting typical patterns in mixed ICU populations.

The result of current study also agrees with **Smith et al. (2021)**, who studied Levels of Consciousness and Neurological Outcomes in Mixed ICU Populations: A Multicenter Observational Study and reported that mechanically ventilated patients in the ICU most commonly present with a semi-conscious state, while full coma is relatively rare. In the present study, more than half of the patients were semi-conscious, while only a small minority were comatose, reflecting the typical distribution of consciousness levels in mixed ICU populations.

Regarding ventilator modes: The result of current study was consistent with **Zhao et al. (2021),** who studied Usage Patterns of Assist-Control and Pressure Support Ventilation in Critically Ill Patients: A Multicentre Analysis and found that assist-control ventilation is the most frequently used mode in mechanically ventilated patients requiring full respiratory support, whereas pressure support ventilation is less commonly applied and is generally reserved for weaning or partial support. In this study, more than one-third of patients were managed with assist-control ventilation, and less than one-quarter received pressure support ventilation, which mirrors standard ICU practices.

The result was also consistent with **Wu et al. (2023)**, who studied Comparison of Clinical Outcomes in Critical Patients Undergoing Different Mechanical Ventilation Modes: A Systematic Review and Network Meta-Analysis and reported that various mechanical ventilation modes, including synchronized intermittent mandatory ventilation, pressure

support, and proportional assist modes, have differing impacts on clinical outcomes in mechanically ventilated patients. In this study, assist-control ventilation was the most frequently applied mode in both groups, while pressure support ventilation was less common, aligning with standard ICU practices where pressure support is typically reserved for weaning or partial ventilator support.

This result disagrees with findings from **Kim et al. (2022),** who studied Ventilation Strategies in neurocritical Care Units: Frequency and Outcomes of SIMV and Pressure Support Modes and reported that alternative ventilation modes such as synchronized intermittent mandatory ventilation (SIMV) or pressure support are more frequently used in neuro-ICUs depending on patient-specific neurological and respiratory requirements. The current study indicates that in a mixed ICU population, assist-control ventilation predominates, reflecting the need for consistent full support in patients with varying consciousness levels.

Regarding hemodynamic parameters: The current study agrees with **Zhang et al. (2021)**, who studied Hemodynamic Changes During Routine Nursing Activities in mechanically ventilated Adults: A Prospective Observational Study and reported that routine nursing activities, such as bathing or repositioning, can induce temporary changes in hemodynamic parameters, including blood pressure, heart rate, and respiratory rate. In the present study, the highest mean values for systolic and diastolic blood pressure, heart rate, and respiratory rate were observed during bathing, reflecting the physiological stress and sympathetic response associated with physical activity and care procedures in mechanically ventilated patients.

The result also in the same line with **Park et al. (2022)**, who studied Fluctuations of Oxygen Saturation and Body Temperature during Routine ICU Care Interventions and noted that oxygen saturation and body temperature, can fluctuate during routine care.

The result was also consistent with **Al-Pinsky et al. (2022)**, who studied Effective hemodynamic monitoring and emphasized that critical care nurses must monitor hemodynamic parameters before, during, and after patient care interventions, as even mild activities can elicit measurable cardiovascular and respiratory responses. The observed variations in blood pressure, heart rate, respiratory rate, oxygen saturation, and body temperature in this study support the

importance of careful monitoring during routine ICU care procedures.

The result of current study disagrees with findings from heavily sedated or pharmacologically stabilized patients, as reported by **Nguyen et al. (2022)** in Hemodynamic Stability in Sedated Mechanically Ventilated Patients During Routine Care Interventions, where minimal fluctuations in hemodynamic parameters are observed during routine care. In contrast, the current study shows that even routine interventions can produce significant hemodynamic changes, highlighting differences in patient responsiveness depending on sedation, illness severity, and underlying physiological reserve.

As regard technical and mechanical ventilation adverse events: This finding was agreement with **Li et al. (2021),** who studied Impact of Routine Nursing Care on Ventilator-Associated Events in Mechanically Ventilated ICU Patients and reported that routine nursing care activities, such as bathing, repositioning, or turning, can precipitate technical and mechanical ventilation-related adverse events. In the present study, the highest percentage of adverse events including decreased tidal volume, chest in drawing, increased work of breathing, and ventilator alarms occurred during or fifteen minutes after bathing, reflecting the impact of patient handling and movement on ventilator function and patient comfort.

The result was also consistent with **Mohamed et al. (2025)**, who studied Effect of Implementing Nursing Intervention Protocol on Reducing Selected Pulmonary Complications among Mechanically Ventilated Patients and reported that minor mechanical ventilation complications, such as tidal volume fluctuations or increased work of breathing, are more frequent than severe events, such as accidental removal of catheters or patient falls. In the present study, accidental device removal and falls were the least frequent adverse events, demonstrating that while technical complications are common during interventions, critical safety events remain relatively rare with proper monitoring and preventive measures.

This result disagrees with findings from heavily sedated or fully immobilized ICU patients, as reported by **Zhao et al. (2022)** in Ventilator Safety and Adverse Events in Sedated Mechanically Ventilated ICU Patients, where minimal adverse ventilator events are observed during routine care. The current study, involving patients with varying levels of consciousness, shows that movement and partial patient responsiveness

increase the likelihood of transient ventilatory complications during nursing care activities.

Regarding behavioral pain severity: The result was matched with **Li et al. (2021)**, who examined pain responses during routine nursing procedures in mechanically ventilated patients and found that hygienic care activities, particularly bed bathing, are frequently associated with increased behavioral pain scores when no structured comfort measures are applied. Their findings emphasized that physical manipulation, repositioning, and prolonged handling during bathing stimulate nociceptive responses, especially in mechanically ventilated patients who may be unable to verbally communicate discomfort. This aligns with the present study, where the control group demonstrated significantly higher pain levels during bathing compared to the study group.

The result also in the same line with **Gélinas et al. (2022)**, who reported that the implementation of evidence-based nursing interventions—such as gentle handling techniques, adequate preparation, and the use of comfort-focused strategies—can significantly reduce procedural pain in ICU patients. The authors highlighted that behavioral pain scales often detect notable increases in pain during routine care unless preventive strategies are incorporated. Similarly, the present study demonstrated substantially lower pain scores in the study group, supporting the effectiveness of targeted nursing interventions in mitigating procedure-related discomfort.

The result was also consistent with **Puntillo et al. (2023)**, who identified bathing, turning, and repositioning as among the most painful non-surgical procedures performed in intensive care settings. Their research further indicated that while pain typically subsides after completion of the procedure, patients exposed to structured pain-prevention protocols recover faster and return to baseline comfort levels more rapidly than those receiving standard care. This supports the current finding that post-bathing pain reduction was more evident in the study group than in the control group.

The result disagrees with findings reported by **Chanques et al. (2022)**, who suggested that some mechanically ventilated patients may exhibit minimal behavioral pain during routine care due to deep sedation or neuromuscular blockade. In contrast, the present study revealed substantial pain responses in the control group during bathing, which may be attributed to varying levels of

consciousness and sedation among patients. This discrepancy suggests that inadequate analgesia or inconsistent sedation practices can heighten pain perception during nursing procedures.

Conclusions

Based on the findings of the present study, it can be concluded that implementing structured nursing interventions for bed bathing had a beneficial effect on reducing the occurrence of adverse events among mechanically ventilated patients in the intensive care unit compared to routine bed-bathing care. The application of evidence-based nursing interventions before, during, and after bed bathing contributed to maintaining hemodynamic stability, minimizing technical and mechanical ventilation–related adverse events, and reducing pain responses among the study group.

Furthermore, mechanically ventilated patients who received the nursing intervention protocol experienced fewer episodes of oxygen desaturation, abnormal vital sign fluctuations, ventilator alarms, accidental removal of invasive devices, and behavioral pain manifestations. These findings emphasize the critical role of nurses in ensuring patient safety during fundamental nursing procedures such as bed bathing. Therefore, structured and standardized nursing interventions for bed bathing are essential components of high-quality critical care nursing practice.

Recommendations: Upon completion of this study, it can be recommended that:

1. For nurses

1- Nursing interventions for bed bathing should be incorporated as an essential part of routine nursing care for mechanically ventilated patients in intensive care units.

2- Standardized bed-bathing safety checklists should be developed and implemented to enhance nurses' compliance with evidence-based interventions and reduce adverse events.

2. For education and training

1- Nursing curricula should include structured educational content addressing safe bed-bathing practices and prevention of adverse events among mechanically ventilated patients.

2- Continuous in-service training programs should be conducted for ICU nurses to improve their knowledge and skills regarding safe patient handling, monitoring during bed bathing, and early detection of adverse events.

3- For research

1- Replication of this study on a larger probability sample and in different intensive care settings is recommended to enhance generalizability of the findings.

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Effect of Applying Regulated Suctioning Pressure in Open Endotracheal suction on Patients' Clinical Outcomes

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Abstract

Background: A notable Although endotracheal suctioning is a useful and necessary procedure, it can have many adverse effects if it is not performed correctly which include changes in blood pressure and heart rate, hypoxia, and bleeding **Aim:** to evaluate the effect of applying regulated suctioning pressure in open endotracheal suction on Patients' clinical outcomes. **Design & Setting:** Quasi-experimental research design was carried out in Chest Intensive Care Unit in Tanta University Chest Hospital at Tanta University Hospitals which affiliated to Ministry of Higher Education and Scientific Research. **Subjects**: A purposive sample of (110) critically ill patients ranging in age from 21years and above. **Tools:** Three tools were utilized **Tool (I):** Mechanically Ventilated Patients Assessment Tool**:** It included 3 parts as the following: **Part (a):** Patient's Demographic characteristics, **Part (b):** Patient's clinical data**, Part(c):**Ventilator profile Assessment, and **Part(d):**Suction profile assessment sheet**, Tool (II):** Clinical outcome Assessment Tool**:** It included 3 parts as the following: **Part (a):** Physiological parameters Assessment, **Part (b):** Behavioral pain scale assessment, and **Part (c):** Chest assessment profile and **Tool (III)** Suction related complication checklist**. Results:** The findings showed that highly significant differences were found between the control and study groups regarding hemodynamic stability, pain severity, arterial blood gases and complications related suction where ($P < 0.001$).**Conclusions:** Implementing regulated suction pressure has significant improvement in physiological stability, lower pain score and fewer complications. **Recommendations:** Mechanically ventilated patients should receive open endotracheal suctioning using regulated and standardized suctioning pressure in accordance with evidence-based guidelines to minimize procedure-related complications.

***Keywords*:** Clinical outcomes, Regulated suctioning pressure, Open endotracheal suction

Introduction

Patients' respiratory functions deterioration is one of the first indicators of acute illness. Among the most common reasons for hospitalization in intensive care units, respiratory disorders are among the leading causes of serious disease. The biggest problem in the critical care unit is when patients have respiratory system impairments and can't breathe on their own. Therefore, the use of mechanical ventilation and the application of an intubation tube is an integral part of these sections **(Osorio, Krakora, Epping, Wright & Rajwani, 2024).**

Suctioning is necessary when secretions build up in critically ill patients with artificial airways (e.g., tracheal tubes) since these patients cannot cough them out. This leads to airway blockage in gas exchange **(Jahromi, Poornoroz, Najafipoor, Rahimi, & Najafi, 2022).**

Open endotracheal suctioning involves removing the patient from the ventilator in order to access the airway, while closed endotracheal suctioning involves connecting the patient to a mechanical ventilator then suctioning will be performed. The open suction method is the most popular, but it can cause the device to come loose from the patient during suctioning, which in turn can lead to a decrease in lung capacity and a loss of airway pressure. Keeping the airway open and using an endotracheal tube suctioning device to clear secretions is associated with a plethora of unwanted side effects **(Chiumello et al., 2021).**

Critical care nurses frequently do endotracheal suctioning to remove secretions from the airway and check if the artificial airway has patency. Serious, and fatal consequences might arise from the suctioning procedure if it is not carried out at the correct time and using the correct method. Pros must be cognizant of the potential risks **(Gilder, Parke and Jull, 2019).** Possible complications include low oxygen levels, rapid heart rate, irregular heart rhythm, bleeding in the lungs, infection of the tracheal mucosa, and even complications during surgery or from the high suction pressure employed. Avoiding these problems requires using the lowest feasible suction pressure. This results in a range of suggested suction pressures, from 80 mmHg to 300 mmHg **(Shamali, Abbasinia, Ostergaard and Konradsen, 2019).**

Endotracheal suctioning can cause desaturation, which is a common adverse effect. Other hemodynamic changes can occur during suctioning, and oxygen desaturation is one of them. Patients on mechanical ventilation are at increased risk for oxygen desaturation if endotracheal suctioning is used more than six times per day. Despite the absence of

transitory hypertension during suctioning at any of the three pressure levels, all individuals who had issues were found to have temporary hypotension. **Eggen, Bronstad, Langeland, Klepstad, & Nordseth, 2022).**

The patient is disconnected from the ventilator, which interrupts the gas flow. As a result, the PaO2 and SaO2 values significantly drop, and there are hemodynamic changes both before and after the suctioning process. This is because the oxygenated air and respiratory secretions are drawn with the open system suction. Therefore, maintaining high PEEP and oxygen levels is crucial for supplying sufficient PaO2 to mechanically ventilated patients with respiratory abnormalities. Hyperoxygenation prior to and following suctioning might lessen the likelihood of hypoxia. **(de Freitas Vianna, Pires Di Lorenzo, Lourenço da S Simões, Guerra, & Jamami, 2020).**

Additionally, hypoxemia often develops in hypoxemic individuals during suctioning as a consequence of negative alveolar pressure. A drop in average PaO2 readings during suction can be due to the suction catheter partially obstructing respiratory passages. Negative pressure levels and the suction procedure can cause damage to the tracheal mucosa and mucosal hemorrhage. The suction catheter itself can cause direct injury to the mucosa, and the pressure pressing on the mucosa at the catheter's tip can damage capillary vessels. Additional risk factors for problems include catheter size and shape, hemophilia, anticoagulant usage, and prolonged or severe suctioning **(Abd Elfatah, Shehata and Abd El-Azim, 2022).**

It has also been observed that the mucosal wall might be injured when suction pressure is exerted while the catheter is being moved. Exfoliation of the epithelium and a rise in red blood cells associated with submucosal injury are symptoms of barotrauma, which occurs when negative pressure increases during endotracheal suctioning and damages the trachea **(Pinto, D'Silva and Sanil, 2020).**

It is important for nursing staff to be knowledgeable about endotracheal suctioning guidelines that are based on the recommendations of the American Association of Respiratory Care (AARC) in order to enhance patient outcomes and avoid issues during ETT suctioning. It is advised to take precautions such as increasing FIO2, utilizing a closed system with high positive end expiratory pressure, avoiding using normal saline instillation before endotracheal suctioning, and extending the time of suction from 5 to 10 seconds. Furthermore, it is imperative that

100% oxygen be administered prior, during, and following the operation. **(Jahromi et al., 2022).**

Additionally, several research and the AARC recommend a maximum suction pressure level of -20 kPa (150 mmHg) for safe suctioning. According to some sources, the optimal amount of negative pressure to apply depends on the size of the catheter and the amount of time the suction is provided. It has been shown that greater suction pressure is more successful in eliminating secretions. When using the right size of catheter, a suction pressure of 200-300 mmHg can be administered **(Maraş, Eşer, Şenoğlu, Yılmaz & Derici, 2020)**

The study conducted by **(Colombage & Goonewardena, 2020)** about knowledge and practice of intensive care nurses on endotracheal suctioning of the intubated patient; showed that accurate performance of endotracheal suctioning by nurses can decrease its undesirable side effects for the patients. It is crucial for nurses to follow evidence-based guidelines in order to enhance the quality of care they provide, which in turn reduces the length of hospital stays, costs, and medical interventions needed to avoid fatalities.

Health care professionals should review the evidence-based practices and clinical standards of endotracheal tube suction to decrease inappropriate practice and promote the provision of high-quality treatment. Because of this, they will be able to carry out the treatments in a scientific manner, reducing the chances of problems and risks for patients **(Chen et al., 2021).**

Significance of the study:

Airway suctioning is crucial for maintaining airway patency in patients with artificial airways, including those with tracheostomy or endotracheal tubes. The clinical significance of the procedure lies in preventing life-threatening airway obstruction from retained secretions, reducing the risk of aspiration, and supporting effective oxygenation and ventilation. Suctioning directly affects outcomes in both acutely ill and chronically ventilated patients. The technique, timing, and equipment used can impact the immediate effectiveness of secretion clearance and long-term safety **(Marietta, Semien, & Fitzgerald, 2025**). Improper suctioning may lead to mucosal injury, hemorrhage, desaturation, bradycardia, or infection that about of 22% of suctioning procedures had adverse events **(Schults et al., 2020)**. So, the current research aims to evaluate the effect of applying regulated suctioning pressure in open endotracheal suction on Patients' Clinical Outcomes.

Aim of the study:

The aim of this study was to evaluate the effect of applying regulated suctioning pressure in open

endotracheal suction on Patients' clinical outcomes.

Research hypothesis:

Mechanically ventilated patients who were exposed to regulated suctioning pressure in open endotracheal suction were expected to have physiological parameters within normal range such as mean arterial pressure, heart rate, respiratory, peripheral oxygen saturation and decrease pain severity, effective airway clearance and are expected to have lower percent of suction related complications such as hypoxia, tracheal bleeding, hypotension and hypertension.

Subjects and Methods

1. Subjects

Research design:

A quasi- experimental research design was utilized in the present study.

Setting

This study was conducted at Chest Intensive Care Unit in Tanta University Chest Hospital at Tanta University Hospitals which affiliated to Ministry of Higher Education and Scientific Research. It was prepared and equipped with 2 rooms, one of them equipped with 10 beds and the other equipped with 3 beds, the total number of beds is (13).

Subjects:

A Purposive sample of (110) adult patients from the previously mentioned setting who fulfilled the inclusion and exclusion criteria, were assigned based on Epi-Info software statistical program according to the total population admitted per year to the intensive care unit and undergo endotracheal intubation (200). and the sample size was calculated as the following:

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

The patients were divided into two equal groups; 55 patients each as follows:

Control group: Consisted of 55 patients received routine nursing care for suction using unregulated suction pressure with any available catheter size.

Study group: - Consisted of 55 adult patients that exposed to regulated suction pressure by the primary researcher which ranged from 80 up to 250mmhg during open endotracheal suction.

Inclusion criteria

The subjects were selected according to the following criteria**:**

- Adult patients 21 years and above.
- Both sex.
- Mechanically ventilated patients via endotracheal tube.

Exclusion criteria

- Hemodynamic instability.
- Having bleeding disorders or thrombocytopenia.
- Patient with pneumonia.

Tools of data collection: -

Three tools were used in this study: -

Tool I: Mechanically Ventilated Patients Assessment Tool: -

- This tool was developed by the researcher after reviewing the related literature **(Chen et al., 2020; Ardehali et al., 2020)** It included three parts as follow: -

Part (a) Patient's Demographic characteristics: -

This part included demographic characteristics of the mechanically ventilated patients such as; age, patient code, sex.

Part (b) Patient's clinical data: -

This part was used by the researcher to collect data such as (current diagnosis, past medical history, surgical history, history of smoking, current medication (mucolytic and expectorant) and level of consciousness.

Part (c) Ventilator profile Assessment: -

It was used by the researcher after reviewing relevant literature to assess ventilator mode, Fraction inspired oxygen (fio2), positive end expiratory pressure (peep), tidal volume, respiratory rate and peak inspiratory pressure, endotracheal tube size, intubation length time.

Part (d) Suction profile assessment sheet

This part included type of suction device, size of suction catheter, suction pressure and duration of suction episode.

Tool II: Clinical outcome Assessment Tool: -

This Tool was developed by the researcher after review related literatures **(Maraş et al., 2020; Rass et al., 2020).** It was used to assess the patient clinical outcomes pre and post each suction techniques and was consisted of three parts as follow:

Part (a) Physiological parameters Assessment: -

Physiological parameters such as mean arterial pressure, heart rate, respiratory rate and peripheral oxygen saturation.

Part (b) Behavioral pain scale assessment: -

This part was developed by **(Payen et al., 2001)**. It was used to assess pain severity which included three parameters as facial expression, upper limb movement and compliance with ventilation, this scale ranks pain from 3 to 12, and the patient's status based on this scale is painless (3), mild (4–6), moderate (7–9), or severe (10–12) pain.

Part (c) Chest assessment profile:

This part was used to assess the Characteristics of tracheal secretions such as amount, consistency (thick or thin) and color (white, red-streaked or bloody, yellow, brown or greenish), Presences of adventitious breathing sound as (crackles, wheezing, rhonchi) and gas exchange (arterial blood Gases). The qualitative data were scored as present or not present.

The quantitative data were scored as mean ± standard deviation.

Tool III: Suction related complication checklist:

This tool was developed by the researcher after reviewing a relevant literature **(Stacy, 2020; Schults,2020)** to assess Presence of suction related complications after applying regulated suction pressure ranging from 80 up to 250mmhg as hypoxia, tachycardia, hypertension, hypotension and tracheal bleeding. Qualitative items were scored according to present (1) or not present (0) checklist.

2- Methods

The study was accomplished through the following steps

1- Administrative process:

An Official Permission was obtained from the responsible authorities at the Faculty of Nursing, Tanta University to the director of Chest Intensive Care Unit in Tanta University Chest Hospital.

2- Ethical consideration:

- Approval of The Scientific Research Ethics Committee of Faculty of Nursing was obtained with code number (4019-3-2024)
- Nature of the study was not cause any harm or pain to the entire subjects.
- Consent was taken from the patient's first degree family members if the patient is unconscious after explaining the aim of the study and including the right to withdrawal at any time.
- Confidentiality and anonymity were maintained by use of code number instead of name and privacy of the patients were taken into consideration regarding data collection.
- The study tools (I, II, III) were developed by the researcher after review of the relevant literatures except Tool II part (b) was developed by **(Payen et al.,2001).**
- The developed tools were tested for content validity by a jury of five experts in the field of Critical Care and Emergency medicine and Nursing and Biostatistics.
- **A pilot study** was conducted on 10% of patients (11) to test the feasibility and applicability of the tools and to determine any obstacles that may encountered during the period of data collection, accordingly, needed modification was done included rephrasing and some additional terms were done by the researcher before the main study. Those patients were excluded from the study subjects.
- There was a modification was done in Tool II part (b) regarding evaluation interval where its evaluation was done before, during, and immediately after, while evaluation of part c was done before and immediately after.
- A modification was done in Tool III regarding evaluation interval where their evaluation was done before, during, immediately after and after 20 minutes.

- **Reliability** was measured on the study tools using Cronbach's alpha test.

  Cronbach's Alpha for tool I is 0.903 for 26 items applied on 6 ventilated patients.

  Cronbach's Alpha for tool II is 0.851 for 16 items applied on 6 ventilated patients.

  Cronbach's Alpha for tool III is 0.921 for 5 items applied on 6 ventilated patients.

  Cronbach's Alpha for the sheet in total is 0.914 for 47 items applied on 6 ventilated patients.

a- Data collection

- Data were collected over a period of 6 months, started from February 2025 to July 2025.
- The present study was conducted through four phases as follow: -

  1-Assessment phase: -

  Assessment was done by the researcher for all patient in both groups using Tool I to assess patients' demographic data, clinical and mechanical ventilator data. Also, clinical patients' outcomes were assessed using Tool II and suction related complications were assessed using Tool III. This phase was started immediately before and after applying regulated suctioning pressure (80 up to 250mmHg) for the study group and the control group who received unregulated suction pressure.

  2-Planning phase: -

  This phase was based on data of the assessment phase and expected outcomes criteria that prescribed when planning patient care include:

- Improve patient's' physiological parameters.
- Maintain effective airway clearance.
- Decrease pain severity.
- Decrease suction related complications

3- Implementation phase:

- Control group

- was received routine care for suction with unregulated suction pressure which ranging from 400 up to 600 mmHg with any available size of suction catheter regardless of size of endotracheal tube and viscosity of secretions.

- Study group:

- Was exposed to regulated suction pressure which ranged from 80 up to 250 mmHg during open endotracheal suction.
- At the beginning of this phase, the researcher prepared the patients and equipment, then started the technique of suctioning as the following:

1- Assessment

- The patients were assessed for signs of airway compromise or inadequate oxygenation which include: Thick secretions in the airway, Decreased or absent breath sounds, Adventitious lung sounds (e.g., wheezes, rhonchi, crackles), Restlessness or decreased level of

consciousness, Tachypnea, Tachycardia or bradycardia, Cyanosis or pallor, Hypertension or hypotension and Use of accessory muscles, Decreased oxygen saturation.

2- Preparation

- The researcher put the patient to a comfortable position, generally a semi-Fowler or Fowler position.
- A work area was prepared in a clean, accessible location and assemble the necessary supplies.
- Determine the appropriate depth to advance the suction catheter.
- Identify the proper size of suction catheter to use by first multiplying the tube's inner diameter by 2 and then selecting the next smallest size catheter.
- Perform hand hygiene and don gloves. Don additional PPE based on the patient's need for isolation precautions or the risk of exposure to bodily fluids.
- Verify the correct patient using two identifiers.
- Verify that the suction apparatus is on.

3- Performance

- Aseptic technique was used, open the flexible catheter package on a clean surface, using the inside of the wrapping as a sterile field; open the package just enough to expose the connecting end.
- Attach the catheter to connecting tube of suction device.
- Before suction, all of patients were hyper oxygenated with 100% oxygen for at least 30s through increasing fraction of inspired oxygen (FIO2) plus during and after airway suctioning procedure.
- After the suction apparatus checked, the patient was disconnected from the ventilator and suction procedure was applied with the following points:

Suction pressure

- The vacuum regulator was adjusted which was ranging from 80 up to 250mmHg

Catheter size

- The diameter of the suction catheter was limited to less than 50% of the internal diameter of the endotracheal tube which creates less negative pressure. Using size 14FG for diameter 7.5 but may increase with increase of viscosity of secretion.
- **Suction episode**
- Suction time wasn't exceeding more than 10-15 seconds in order to minimize the risk of hypoxia, atelectasis and trauma.
- After each endotracheal tube suctioning, patient's airway was assessed to ensure effective airway clearance.

- Patients' breath sounds, respiratory rate, chest movement, and characteristics of secretions removed were monitored and documented after endotracheal tube suctioning to ensure effective cleaning.

4-Evaluation phase: -

All mechanically ventilated patients in the study and control groups were evaluated using Tool II and Tool III. Comparisons were done between using regulated suction pressure ranging from 80 to 250 mmhg versus unregulated suction pressure to determine the effect of regulated suction pressure on patients' physiological parameters and related complications at three times before suction and after suction (immediately and 20 minutes of endotracheal suctioning).

Results

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

Regarding age, this table revealed that nearly three quarter (74.55%) of the control group and the majority (81.82%) of the study group were in the age group (≥60) years with mean ± SD (65.69±13.269 and 66.36±10.846) respectively. **In relation to gender,** more than half (56.36%, 58.18%) of them were male respectively, with no statistically significant difference between the two groups regarding age and gender as ($p>0.05$).

Table (2) Represents distribution of the studied ventilated patients regarding their clinical data.

Regarding to current diagnosis, it was noticed that more than two thirds (70.91%)of the control group and majority of patients (92.73%)in the study groups had diagnosis of acute respiratory failure. Also, nearly quarter (20%) of the control group and minority (9.09%)of the study group diagnosed with pleural effusion, respectively.

In relation to past medical history, this table revealed that more than two thirds (67.27%)of the control group and nearly three quarters (72.73%)of the study group had heart diseases. In addition, less than half (40%, 45.45%) of both groups were diabetic, respectively.

In relation to past medical history, this table revealed that more than two thirds (67.27%) of the control group and nearly three quarters (72.73%) of the study group had heart diseases. In addition, less than half (40%, 45.45%) of both groups were diabetic, respectively.

As regard current medication, it was noticed that almost of all (100%) of the control group and the study group had received antibiotics, mucolytics and bronchodilators drugs, respectively.

Table (3) Show distribution of the studied ventilated patients regarding Glasgow coma scale

A statistical significant differences were observed between the control and study groups in relation to both eye opening and motor response where p = 0.001 &0.012 respectively. Also, the table shows the highest mean scores of GCS were seen in the control group was (6.56±1.198) compared to (5.95±1.458) of the study group respectively with statistically significant difference as p value = 0.017.

Table (4) Reveals distribution of the studied ventilated patients regarding suction profile assessment.

The findings demonstrate that almost all (100%) patients in both the control and study groups used a fixed wall suction device. Also, it was noticed that all (100%) patients of the control group were subjected to high\unregulated suction pressure (>250 mmHg), while in the study group, more than half (54.55%) received suction pressure within the recommended range of 120–200 mmHg, and nearly half of them (45.45%) within 200–250 mmHg respectively, with statistically significant differences between the control and study group as p value =0.000.

Regarding suction catheter size, it was observed that more than three quarter (78.18%) of the control group used size of 16 FG followed by nearly one quarter (20%) used 18 FG, while only 1.82% used 14 FG. Otherwise, the majority (90.91%) of the study group used 14 FG and the minority (9.09%) used 16 FG, with a high statistically significant difference was found between the control versus the study group regarding size of suction catheter where p value =0.000.

As regard the duration of suctioning, both groups were similar, with 100% of suction procedures lasting 10–20 seconds.

Table (5) Demonstrates distribution of the studied ventilated patients regarding physiological parameters throughout the study period.

The findings indicate that there was statistically significant difference between patients of the control group regarding heart rate, respiratory rate, mean arterial pressure and peripheral oxygen saturation with p =0.025, 0.000,0.010 and 0.000 before, immediately after and after 20 minutes from suction respectively. Also, high statistically significant differences were observed among patients of the study group concerning respiratory rate, mean arterial pressure and peripheral oxygen saturation with p =0.000, 0.000 and 0.000 before, immediately after and after 20 minutes from suction respectively.

Table (6) Represents distribution of studied ventilated patients

regarding to pain severity using BPS throughout the study period.

The results show that there were a highly statistical significant differences among patients of the control group and also in the study group regarding pain severity using BPS before, during and after suction respectively where p value =0.000. Also, a statistical significant difference was found in the control group and also in the study group concerning mean score of pain severity as p value =0.000 respectively.

Table (7) Shows mean scores of arterial blood gases among the studied ventilated patients throughout the study period.

It was found that there were a highly statistical significant differences were found in the control group and also in the study group regarding arterial blood gases (PH, Pao2, Paco2 and Spo2) before and immediately after suction where p value =0.001, 0.000,0.000 and 0.000 respectively.

Table (8) Reveals distribution of the studied ventilated patients regarding suction related complications throughout the study period.

This table shows that there was statistically significant difference among patients of the control group and also in the study group regarding hypoxia, tachycardia and tracheal bleeding before, during, immediately after and after 20 minutes from suction where p =0.000, 0.000 and 0.000 respectively.

Moreover, a statistical significant differences were found between patients of the control and the study group regarding hypoxia, tachycardia and tracheal bleeding during suction as p value = 0.000, 0.010 and 0.000 respectively.

Table (9) Show relation between pain severity (BPS) of the studied ventilated patients and their suction profile assessment.

Regarding the size of suction catheter, this table illustrates that the highest mean scores of pain severity which was observed in the control group with catheter size (16FG) where the mean ±SD was (3.63±1.047, 8.44±1.578, 4.19±1.749) before, during and immediately after suction respectively compared to (5.20±1.483, 9.60±1.1404.40±0.894) of the study group before, during and immediately after suction respectively.

Regarding the intubation length time (in days), it was found that the highest mean scores of pain severity was found among the control group with intubation length time(>7days) where the mean ±SD was (3.67±0.900, 8.41±1.877, 4.03±1.660) before, during and immediately after suction respectively compared to (4.00±1.155, 8.10±2.234, 3.90±0.994) of the study

group before, during and immediately after suction respectively.

Regarding the suction pressure(mmHg), it was observed that it was found that the highest mean scores of pain severity was observed among the study group with suction pressure (200-250mmHg) where the mean ±SD was 4.28±1.514, 8.04±1.274,4.08±1.115) with presence of statistically significance difference as p=(0.000,0.000and0.000) before, during and immediately after suction respectively.

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

Characteristics	The studied ventilated patients (n=110)				χ^2 P
	Control group (n=55)		Study group (n=55)		
	N	%	N	%	
Age (in years)					
▪ (30-<40)	3	5.45	2	3.64	
▪ (40-<50)	4	7.27	2	3.64	1.144
▪ (50-<60)	7	12.73	6	10.91	0.766
▪ (≥60)	41	74.55	45	81.82	
Range **Mean ± SD**	**(33-91)** **65.69±13.269**		**(37-88)** **66.36±10.846**		t=0.085 P=0.772
Gender					
▪ Male	31	56.36	32	58.18	FE
▪ Female	24	43.64	23	41.82	1.00

FE: Fisher' Exact test

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

Clinical data	The studied ventilated patients (n=110)				χ^2 P
	Control group (n=55)		Study group (n=55)		
	N	%	N	%	
Current diagnosis					
▪ Acute respiratory distress syndrome	3	5.45	1	1.82	
▪ Acute respiratory failure	39	70.91	51	92.73	
▪ Chronic obstructive pulmonary disease	6	10.91	1	1.82	0.210
▪ Pleural effusion	11	20.00	5	9.09	0.647
▪ Lung mass	2	3.64	0	0.00	
▪ Septic shock	2	3.64	0	0.00	
Past medical history					
▪ Non	6	10.91	5	9.09	
▪ Respiratory diseases	1	1.82	6	10.91	
▪ Heart diseases	37	67.27	40	72.73	
▪ Hepatic failure	3	5.45	5	9.09	
▪ Renal diseases	6	10.91	5	9.09	0.946
▪ Diabetic	22	40.00	25	45.45	0.331
▪ Neurological diseases	8	14.55	11	20.00	
▪ Cancer	1	1.82	0	0.00	
▪ Hyperthyroidism	1	1.82	0	0.00	
▪ Hypothyrodisim	1	1.82	0	0.00	
▪ Rheumatiod	1	1.82	0	0.00	
Past surgical history					
▪ Non	37	67.27	52	94.55	
▪ Cardiovascular surgery	4	7.27	2	3.64	
▪ Abdominal surgery	4	7.27	0	0.00	0.956
▪ Abcess in scrotum	1	1.82	0	0.00	0.328

▪ disc fixation	1	1.82	0	0.00	
▪ Appendicectomy	2	3.64	0	0.00	
▪ Fibriod	1	1.82	0	0.00	
▪ Hemorriod	1	1.82	1	1.82	
▪ Inguinal hernia	1	1.82	0	0.00	
▪ Knee joint replacement	1	1.82	0	0.00	
▪ Pitutary tumor excision	1	1.82	0	0.00	
▪ Varicosectomy	1	1.82	0	0.00	
Current medication					
▪ Antibiotics	55	100.00	55	100.00	
▪ Mucolytic	55	100.00	55	100.00	
▪ Corticosteroids	54	98.18	55	100.00	0.211
▪ Antacids	51	92.73	55	100.00	0.646
▪ Bronchodilators	55	100.00	55	100.00	
▪ Anticoagulants	55	100.00	53	96.36	

FE: Fisher' Exact test

Table (3): Distribution of the studied ventilated patients regarding Glasgow coma scale.

Glasgow coma scale	The studied ventilated patients (n=110)				χ^2 P
	Control group (n=55)		Study group (n=55)		
	N	%	N	%	
Eye opening					
▪ No response	3	5.45	19	34.55	
▪ Open in response to pain	35	63.64	27	49.09	**16.516**
▪ Open to verbal command	13	23.64	7	12.73	**0.001***
▪ Open spontaneously	4	7.27	2	3.64	
Verbal					
▪ No response	55	100.00	55	100.00	-
Motor					
▪ No response	3	5.45	7	12.73	
▪ Responds to pain with abnormal extension	0	0.00	1	1.82	**12.797**
▪ Responds to pain with abnormal flexion	37	67.27	27	49.09	**0.012***
▪ Withdraws from pain stimuli	11	20.00	20	36.36	
▪ Responds to pain with purposeful movement	4	7.27	0	0.00	
Total consciousness level					
▪ Comatose (3-8)	52	94.55	53	96.36	FE
▪ Semi-conscious (9-12)	3	5.45	2	3.64	1.00
Range	(3-9)		(3-9)		**t=5.900**
Mean ± SD	6.56±1.198		5.95±1.458		**P=0.017***

FE: Fisher' Exact test

* Statistically significant level at P<0.05

Table (4): Distribution of the studied ventilated patients regarding suction profile assessment.

Suction profile Assessment	The studied ventilated patients (n=110)				χ^2 P
	Control group (n=55)		Study group (n=55)		
	N	%	N	%	
Type of suction device					
▪ Fixed wall device	55	100.00	55	100.00	-
Suction pressure (mmhg)					
▪ (120-200)	0	0.00	30	54.55	
▪ (200-250)	0	0.00	25	45.45	**152.49**
▪ >250	55	100.00	0	0.00	**0.000***
Size of suction catheter					
▪ 14 FG	1	1.82	50	90.91	
▪ 16 FG	43	78.18	5	9.09	**110.57**
▪ 18 FG	11	20.00	0	0.00	**0.000***
Duration of suction episode					
▪ (10-20) seconds	55	100.00	55	100.00	-

* Statistically significant level at P<0.05

Table (5): Distribution of the studied ventilated patients regarding physiological parameters throughout the study period.

Physiological Parameters	The studied traumatic patients (n=110) Range Mean ± SD							
	Control group (n=55)			F P	Study group (n=55)			F P
	Before	Immediately after	After 20 minutes		Before	Immediately after	After 20 minutes	
1. Heart rate (b\m)	(69-133) 96.53±15.361	(75-135) 95.78±12.096	(68-110) 90.56±8.935	**3.770 0.025***	(68-130) 91.20±14.812	(70-123) 92.80±12.186	(65-119) 87.49±10.925	2.512 0.084
2. Respiratory rate (c\m)	(14-32) 21.04±4.384	(11-20) 14.64±1.957	(11-20) 14.53±1.814	**87.010 0.000***	(12-32) 21.58±4.589	(12-23) 16.87±2.653	(10-16) 13.44±1.844	**87.591 0.000***
3. Mean arterial pressure (mmHg)	(60-107) 89.06±6.930	(53-108) 92.89±8.465	(59-106) 88.89±7.578	**4.767 0.010***	(78-107) 89.34±6.781	(80-108) 94.84±5.043	(80-106) 90.36±5.713	**13.535 0.000***
4. Peripheral oxygen saturation (SpO2)	(85-97) 93.65±3.683	(85-99) 95.35±3.395	(90-99) 96.69±1.845	**13.405 0.000***	(85-99) 94.29±3.650	(85-99) 96.38±3.684	(87-99) 96.71±2.034	**9.152 0.000***

* Statistically significant level at P<0.05

Table (6): Distribution of studied ventilated patients regarding to pain severity using BPS throughout the study period.

BPS level	The studied ventilated patients (n=110)													
	Control group (n=55)						χ^2 P	Study group (n=55)						χ^2 P
	Before		During		After			Before		During		After		
	N	%	N	%	N	%		N	%	N	%	N	%	
▪ Painless (3)	35	63.64	3	5.45	30	54.55		42	76.36	7	12.73	41	74.55	
▪ Mild (4-6)	18	32.73	3	5.45	20	36.36	**125.27**	10	18.18	22	40.00	14	25.45	**83.93**
▪ Moderate (7–9)	2	3.64	34	61.82	3	5.45	**0.000***	3	5.45	21	38.18	0	0.00	**0.000***
▪ Severe (10–12)	0	0.00	15	27.27	2	3.64		0	0.00	5	9.09	0	0.00	
Range	**(3-7)**		**(3-11)**		**(3-10)**		**F=160.28**	(3-8)		(3-11)		(3-6)		**F=80.339**
Mean ± SD	**3.60±0.993**		**8.25±1.808**		**4.02±1.604**		**P=0.000***	3.58±1.197		6.49±1.914		3.51±0.920		**P=0.000***
Control Vs Study														
t	0.087		**4.969**		**2.041**									
P	0.931		**0.000***		**0.044***									

Table (7): Mean scores of arterial blood gases among the studied ventilated patients throughout the study period.

Arterial Blood Gases	The studied traumatic patients (n=110) Range Mean ± SD					
	Control group (n=55)		t P	Study group (n=55)		t P
	Before	Immediate		Before	Immediate	
1. PH	(7.11-7.55) 7.38±0.102	(7.17-7.53) 7.43±0.072	**3.372 0.001***	(7.19-7.54) 7.38±0.090	(7.17-7.53) 7.43±0.067	**3.569 0.001***
2. PaO2	(26-133) 62.43±19.929	(68-181) 99.55±26.529	**8.297 0.000***	(34-107) 57.39±17.107	(12-149) 91.64±21.287	**9.302 0.000***
3. PaCO2	(23-88) 52.52±15.410	(27-76) 41.98±11.013	**4.125 0.000***	(22-88) 53.19±16.261	(28-76) 42.27±10.840	**4.143 0.000***
4. HCO3	(20-47) 29.06±6.254	(18-38) 27.99±4.911	0.992 0.323	(16-47) 29.47±6.234	(16-40) 29.62±5.531	0.134 0.893
5. SpO2	(44-97) 85.38±9.305	(90-99.7) 96.08±2.427	**8.251 0.000***	(60-97) 83.61±8.136	(90-99) 96.40±2.060	**11.306 0.000***

* Statistically significant level at P<0.05

Table (8): Reveals distribution of the studied ventilated patients regarding suction related complications throughout the study period.

Items	The studied ventilated patients (n=110)																
	Control group (n=55)								χ^2 P	Study group (n=55)								χ^2 P
	Before		During		Immediate		After 20 min			Before		During		Immediate		After 20 min		
	N	%	N	%	N	%	N	%		N	%	N	%	N	%	N	%	
1.Hypoxia																		
▪ Absent	42	76.36	17	30.91	49	89.09	53	96.36	**72.57**	40	72.73	40	72.73	50	90.91	54	98.18	**23.67**
▪ Present	13	23.64	38	69.09	6	10.91	2	3.64	**0.000***	15	27.27	15	27.27	5	9.09	1	1.82	**0.000***
Control Vs Study χ^2 **P**	FE 0.827		**FE 0.000***		FE 1.00		FE 1.00											
2.Tachycardia																		
▪ Absent	40	72.73	9	16.36	47	85.45	49	89.09	**85.32**	45	81.82	22	40.00	47	85.45	50	90.91	**44.28**
▪ Present	15	27.27	46	83.64	8	14.55	6	10.91	**0.000***	10	18.18	33	60.00	8	14.55	5	9.09	**0.000***
Control Vs Study χ^2 **P**	FE 0.363		**FE 0.010***		FE 1.00		FE 1.00											
3.Hypertension																		
▪ Absent	52	94.55	52	94.55	52	94.55	52	94.55	0.00	52	94.55	52	94.55	52	94.55	52	94.55	0.00
▪ Present	3	5.45	3	5.45	3	5.45	3	5.45	1.00	3	5.45	3	5.45	3	5.45	3	5.45	1.00
Control Vs Study χ^2 **P**	FE 1.00		FE 1.00		FE 1.00		FE 1.00											
4.Hypotension																		
▪ Absent	53	96.36	53	96.36	53	96.36	53	96.36	0.00	55	100.00	55	100.00	55	100.00	55	100.00	-

▪ Present	2	3.64	2	3.64	2	3.64	2	3.64	1.00	0	0.00	0	0.00	0	0.00	0	0.00	
Control Vs Study **χ^2** **P**	FE 0.495		FE 0.495		FE 0.495		FE 0.495											
5.Tracheal bleeding																		
▪ Absent	50	90.91	15	27.27	50	90.91	50	90.91	**82.44**	52	94.55	38	69.09	52	94.55	52	94.55	21.97
▪ Present	5	9.09	40	72.73	5	9.09	5	9.09	**0.000***	3	5.45	17	30.91	3	5.45	3	5.45	0.000*
Control Vs Study **χ^2** **P**	FE 0.716		**FE** **0.000***		FE 0.716		FE 0.716											

FE: Fisher' Exact test

* Statistically significant level at P<0.05

Table (9): Relation between pain severity (BPS) of the studied ventilated patients and their suction profile assessment.

Suction profile Assessment	The studied ventilated patients (n=110) Pain severity (BPS)					
	Control group (n=55)			Study group (n=55)		
	Before	During	After	Before	During	After
Size of suction catheter						
▪ 14 FG	**4.00±0.00**	7.00±0.00	4.00±0.00	3.42±1.052	6.18±1.687	3.42±0.883
▪ 16 FG	3.63±1.047	**8.44±1.578**	**4.19±1.749**	**5.20±1.483**	**9.60±1.140**	**4.40±0.894**
▪ 18 FG	3.45±0.820	7.64±2.541	3.36±0.674	-	-	-
F, P	0.210, 0.811	1.120, 0.334	1.158, 0.322	**12.120, 0.001***	**19.489, 0.000***	**5.591, 0.022***
Intubation length time (in days)						
▪ <3	3.33±0.516	8.33±2.805	**4.67±2.658**	3.67±1.234	7.00±1.00	3.53±0.915
▪ (3-7)	3.62±1.101	7.87±1.125	3.73±0.799	3.40±1.192	5.70±1.765	3.37±0.890
▪ >7	**3.67±0.900**	**8.41±1.877**	**4.03±1.660**	**4.00±1.155**	**8.10±2.234**	**3.90±0.994**
F, P	0.249, 0.781	0.470, 0.627	0.720, 0.492	0.994, 0.377	**8.460, 0.001***	1.279, 0.287
Suction pressure (mmhg)						
▪ (120-200)	-	-	-	3.00±0.00	5.20±1.297	3.03±0.183
▪ (200-250)	-	-	-	**4.28±1.514**	**8.04±1.274**	**4.08±1.115**
t, P	-	-	-	**21.514, 0.000***	**66.422, 0.000***	**25.701, 0.000***

* Statistically significant level at P<0.05

Discussion

The total number of patients sampled in the present study were 110 patients divided equally in the control group and study group. The findings of the study revealed that nearly three quarter of the control group and the majority of the study group were in the age group (≥60) years, it can be justified that the aging process brings physiological changes, such as reduced pulmonary compliance, impaired immune responses, and diminished physiological reserve, which may exacerbate the severity of disease and hinder recovery. These age-related changes also increase susceptibility to complications, such as ventilator-induced lung injury and multi-organ dysfunction **Huang &Huang (2024).**

This result was consistent with reported by **Maraş et al.,2020** who conducted study about "Increasing suction pressure during endotracheal suctioning increases the volume of suctioned secretions, but not procedure-related complications" and reported that the median age was 65 or older years, On the other hand, this finding was contradicted by **Abdelshafy(2023)**who conducted study about "The Relation between Age and CardioRespiratory Parameter in Open and Closed Suction System for Mechanically Ventilated Patients" and found that the median age was 47.45 years.

Concerning sex, the present study found that more than half of both groups were male. This might be due to a combination of lifestyle factors like higher smoking rates, occupational exposures and biological differences (hormones, lung development, immune response **(Cioboata et al.,2025).** This result was in the same line with **Liu, Gu, Li, and Xiong, (2025)** who conducted a study about "Safe and effective pressure of endotracheal tube suctioning based on sputum viscosity grades during artificial airway open suctioning procedures" who reported that most of studied patients were males. On the opposite, this finding was inconsistent with **Elhefny, AbdelHalim, and Shalaby (2025)** who reported in a study about "Efficacy of high-velocity nasal insufflation initiation in comparison to noninvasive ventilation and conventional oxygen therapy during acute respiratory failure in patients with interstitial lung disease" that one quarter of the studied patients were males and three quarters of them were females.

Regarding clinical data, it was noticed that more than two thirds of patients in the control group and majority of patients in the study groups diagnosed with acute respiratory failure(ARF) **(King et al., 2020).** This finding are consistent with **Alemayehu, Azazh, Hussien, and Baru (2022)** who reported in a study about "Characteristics and outcomes of mechanically ventilated patients at adult ICU of selected public hospitals" that the majority of total patient number were suffered from respiratory failure and is strongly associated with increased need for mechanical ventilation, longer ICU stays, and higher mortality. On the other hand, this finding was in contrast with **Madkour, ELMaraghy and Elsayed, (2022)** who studied" "Prevalence and outcome of sepsis in respiratory intensive care unit" and reported that This study highlights sepsis as a major determinant of mortality in respiratory ICU patients, exceeding the impact of respiratory failure alone.

Regarding past medical history, the current study revealed that more than two thirds of the control group and nearly three quarters of the study group had heart diseases. In addition, less than half of both groups were diabetic that it is associated with ageing process, insulin resistance/obesity, unhealthy lifestyle (physical inactivity, smoking) **Alsaadon et al., 2022.** These findings were consistent with a study done by **Ebrahimpur et al. (2024)** who reported that heart diseases especially hypertension and diabetes mellitus were common among elderly male patients who represent the majority of the study sample.

Regarding current medication, the present study showed that almost of the control group and the study group have antibiotics, mucolytics and bronchodilators drugs. This can be justified by the fact that most mechanically ventilated patients receive antibiotics, mucolytics, and bronchodilators because mechanical ventilation increases the risk of ventilator-associated pneumonia and impairs normal mucociliary clearance, leading to infection, airway inflammation, and secretion retention. Antibiotics are used to treat or prevent respiratory infections, while mucolytics and bronchodilators help reduce mucus viscosity, improve airway patency, facilitate secretion removal, and enhance ventilation and gas exchange **(Esmeijer et al.,2025).** These finding were in the same line with **Gipsman, Bhandari, and Bhandari (2025**) who reported in a study about "Use of mucolytics and inhaled antibiotics in the NICU" that these medications are commonly used ventilated patients.

Regarding Glasgow coma scale, In the current study, it was observed that there was statistically significant difference between control and study group throughout the period of study regarding to Glascow coma scale, this can be justified by patients with severe respiratory problems often have other severe systemic issues (e.g., acidosis, hypoxemia, multi-organ failure) that directly impact neurological function and GCS scores **Akpa, Pusalavidyasagar and Iber (2024).**

In harmony with these findings **Zhang, Hu, Zhu, and Tan (2022)** who found that there was a highly statistically significant difference between two groups in relation to Glascow coma scale.

On the contrary, **Moghaddam, Fathi, Jame, Darvishi, & Mortazavi (2023)** who carried a study about "Association of Glasgow coma scale and endotracheal intubation in predicting mortality among ICU patients" and found that there was no statistically significant difference between two groups throughout the period of study.

Regarding the type of suction device and suction pressure, the findings demonstrate that almost all (100%) patients in both the control and study groups used a fixed wall suction device. Also, it was noticed that all (100%) patients of the control group were subjected to high\unregulated suction pressure (>250 mmHg), while in the study group, more than half (54.55%) received suction pressure within the recommended range of 120–200 mmHg, and nearly half of them (45.45%) within 200–250 mmHg respectively, with significant differences between the control and study group as p value =0.000.

These findings were consistent with **Liu, Gu, Li, and Xiong (2025)** who conducted a study about "Safe and effective pressure of endotracheal tube suctioning based on sputum viscosity grades during artificial airway open suctioning procedures" and demonstrated that suction pressures within recommended ranges (approximately 80–200 mmHg) were effective in removing secretions while reducing adverse effects such as hypoxemia and mucosal injury.

Also, The American Association for Respiratory Care (AARC) demonstrated that suction pressure should be kept less than 200 mm Hg in adult patients **Blakeman, Scott, Yoder, Capellari, and Strickland (2022)**.

Concerning to size of suction catheter, it was observed that more than three quarter of the control group used size of 16 FG followed by nearly one quarter used 18 FG. Otherwise, the majority of the study group used 14FG and the minority used 16 FG, with a high statistically significant difference which reflects adherence to clinical suctioning guidelines aimed at minimizing airway compromise. Current practice guidelines recommend selecting a suction catheter size based on the internal diameter of the endotracheal tube (ETT) so that the catheter's external diameter does not exceed approximately 50% of the ETT's internal diameter, thereby allowing sufficient airflow around the catheter during suctioning and reducing the risk of hypoxemia, excessive negative pressure, and loss of lung volume (**(Blakeman et al., 2022)**. Thus, the higher use of 14 FG in the study group may indicate better alignment with guideline recommendations for minimizing ventilatory compromise, while the larger sizes in the control group could reflect less strict adherence to these guidelines or clinical need for increased secretion clearance.

These findings supported by **Elmaghraby Saber Saber and Abdelrahman (2023)** who found that the majority of critical care nurses used suction catheters sized 14–16 FG for adult intubated patients,

highlighting that larger catheters (18 FG) were associated with increased risk of mucosal trauma.

Regarding suction episode, the present study demonstrated that suctioning duration was similar across both groups, with all procedures lasting between 10–20 seconds as prolonged suctioning is associated with increased risk of physiological adverse effects including hemodynamic instability and alterations in oxygenation and cardiovascular parameters**.** This finding aligns with the American Association for Respiratory Care (AARC) guideline emphasizes that suctioning should generally last 10–15 seconds and not exceed 20 seconds **(Blakeman et al., 2022)**.

Part III: Clinical outcomes of the studied ventilated patients. Regarding to physiological parameters, it was noted that there was statistically significant difference among patients of the control group and also in the study group regarding heart rate, respiratory rate, mean arterial pressure and peripheral oxygen saturation before, immediately after and after 20 minutes from suction. These findings can be justified that endotracheal suctioning can acutely affect cardiovascular and respiratory parameters, likely due to transient hypoxemia, vagal stimulation, or sympathetic response during the procedure. **El-Hady, Babkair, Alharazi, Noorsaeed & Mehrez (2025)**

These findings were consistent with **Mohamed, Mohamed, Shoeib & Ibrahim (2024)** who demonstrated that open versus closed suctioning systems produced measurable differences in gas exchange and cardiorespiratory indices among mechanically ventilated patients.

In addition, **Shehab (2025)** who carried out a study about "The Effects of Endotracheal Suctioning and Invasive Interventions on the Pain Behaviors and Hemodynamic Measures of Adult Intensive Care Patients" and confirmed that suctioning and other invasive interventions significantly affected hemodynamic measures and patient pain behaviors.

Conversely, this finding is incongruent with the study conducted by **Mohamed, Mahmoud, Gouda & Kandeel (2023**) who concluded that closed and open tracheal suction systems improve the physiological parameters of mechanically ventilated patients with no statistically difference. **In relation to pain severity using BPS,** the findings of present study revealed highly statistically significant differences in pain severity within each group before, during and after endotracheal suction, with pain scores peaking during suctioning and declining after

the procedure considering that the control group who exposed to higher pressure during suction experience high pain score. This pain response has been attributed to airway mucosal irritation, coughing, hypoxia, and vagal stimulation during catheter insertion and negative pressure application. **(Raimundo et al., 2021).** This study was in the same line with **Kurt and Zaybak (2022)** who reported in a study about "Pain behavior experienced during nursing interventions by patients on mechanical ventilation" that increased pain score was associated with applying endotracheal suction.

Considering to the study group, it agreed with **Gulsoy & Kol (2024)** who studied "The Effect of Endotracheal Suctioning on Pain in Conscious Adult Patients in Intensive Care Unit" and illustrated that endotracheal suctioning did not cause pain in conscious patients when the procedure was performed with the correct catheter in accordance with the guideline.

Regarding to arterial blood gases, the present study demonstrated statistically significant changes in arterial blood gas parameters, including pH, PaO_2, $PaCO_2$, and SpO_2, before and immediately after endotracheal suctioning in both the control and study groups. These results highlight suctioning as an effective intervention for clearing secretions and enhancing gas exchange and the observed decrease in $PaCO_2$ after suctioning in the present study may be explained by transient hyperventilation or improved airway clearance.

These findings were consistent with **Khalil, Ismaeel, Askar& Sayed (2021)** who reported that immediate improvements in oxygenation (PaO_2, SpO_2) and reductions in carbon dioxide levels ($PaCO_2$) following suctioning.

Also, these findings were in agreement with **Elrefaey & Zidan (2020)** carried out "Efficacy of manual hyperinflation on arterial blood gases in patients with ventilator-associated pneumonia" and reported significant alterations ABG parameters,

Meanwhile, these findings were different with **Elmansy, Elbqry, & Aly (2024)** who studied" Effect of closed versus open tracheal suction on cardiopulmonary functions in mechanically ventilated adult patients" and illustrated that there was no statistically significant difference in ABG results. Additionally, these results were inconsistent with **Zohary, Mohieldeen, Mohammed & Hussien (2022)** who revealed that there were no statistically significant differences in the ABG parameters immediately and after procedure.

In relation to suction related complications, the present study revealed statistically significant

physiological disturbances, particularly during the suctioning procedure. **Concerning hypoxia**, These results represents that there were a significant increase in hypoxic episodes during suctioning can be justified by that open suctioning applied with disconnection the patient from the ventilator leading to cut of oxygen supply **(Berkow, 2024)**, This result was in the same line with **Shamali, Abbasinia, Ostergaard, & Konradsen (2019)** who studied on " Effect of minimally invasive endotracheal tube suctioning on physiological indices in adult intubated patients" and reported that endotracheal suctioning commonly results in a significant drop in peripheral oxygen saturation, especially when high or unregulated suction pressures are applied or when pre-oxygenation is inadequate.Similarly, **El-Hady, Babkair, Alharazi, Noorsaeed & Mehrez (2025)** who studied " Impact of Deep Versus Shallow Tracheal Suctioning on Cardiovascular Indices and Suction Induced Complications Among Mechanically Ventilated Patients". and demonstrated that deeper or more aggressive suctioning techniques were associated with higher rates of hypoxemia and physiological instability, supporting the current findings.

Moreover, this finding was congruent with **Jahromi, Poornoroz, Najafipoor, Rahimi, & Najafi** (2022) who studied " Best-Practice Interventions: How Can You Prevent Endotracheal Suctioning Associated Complications " and suggested that arterial oxygen saturation can be controlled by performing sufficient oxygenation and the least duration of suction as an invasive procedure

Regarding cardiovascular responses, it was observed that tachycardia was significantly more prevalent during suctioning in both groups, this may be related to the fact that with the open suction approach, the suction tube disconnects from the mechanical ventilator, resulting in decreased oxygenation and hypoxia. As a compensatory response to the lack of blood oxygen saturation, hypoxia stimulates the adrenergic nerve system, which controls cardiovascular and hemodynamic responses such as tachycardia. **(Alkubati et al., 2022).** These results were aligned with the findings of **Aris, Arafat, & Rachmawaty (2025)** who studied" The Effect of Endotracheal Suction on Hemodynamics of Neurological Patients" and reported that there was a significant increase in heart rate during open endotracheal suctioning among critically ill patients.

In relation to tracheal bleeding, the current study illustrated that there was also significantly observed during suctioning, particularly in the control group, which may be related to mucosal trauma caused by excessive

suction pressure, repeated catheter insertion, or inappropriate catheter size. This finding was supported by **Marietta, Semien & Fitzgerald (2025)** who studied "Surgical airway suctioning" and reported that direct contact and the excessive negative pressure from suction equipment may cause trauma to the airway mucosa, leading to hemorrhage or structural injury. The lower incidence of bleeding in the study group may reflect better adherence to suctioning guidelines and safer suctioning practices. Furthermore, the results of this study were agreed with **Alkubati et al., (2022)** who studied **"**Adherence of critical care nurses to endotracheal suctioning guidelines: a cross-sectional study" and reported that endotracheal suctioning performed outside recommended technique can lead to several complications, including bleeding and tracheobronchial trauma.

Regarding to relation between pain severity (BPS) of the studied ventilated patients and their suction profile assessment.

The present findings indicate that pain severity, as measured by the Behavioral Pain Scale (BPS), was significantly influenced by suction profile parameters, including catheter size, suction pressure, and intubation duration. Also, the present study revealed that patients who exposed to higher suction pressures (200–250 &>250 mmHg) exhibited statistically significant increases in BPS scores before, during, and after suctioning. this is consistent with **Shehab et al. (2025)** who reported that elevated pain responses were associated with under high-pressure suctioning protocols.

Mean while, these results were inconsistent with **Maraş et al., (2020)** who studied **"**Increasing suction pressure during endotracheal suctioning increases the volume of suctioned secretions, but not procedure-related complications and reported that increasing suction pressure during endotracheal suction increases the volume of suctioned secretions without causing complications.

Conclusion

The findings of the present study indicate that the application of regulated suction pressure during open endotracheal suctioning has a beneficial impact on patients' clinical outcomes as improved physiological stability, as evidenced by better maintenance of oxygen saturation, heart rate, and blood pressure during and after the suctioning procedure. In addition, patients subjected to regulated suction pressure experienced fewer procedure-related complications, such as mucosal trauma, bleeding, and significant desaturation episodes, compared with those exposed to unregulated or high suction pressures.

Recommendations

Recommendation for Clinical Practice and Patients

- Mechanically ventilated patients should receive open endotracheal suctioning using regulated and standardized suctioning pressure in accordance with evidence-based guidelines to minimize procedure-related complications.

Recommendations for Nurses

- Continuous professional development programs should be implemented to enhance nurses' competencies in safe suctioning techniques, appropriate pressure regulation, and early recognition of suction-related complications.

Recommendations for Future Research

- Future studies are recommended to investigate the long-term effects of regulated suctioning pressure on clinical outcomes such as duration of mechanical ventilation, length of intensive care unit stay, and incidence of ventilator-associated complications.

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Effect of Aromatherapy Massage on Neuropathic Pain and Quality of Life of Diabetic Patients

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Abstract

Background: One of the most widely used alternative and complementary therapies is aromatherapy massage, which uses a variety of techniques on the surface of the body and acupuncture points or meridians to deliver massage therapy transdermally with the goal of strengthening the body and curing illnesses. **Aim:** Evaluate the impact of massage with aromatherapy on neuropathic pain and quality of life among patients with diabetes. **Method:** Aquasi-experimental research method was utilized in this research with a purposive sample of sixty patients recruited from General Internal Medicine Department affiliated to Tanta University Hospitals. **Tools: Tool I:** Patients' Bio socio Demographic Characteristics **Tool II:** The Neuropathic Pain Scale (NPS) **Tool III:** Douleur Neuropathic 4 questionnaire (DN4) **Tool IV:** Neuropathic Pain Impact on Quality of Life Questionnaire. **Results:** The findings showed extremely notable decreases in neuropathic pain scores (from 53.73 at baseline to 14.77) were observed among studied patients post aromatherapy massage implementation where (all $p< 0.001$). Also, the quality of life showed a statistically significant improvement. **Conclusion:** the current study showed that aromatherapy massage is a useful technique for neuropathic pain management and improves the quality of life for Patients with DPN. **Recommendations:** Further training program for nurses on aromatherapy massage will be needed as a part of continuing nursing education to promote holistic patient care.

Key words: aromatherapy massage, diabetes mellitus, neuropathic pain.

Introduction

Diabetes mellitus (DM) is a metabolic disorder that is characterized by hyperglycemia and glucose intolerance. It is known to be associated with impaired insulin secretion and peripheral sensitivity, as well as eventual β-cell dysfunction (Unuofin & Lebelo, 2020). Over time, elevated blood glucose levels can cause serious blood vessel damage, which can result in serious complications that impact the entire body **(Lukic et al., 2024)**. One of the main causes of foot ulcers and amputations and the most popular micro vascular consequence of diabetes is diabetic peripheral neuropathy (DPN). **(Lu et al., 2020) (Abdissa et al., 2020)**. Diabetic peripheral neuropathy (DPN) is the term used to describe the signs related to peripheral neurological impairment in diabetics that do not have any other cause. Diabetic peripheral neuropathy affects all peripheral nerves, including motor neurons, nociceptive fibers, and the autonomic nervous system, and represents the second most prevalent cause of post-traumatic nerve injury. **(Selvarajah et al., 2019) (Zakin et al., 2019)**. The American Holistic Nurses Association states that in order to provide holistic nursing care, nurses should incorporate complementary practices like massage, herbal remedies, and aromatherapy that fall within the purview of nursing practice. **(AHNA, 2001)**. Nurses are crucial in helping patients manage their pain and anxiety. **(Park et al., 2013)**. With greater time spent with patients, nurses are better able to evaluate their level of pain and anxiety and, if necessary, employ non-pharmacological treatments. **(Ghezeljeh et al., 2017)**. **Significance of study:**

Aromatherapy is a holistic healing method that supports mental, emotional, and physical health by utilizing the healing properties of aromatic compounds found in essential oils extracted from medicinal herbs. **(Khatib, 2024)**. This complementary therapy has ancient roots, with aromatic substances being used for their healing properties in various civilizations throughout history **(Khatib, 2024; Vora et al., 2024)**. Therefore, this study examined how Neuropathic pain and quality of life in patients with diabetes were impacted by aromatherapy massage using chamomile and lavender oil.

The aim of the study was to **evaluate** the impact of massage with aromatherapy on neuropathic pain and quality of life among patients with diabetes. **Research hypothesis:**

- Patients who will receive aromatherapy massage with chamomile and lavender oil is exhibited to have less neuropathic

pain than patients who will receive routine hospital care.

- Patients quality of life post applying aromatherapy will have improvement in massage with chamomile oil and lavender oil.

Subjects and Method:

Design: Aquasi-experimental research method was utilized in this research. **Setting**: The study was conducted at Tanta Main University Hospital in the General Internal Medicine Department and the associated outpatient clinic. **Subjects:** A purposive sample of sixty patients was split into two equal groups, each with thirty patients.

Group 1: Control group, (30) patients, they received the standard hospital treatment from nursing staff.

Group 2: Study group, (30) patients, In addition to standard care, the researcher provided them with aromatherapy massage using chamomile and lavender oil.

Tools of the study: four tools were utilized in this research

Tool (I): Patients' assessment questionnaires:

This tool was developed by the researcher after reviewing the related literatures **(Guyatt et al., 1993).** It consisted of 2 parts: -

Part (1): Socio demographic data of the patients: it contained: code of patient, age, sex, marital status, level of education, occupation, residence and previous application of aromatherapy massage.

Part (2): Clinical data for diabetes patients: which included; weight, height, BMI, type and duration of diabetes, current treatment, HbA1c level, current use of the parameters of neuropathic pain (symptom location, neuropathy medication use, factors influencing the severity of pain, daytime of intense, smoking, history of hospitalization, the patient's history of disease regarding symptoms as tingling, blurred vision, and dry mouth).

Tool (II): **The Neuropathic Pain Scale (NPS)**

NPS was developed by **(Galer and Jensen, 1997)** and **(Bouhassira etal., 2004)** to assess the various qualities of pain linked to NP. NP Scale has a total of 10 items of a total score 100, For example, two assess pain dimensions (intensity and discomfort), and eight assess NP quality (deep pain, superficial pain, burning, freezing, boring, tender, itchy, and stabbing). On a numerical scale ranging from zero to ten, items are assessed.

To depict "too hot" discomfort, for instance, a score of 10 would be considered "worst imaginable sensation," while a score of zero would be considered "not hot."

Tool (III): Douleur Neuropathic 4 questionnaire (DN4)

The Douleur neuropathique 4 questionnaires (DN4) were a tool developed by **(Bouhassira et al., 2005**) and **(Haanpää et al., 2011),** With ten elements and a total score of 10, it was designed to differentiate between nociceptive and neuropathic pain. characteristics of pain burning, painful, pain linked to one or more symptoms, pain located, provoked factors of pain. **Scoring system;** Each item has a score that ranges from zero to ten, with 1 denoting a positive response and 0 denoting a negative one. Since scores of four or higher indicate NP, four is the cutoff point.

Tool (IV): Neuropathic Pain Impact on Quality-of-Life Questionnaire: this tool was developed by **(Poole et al, 2009).** It was an assessment of neuropathic pain and its impact on quality of life using a self-reported scale. 42 questions total, broken down into six categories: psychological, physical, personal care, symptoms, work or social activity, and relationships. The NePIQoL score ranged from 42 to 210. The high score reflected an improved quality of life.

Method

1. Obtaining approval

- Tanta Main University Hospital granted official authorization to conduct the study, which was then submitted to the appropriate authorities in the chosen sitting.

2. Ethical and legal consideration:

- The Tanta University Faculty of Nursing's ethical committee gave its approval prior to the study's execution with code 429-4-2024.
- privacy and confidentiality were taken into account when gathering data.
- The nature of the study ensured that none of the patients experienced any pain or injury.
- Following an explanation of the study's purpose, patients provided written informed consent to take part. Every participant was informed about the objectives of the study, information confidentiality, advantages, and their freedom to leave the study at any moment if they so chose.

3. Tool development:

The tools of the study were developed by the researcher after reviewing of related literatures except Tool (II): Neuropathic Pain Scale (NPS) was designed by **(Galer and Jensen, 1997)** and **(Bouhassira etal.,2004),** Tool (III): The Douleur neuropathique 4 questionnaire was developed by **(Bouhassira et al., 2005) and (Haanpää et al., 2011)** and Tool (IV): Neuropathic Pain Impact on Quality-of-Life Questionnaire was developed by **(Poole et al, 2009).**

4. Tool validity:

Regarding validity, the self-validation and content validity scores also demonstrated high values (0.930,

0.877, 0.959 for **self-validation** and 0.920, 0.835, 0.913 for **content validity**), and a final content validity score of 0.861, confirming the appropriateness of the tools.

5. A pilot study:

It was conducted on 10% (6 patients) of the study sample from the previously mentioned setting to test the feasibility and applicability of the used tools. The pilot study was not included in the study sample.

6. Reliability:

Cronbach's Alpha reliability analysis used to measure the internal consistency of the applied tools. The reliability coefficients were high across all tools, with values of **0.858, 0.816, and 0.952** for the neuropathic pain impact on QOL, Neuropathic Pain Scale (NPS), and Douleur Neuropathic 4 (DN4), respectively. Similarly, Cronbach's Alpha values were **0.927, 0.822, and 0.837**, with a **final Cronbach's Alpha of 0.848** indicating strong internal consistency beyond the acceptable threshold of 0.60.

7. Data collection period:

Data was gathered from the end of September 2024 to the end of March 2025, a period of six months.

8. The current study was carried out through four phases (Assessment, preparatory, implementation and evaluation) and it would be continued with each patient separately during their follow ups.

1-Assessment phase:

- The researcher evaluated all study and control group patients using Tools I, II, III, and IV pre, two, and four weeks to determine which patients fulfilled the inclusion requirements and would be incorporated into the research.
- Using tool (I), study and control patients were evaluated based on their age, sex, marital status, level of education, occupation, previous application of aromatherapy massage, residence, and clinical data about diabetes. Using tool (II) to assess different pain qualities associated to neuropathic pain like stabbing, burning, freezing, boring, using tool (III) to differentiate between nociceptive and neuropathic pain. and using tool (IV) to evaluate neuropathic pain and its influence on quality of life.

-Based on collected data choose massage techniques and pressure levels suitable for the patient's health and comfort.

2-Preparatory phase:

-The researcher designed intervention regarding applying aromatherapy massage including chamomile essential oil and lavender essential oil according to the literature review **(Abolfazli et al., 2021), (Cicek and**

Sendur 2021), (Hashemi et al., 2015) and (Hashempur et al.,2017).

-The lavender and chamomile essential oil were chosen after consultation with experts at the department of pharmacology and were prepared at the national research center in Cairo.

-To maintain safety the researcher kept essential oils away from eyes and mucous membranes and stored them in dark glass bottles, away from heat and light.

- describe the massage steps, expected duration and benefits to the patients and provide them with the booklet which was prepared by the researcher and answer all their questions.

-Prepare essential oils topically. Didn't put essential oils directly on patients' skin. For the massage, 30 ml of coconut or olive oil were used to dilute two drops of pure lavender essence and two drops of pure chamomile essential oil. Doing so prevented any possible skin irritation from developing. Ensure the patient has washed or sanitized skin before starting.

-offer privacy for undressing to the appropriate level and provide clean towels or sheets for draping, leaving only the area worked on exposed and keep extra towels handy for draping and wiping excess oil.

-Aromatherapy massage was conducted in a calm, warm and well-ventilated room. The patient was instructed to lie down on the examination couch before the foot massage began, and the researcher sat at chest level in a chair facing the patient's feet to modify ergonomics.

- patients' allergy was be assessed through diluting essential oils on a small patch of patients' skin first, like the area inside elbow or wrists. If red patches, breakouts, or itchiness developed, using was stopped.

- patients' body parts of areas of the skin with open wounds, infections, or injury were being assessed.

3- Implementation phase:

-Each participant in the intervention groups received the same massage protocol: 12 sessions in the form of three sessions a week for four weeks.

- Each massage lasted 30 minutes, with 10 minutes spent on the hands and 20 minutes on the feet.

- Patients sit in a comfortable position, in order to apply moderate pressure, it was more convenient to rest one hand on a table and perform the massage strokes with the other hand.

- Starting with the right foot, the intervention progressed to the left foot, right hand, and left hand. with rubbing 5 ml of treatment oils. Apply topically to the feet. From the toes to the ankle, use the Effleurage massage and friction technique. After that, plantar effleurage, friction, and petrissage techniques were used.

- patients hands or feet were being massaged as deeply as comfortably could. By Using thumb and index finger to strongly grasp each toe or fingertip and squeezing from the tip to the base. Rolling ankles and wrists to stretch out joints. Then deeply stroking the sides of feet moving in an upward motion towards knee.

4- Evaluation phase:

The researcher used Tool (I) part (I), (II), Tool (II), Tool (III) and tool (IV**)** for all study groups pre, two weeks and fourth weeks' post applying of aromatherapy.

Results:

Table (1) presented Comparison of socio demographic characteristics between study and control groups of diabetic patients.

The data indicated that the majority of patients aged between 40–60 years in both groups. with the mean age of study and control 44.77 ± 13.48 and 45.40 ± 10.37 respectively.

In relation to gender, it was noticed that more than half (56%) of the study group were female as compared to (50.0 %) in the control group. Also the table demonstrates that over one third (36.7%) of study group had completed secondary school as compared to half (50%) in the control group.

As regard to occupation, it was observed that over two thirds (70%) of patients in study group were unemployed, whereas over half (53%) of the control group had jobs, and over half of the patients in the two groups were married (60_63%) respectively. The result also showed that, none of the diabetic patients in either group had previously received aromatherapy massage and were with residence (p = 0.284).

Table (2) Demonstrated the neuropathic pain parameters data of the studied groups. The findings revealed that no statistically significant differences across all assessed parameters, indicating baseline similarity. Symptom location (right/left leg and hand) was generally comparable, with no significant differences observed (p-values from 0.100 to 0.718). The proportion of diabetic patients using medications for neuropathy did not differ significantly between groups (30.0% study 16.7% control; p = 0.222), nor did the types of medications used (analgesics, vitamin B12, or both; p = 0.752). Smoking status was nearly identical across study and control groups as most of them were no smoking (96.7%) (93.3) respectively. Finally, the severity of neuropathic pain was evenly distributed, with almost one half (50.0%) in the study group and over one half (53.3%) in the control group reporting mild pain, and the remainder reporting moderate pain.

Table (3) illustrated the total neuropathic pain scale (NPS) between

study and control groups at pre-intervention, two weeks, and four weeks' post-intervention

It showed that the study and control groups did not differ statistically significantly at baseline ($t = 1.542$, $p = 0.129$). By two weeks' post-intervention, the study group showed a highly reduction in overall NPS scores when contrasted with the control group. ($t = 7.540$, $p < 0.001$). These improvements were further enhanced by week four, where the study group's pain levels significantly decreased (from 53.73 to 14.77), but the control group's decline was less noticeable (from 51.93 to 28.30), resulting in a highly significant between-group difference ($t = 15.334$, $p < 0.001$).

Table (4) showed the neuropathic pain impact on quality of life (QOL) domains between study and control groups at pre-intervention, two weeks, and four weeks' post-intervention**.** It illustrated that at baseline, the study and control groups did not differ statistically significantly across all domains of neuropathic pain impact on quality of life, including psychological, physical, personal care, symptoms, work or social activity, and relationships. (all $p > 0.05$), indicating initial group comparability. However, at two weeks' post-intervention, the study group demonstrated significant improvements across all domains as compared to the control group (all $p < 0.001$), with the most pronounced differences observed in psychological status ($t = 8.132$, $p < 0.001$) and social activity ($t = 6.145$, $p < 0.001$). These improvements were further accentuated at four weeks, where all quality of life domains showed highly significant enhancement in the study group as compared to the control group (all $p < 0.001$), demonstrating the sustained positive effect of the intervention.

Table (5) showed the Correlation between QOL and neuropathic pain measures (NPS and DN4) among the study and control at different time points. The findings indicated that **QOL** and both **NPS** and **DN4** in the study group correlated negatively that was a statistically significant at all assessment times ($P < 0.001$), indicating that increased pain scores were associated with lower quality of life. The strongest correlation appeared at 4 weeks post ($r = -0.841$ with NPS). In the control group, a significant negative correlation with NPS was only observed at 4 weeks ($P < 0.001$), while DN4 showed a weak or non-significant relation in most time points, except a moderate correlation at 2 and 4 weeks ($P < 0.05$).

Table (1): Comparison of socio-demographic characteristics between study and control groups of diabetic patients.

	Study (N=30)		Control (N=30)		Chi-square	
	N	%	N	%	X^2	P-value
Age						
21- <30	6	20.0	4	13.3	1.067	0.785
30- <40	2	6.7	4	13.3		
40- <50	9	30.0	9	30.0		
50- 60	13	43.3	13	43.3		
Mean±SD	44.77 ± 13.48		45.40 ± 10.37			
Sex						
Male	13	43.3	15	50.0	0.268	0.605
Female	17	56.7	15	50.0		
Educational level						
Illiteracy	5	16.7	2	6.7	2.454	0.484
Basic	5	16.7	3	10.0		
Secondary	11	36.7	15	50.0		
University	9	30.0	10	33.3		
Occupation						
Working	9	30.0	16	53.3	3.360	0.067
Not working	21	70.0	14	46.7		
marital status						
Single	8	26.7	7	23.3	0.094	0.954
Married	18	60.0	19	63.3		
Widowed	4	13.3	4	13.3		
previous application of aromatherapy massage						
Yes	0	0.0	0	0.0	0.000	1.000
No	30	100.0	30	100.0		
Residence						
Village	21	70.0	17	56.7	1.148	0.284
City	9	30.0	13	43.3		

Table (2): Comparison of neuropathic pain parameters data between study and control groups of diabetic patients

Clinical data related to neuropathic pain parameter	Study (N=30)		Control (N=30)		Chi-square	
	N	%	N	%	X^2	P-value
location of symptoms						
right leg	7	23.3	4	13.3	1.002	0.317
left leg	5	16.7	4	13.3	0.131	0.718
right hand	17	56.7	23	76.7	2.700	0.100
left hand	14	46.7	17	56.7	0.601	0.438
use medications for neuropathy						

Yes	9	30.0	5	16.7	1.491	0.222
No	21	70.0	25	83.3		
If yes mention type of medication						
Analgesics	4	44.4	2	40.0	0.570	0.752
vitamin B12	3	33.3	1	20.0		
Both	2	22.2	2	40.0		
Smoking						
Yes	1	3.3	2	6.7	0.351	0.554
No	29	96.7	28	93.3		
severity of neuropathic pain						
Mild	15	50.0	16	53.3	0.067	0.796
Moderate	15	50.0	14	46.7		

Table (3): Comparison of total neuropathic pain scale (NPS) between study and control groups at pre-intervention, two weeks, and four weeks' post-intervention

Total Neuropathic Pain Scale (NPS)	Study	Control	T-test	
			t	P-value
Pre	53.73±4.53	51.93±4.51	1.542	0.129
Post 2 wks.	32.03±3.06	40.83±5.61	7.540	<0.001*
Post 4 wks.	14.77±2.50	28.30±4.14	15.334	<0.001*

Table (4): Comparison of neuropathic pain impact on quality of life (QOL) domains between study and control groups at pre-intervention, two weeks, and four weeks' post-intervention.

Items of neuropathic pain impact on QOL	Study			Control			P_1		P_2		P_3	
	Pre	Post 2 wks.	Post 4 wks.	Pre	Post 2 wks.	Post 4 wks.	T	P-value	T	P-value	t	P-value
Symptom	12.03±1.88	22.63±4.51	28.50±3.06	11.90±3.28	15.47±6.13	18.73±7.47	0.193	0.848	5.157	<0.001*	6.627	<0.001*
Relationships	8.07±1.80	13.83±2.35	15.93±2.30	7.80±1.42	9.37±2.28	11.70±4.25	0.637	0.527	7.469	<0.001*	4.795	<0.001*
Psychological	12.13±1.43	22.50±4.38	28.67±2.89	12.87±3.07	14.13±3.54	18.70±6.11	1.185	0.241	8.132	<0.001*	8.076	<0.001*
Social activity	11.97±1.59	23.27±5.19	27.63±2.91	12.27±2.94	14.73±5.56	18.87±7.32	0.492	0.624	6.145	<0.001*	6.097	<0.001*
Physical	10.33±1.18	19.13±3.44	22.93±3.65	10.23±2.16	12.67±4.44	16.30±6.01	0.222	0.825	6.302	<0.001*	5.170	<0.001*
Personal care	8.90±1.32	16.50±3.79	20.47±2.64	8.97±1.75	11.30±4.54	13.80±5.26	0.166	0.868	4.812	<0.001*	6.205	<0.001*

P_1= Study& Control pre, P_2= Study& Control Post 2 wks. and P_3= Study& Control Post 4 wks.

Table (5): Correlation between QOL and neuropathic pain measures (NPS and DN4) among the study and control groups at different time points.

		Total neuropathic pain impact on QOL		Total Neuropathic Pain Scale (NPS)	
		r	P-value	R	P-value
Study	**Pre**				
	Total Neuropathic Pain Scale (NPS)	-0.573	<0.001*		.
	Total douleur Neuropathic 4 (DN4)	-0.589	<0.001*	0.925	<0.001*
	Post 2 wks.				
	Total Neuropathic Pain Scale (NPS)	-0.554	<0.001*		.
	Total douleur Neuropathic 4 (DN4)	-0.579	<0.001*	0.774	<0.001*
	Post 4 wks.				
	Total Neuropathic Pain Scale (NPS)	-0.841	<0.001*		
	Total douleur Neuropathic 4 (DN4)	-0.528	0.003*	0.631	<0.001*
Control	**Pre**				
	Total Neuropathic Pain Scale (NPS)	-0.836	<0.001*		
	Total douleur Neuropathic 4 (DN4)	-0.062	0.744	0.003	0.985
	Post 2 wks.				
	Total Neuropathic Pain Scale (NPS)	-0.211	0.262		
	Total douleur Neuropathic 4 (DN4)	-0.443	0.014*	0.712	<0.001*
	Post 4 wks.				
	Total Neuropathic Pain Scale (NPS)	-0.618	<0.001*		
	Total douleur Neuropathic 4 (DN4)	-0.286	0.125	0.554	<0.001*

Discussion

Aromatherapy massage is the application of essential oils for medical or therapeutic purposes by absorption through the skin or olfactory system. It promotes the treatment of discomfort, anxiety, stress, pain, and sleep patterns **(Mehta& MacGillivray, 2022)**. These results can be explained by the synergic effects of both aromatherapy and massage **(Rafii et al., 2019)**. Therefore this study examined how diabetes patients' neuropathic pain and quality of life were impacted by aromatherapy massage using chamomile and lavender oil.

Concerning to socio characteristics of the studied groups. The study demonestrated that the majority of patients aged 40–60 years in both groups which might indicate a negative sign, such as the prevalence disadvantage of diabetes mellitus neuropathy, which manifested earlier than anticipated in the age group. The current findings were supported by **Mohammed et al., (2019)** who

reported the majority of patients with diabetic neuropathy under study aged 40–60 years in both. On the other hand, **Amour et al., (2019)** discovered that most individuals with painful diabetic neuropathy were older than sixty.

In relation to sex, the current study demonstrated that women made up over half of the patients. which revealed that there are some factors such as sex hormones, especially estrogen and progesterone, strongly influence how pain is perceived and processed among female, therefore females tend to have higher pain sensitivity and may develop neuropathic pain more easily than males. This result was similar to **Oraby et al., (2019)** who observed that about 2 thirds of patients were female. While these results were contraindicated with **Basebaa et al., (2024).** Who noticed that over than half of patients were male.

Regarding to educational level, our results illustrated that most of patients had secondary or university education in contrary with, **Gok Metin et al., (2017)** who noticed that most of diabetic patients had primary education but they were in the line with our study regarding to **marital status** as both results reported that most of patients were married. **In relation to occupation,** our study reported that most of diabetic patients were not working but this finding contradicts **Abdel Hamid Hawash et al., (2023)** who reported that most of diabetic patients were working.

Regarding location of symptoms, this study showed that Neuropathy symptoms have been observed in the majority of individuals in both groups in the upper limbs. It is may be due to microvascular vulnerability as upper limb nerves may exhibit greater microvascular impairment compared to lower limb nerves, making them more susceptible to ischemic. This result was in line with **Tóth et al., (2023)** who detected that Significant mild/moderate prominent nerve enlargement was found in those with type 2 diabetes; this enlargement was more noticeable on the upper limbs than the lower limbs and at compression sites as opposed to non-compression sites. However, these results did not agree with **Kender et al., (2022)** who reported that the prevalence of upper limb neuropathy was 30.5% in their study as compared to 49.6% for lower limb neuropathy.

Regarding to smoking the study result detected that the majority of diabetic patients were not smokers. In our point of view smoking is confounding with other risk factors as smokers often exhibit poor glycemic control, dyslipidemia, and sedentary lifestyles, making it difficult to isolate the effect of smoking itself. When adjusted for these confounders in multivariate analyses, the association between smoking and DPN often loses statistical significance. This

result was in agreement with **Liu et al., (2019)** who reported that the effect of smoking was not statistically significant however, this result disagreed with **Clair et al., (2015)** who reported a strong positive association between smoking and DPN.

Concerning to severity of neuropathic pain, our present study reported that the studied patients were limited to mild and moderate pain only as Aromatherapy massage is appropriate for patients with mild to moderate pain in peripheral neuropathy because it minimizes the risk of worsening nerve irritation or pain, while providing relaxation and improving quality of life and to safeguard the patients well-being, those with severe or high-risk conditions are not included in the study and it is in the same line with **M Gallo et al., (2022)** who included patients with Only second-degree burns, with a proportion of the total body surface area between 10% and 45%, were recorded in the patient's medical file; high-risk circumstances were not included in the study.

Regarding to total neuropathic pain scale between study and control groups. This study revealed that the study and control groups did not differ statistically significantly at baseline. By two weeks post-intervention, the study group exhibited a highly reduction in total NPS scores in comparison to the control group. These improvements were further enhanced by week four, where the study group demonstrated a marked decline in pain scores, while the control group showed a less pronounced reduction, resulting in a highly significant between-group difference. This result reinforces the effectiveness of aromatherapy massage and essential oils as a complementary approach in alleviating the pain and this is in agreement with **zhang et al., (2025)** who reported that at the fourth week following the intervention, the study group and the control group had statistically significant changes in terms of pain response, anxiety scores, and sleep quality scores. These results also are in agreement with **Izgu et al., (2019)** who observed that the incidence of neuropathic pain was much decreased at week six in the intervention group as compared to the control group.

In relation to Comparison of neuropathic pain impact on quality of life domains between study and control groups. The current study illustrated that study and control groups did not differ statistically significantly across all domains of neuropathic pain impact on quality of life, including psychological status, physical function, personal care, symptoms, work or social activity, and relationships. However, at two weeks post-intervention, study group demonstrated significant

improvements across all domains compared to control group with the most pronounced differences observed in psychological status and social activity These improvements were further accentuated at four weeks, where all quality of life domains showed highly significant enhancement in the study group relative to the control group.

This improvement was further reinforced at week four this results due to Aromatherapy massage is believed to reduce peripheral neuropathic pain and improve quality of life among diabetic patients through both physiological and psychological mechanisms. This result aligned with **Davoudi et al. (2021)** which reported that pain reduction is directly correlated with improved psychological and physical QOL in patients with painful neuropathy. Similarly, **Mahmoud et al. (2022)** and **Turan et al. (2025)** found significant enhancement in physical, psychological, and social domains following structured interventions addressing neuropathic pain. And it was in agreement with Abdel **Hamid Hawash et al., (2023**) who reported that Diabetes neuropathy has a substantial impact on quality of life (QOL) Indeed, diabetic neuropathy patients have lower QoL than non-neuropathic persons, the results of their study proved The efficiency of the massage with chamomile or lavender oil applied four weeks, three times per week in increasing the QoL of patients with painful DPN as compared to the control.

Concerning to correlations: Our results observed that QOL and both Neuropathic Pain scale (NPS) and Douleur Neuropathic 4 (DN4) correlated negatively that was statistically significant in the study group at all assessment times. This result was in agreement with **Hameed et al., (2023)** who revealed that neuropathic pain and enjoyment in life were significantly correlated negatively. Similarly, to **Won et al., (2017)** who reported that the quality of life was worse for people who had more severe pain. **Abo-Elfetoh et al., (2022)** also were in line with our results as their study detected that According to the severity of their pain, patients with painful DPN experienced poor functioning, poor sleep, and cognitive impairment. **Degu et al., (2019)** conducted a study that matched with our study and reported that Patients with type II diabetes who experienced diabetic peripheral neuropathic pain reported lower health-related quality of life, and the degree of pain correlate negatively that is a statistically significant with all domains.

Conclusion: the current study showed that aromatherapy massage is a useful technique for neuropathic pain management and improves the quality of life for Patients with DPN.

Recommendations: -Further research study about applied aromatherapy on large sample of diabetic patients in different settings should be done.

-in-service training programs for nurses on aromatherapy massage should be part of continuing nursing education to promote holistic patient care.

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Mitigating the Risk of Deep Venous Thrombosis in Post-Cesarean Recovery Period: Evidence-Based Insights

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Abstract

Background: Post-cesarean recovery period is a crucial time for women at risk for deep venous thrombosis (DVT). Pain, anesthesia, fatigue, and dizziness are factors that limit women's ability to move and exercise. Implementing evidence-based preventive measures plays an important role in enhancing women's compliance with DVT preventive practices and mitigating the risk of DVT. **Aim:** To evaluate the effect of implementing evidence-based practices on mitigating the risk of deep venous thrombosis in post-cesarean recovery period. **Design:** A quasi-experimental research design (two groups pretest- posttest). **Setting**: The study was conducted at the antenatal clinics and post-natal wards (9, 10, 15, and 18) of Mansoura University Hospitals, Mansoura City, Egypt. **Subjects**: One hundred and six post-cesarean women were selected as a purposive sample. **Tools**: Four tools were utilized: a structured interview questionnaire, Autar DVT risk assessment scale, DVT preventive measure questionnaire, and DVT manifestation sheet. **Results:** There was a highly statistically significant difference between both groups regarding the DVT total knowledge before and after implementing the evidence-based practices ($P \leq 0.001$). Manifestations of DVT showed a significant reduction in the intervention group compared to the control group. Also, compliance with DVT preventive measures achieved a satisfactory level (86.8% in the intervention group compared to 13.2% in the control group) during follow-up. **Conclusion:** Implementing evidence-based preventive measures significantly improved women's DVT knowledge, reduced DVT manifestations, and enhanced compliance with DVT preventive practices, which positively mitigate the risk of DVT. **Recommendation:** Incorporating a structured DVT awareness session for DVT-risk women scheduled for a cesarean section, enhancing their compliance with DVT preventive measures.

Key words: Deep Venous Thrombosis, Evidence-Based Insights, Post-Cesarean Recovery.

Introduction

Deep venous thrombosis is the formation of a blood clot (thrombus) within a deep vein, usually in the lower leg, calf, or pelvis, leading to vessel obstruction and impaired venous return. The three key factors that influence DVT are venous stasis, endothelial damage, and hypercoagulopathy **(Basli & Kurt, 2025).** It is a common problem among pregnant and postpartum women **(Alharazi et al., 2024).**

The most significant risk factors for developing DVT are prolonged bed rest, recent surgical procedures including cesarean section, increased age, cancer, pregnancy, obesity, infection, cardiovascular disorders, injuries, and hormonal contraceptives **(Mousa et al., 2022)**. Symptoms of DVT include redness, swelling, pain, tenderness, and unusual warmth in the affected area **(CDC, 2025).**

In pregnant women, the risk of DVT increases fivefold because of increased levels of coagulation factors (a prothrombotic state). The incidence increases during the third trimester and peaks in the first 3 months postpartum due to decreased blood flow to the legs **(Maughan et al., 2022).** Additionally, women after cesarean section spend significant time resting in bed in a lying position, which causes stasis of venous return **(Feng et al., 2024).**

Preventing DVT is often highly achievable despite its severity **(Henke et al., 2024).** Prevention should be considered for the safe care of postpartum women. Mitigating DVT in the post-cesarean recovery period is an effective way to lower the associated maternal morbidities and mortalities **(Abd ELmoniem, Sayed, & Emam, 2023).** This includes women's risk assessment, adopting preventive practices, and evaluation to ensure optimal postpartum care outcomes **(Hu et al., 2022).**

Awareness of DVT is crucial for prevention. Improving knowledge of DVT is an essential initial step for effective prevention and early detection **(Taha et al., 2024).** It promotes women's participation in recommended preventive practices and helps them to self-assess and self-report DVT symptoms during hospital stay and after discharge, enabling them to access timely medical help **(Abd ELmoniem, Sayed, & Emam, 2023; Hassan et al., 2021).**

The overwhelming increase in cesarean sections necessitates evidence-based interventions. Evidence-based insights for mitigating DVT are protocols that guide actions to

mitigate the risk of DVT, focusing on using the best available practices to improve overall women's care and achieve better outcomes. The implementation of evidence-based practices follows a multimodal approach, which includes early ambulation, leg elevation, range of motion exercises, elastic stockings, adequate hydration as prescribed, maintaining a healthy body weight, and the administration of antithrombotic drugs. Gaining evidence-based insight allows healthcare providers to move toward a more proactive, data-driven approach to enhance maternal safety and reduce maternal deaths. These practices should be started early for the women at risk for DVT through regaining the women's mobility and stability and improving venous return in the calf muscles **(Abd ELmoniem, Sayed, & Emam, 2023)**. Maternity nurses have an important lifesaving role in mitigating DVT among post-cesarean women through effective observation and standardized risk assessment, educating them regarding the risk factors, the warning signs, and serious complications, and motivating them to practice timely preventive measures **(Alharazi et al., 2024).** This can result in early diagnosis and treatment, entailing a significant decrease in life-threatening complications like pulmonary embolism and an improvement in maternal recovery **(Yohannes et al., 2022).**

Significance of the study

Deep venous thrombosis remains a leading cause of maternal morbidity and mortality worldwide. It is a silent and life-threatening complication for post-cesarean women. It occurs due to inconsistent risk assessment, delayed mobilization, or lack of adherence to updated preventive measures. The incidence of DVT is so significant that it is responsible for 1 in 4 deaths **(Wendelboe & Weitz, 2024).** Approximately 30 percent of patients who have a DVT in a certain year will suffer from a recurrent episode in the next 10 years, with the greatest risk in the first two years **(National Institute of Health (NIH), 2025).**

Postpartum women are at increased risk of DVT, resulting in a global incidence of about 0.1%. Additionally, women having a history of DVT encounter an elevated risk (between 2% to 10%) of experiencing recurrent episodes compared to those who do not **(Filip et al., 2024).** The prevalence of cesarean sections in Egypt has increased from 52% in 2014 to 72%, making it a serious public health

concern **(Egypt Family Health Survey (EFHS), 2021).** It significantly increases the risk of DVT by four to five times in postpartum women compared to non-pregnant women **(Filip et al., 2024).**

The complications of DVT have significant social and economic impacts. It often causes slow venous blood flow, hypercoagulability, and venous wall injury, leading to either partial or complete circulation blockage **(Chen et al., 2022).** Even worse, the condition can be serious leading to increased length of hospital stay and a severe health complication called pulmonary embolism (when the blood clot travels in the bloodstream and lodges in the lung, causing chest pain, shortness of breath, coughing blood, and dizziness, a life-threatening condition that requires immediate effective intervention because it can result in sudden death **(CDC, 2025).**

Early DVT prevention is the leading measure to reduce related maternal morbidities and mortalities **(Feng et al., 2024).** Yet, there is a reliance on traditional nursing routines in most clinical settings, and a gap in the application of evidence-based practices persists, underscoring the need for its application for high-risk women to improve the quality of maternal healthcare and reduce the financial burden of prolonged hospital stays. Therefore, this study was designed to evaluate the effect of applying evidence-based practices on mitigating deep venous thrombosis in the post-cesarean recovery period.

Aim of the study

This study aimed to evaluate the effect of implementing evidence-based practices on mitigating the risk of deep venous thrombosis in post-cesarean recovery period.

Hypothesis of the study

To achieve the study's aim, the following hypothesis was tested:

Post-cesarean women who followed the evidence-based practices showed a significant reduction in deep venous thrombosis risk compared to those who didn't.

Operational definitions:

Post-Cesarean Recovery Period: It is the period following cesarean birth through which the woman's body heals and recovers from the birth process. It ranges from a few days to 6 weeks postpartum.

Evidence-Based Insights: It is a combination of evidence-based procedures (early ambulation, wearing elastic stockings, leg elevation, active exercises, maintaining hydration, and anticoagulants) that are implemented

after cesarean delivery for women who are at risk for deep venous thrombosis to improve their condition and control the risk.

Subjects and Method

Study design: A quasi-experimental design (two groups- pre and post) was followed to determine the effect of the independent variable (i.e., applying evidence-based practices) on the dependent variables (i.e., mitigating the risk of deep venous thrombosis) **(Miller et al., 2020)**.

Setting: This study was carried out at the antenatal clinics and post-natal wards (9, 10, 15, and 18) of Mansoura University Hospitals, Mansoura City, Egypt. The antenatal clinics provide antenatal care and follow-up to women throughout pregnancy. Women admitted to the postpartum ward 24-48 hours before cesarean delivery for preoperative preparations and stay one or two days under observation for postpartum assessment before hospital discharge.

Study sampling: A purposive sample of 106 pregnant women (study and control groups) was enrolled in this study according to the following inclusion criteria: gestational age of 37 weeks or more, DVT risk, eligibility for elective cesarean birth, and willingness to participate. Women with previous DVT surgical intervention, such as Endovenous Laser Ablation (EVLA) procedure, emergency cesarean section, birth complications, or postpartum problems were excluded.

Sample size calculation

Based on data from the literature **(Abd ELmoniem, Sayed, & Emam, 2023)**, considering the level of significance of 5%, and the power of the study of 80%, the sample size can be calculated using the following formula:

$$n = \frac{2(Z\alpha/2 + Z\beta)^2 \times p\,(1-p)}{(d)^2}$$

Where p = pooled proportion obtained from the previous study; d = expected difference in the proportion of events; $Z_{\alpha/2}$ =1.96 (for 5% level of significance) and Z_{β} = 0.84 (for 80% power of the study). Therefore,

$$n = \frac{2(1.96 + 0.84)^2 \times 0.18\,(1-0.18)}{(0.21)^2} = 52.5.$$

Accordingly, the sample size required is 53 in each group. The flowchart of the study procedure is presented in Fig. 1.

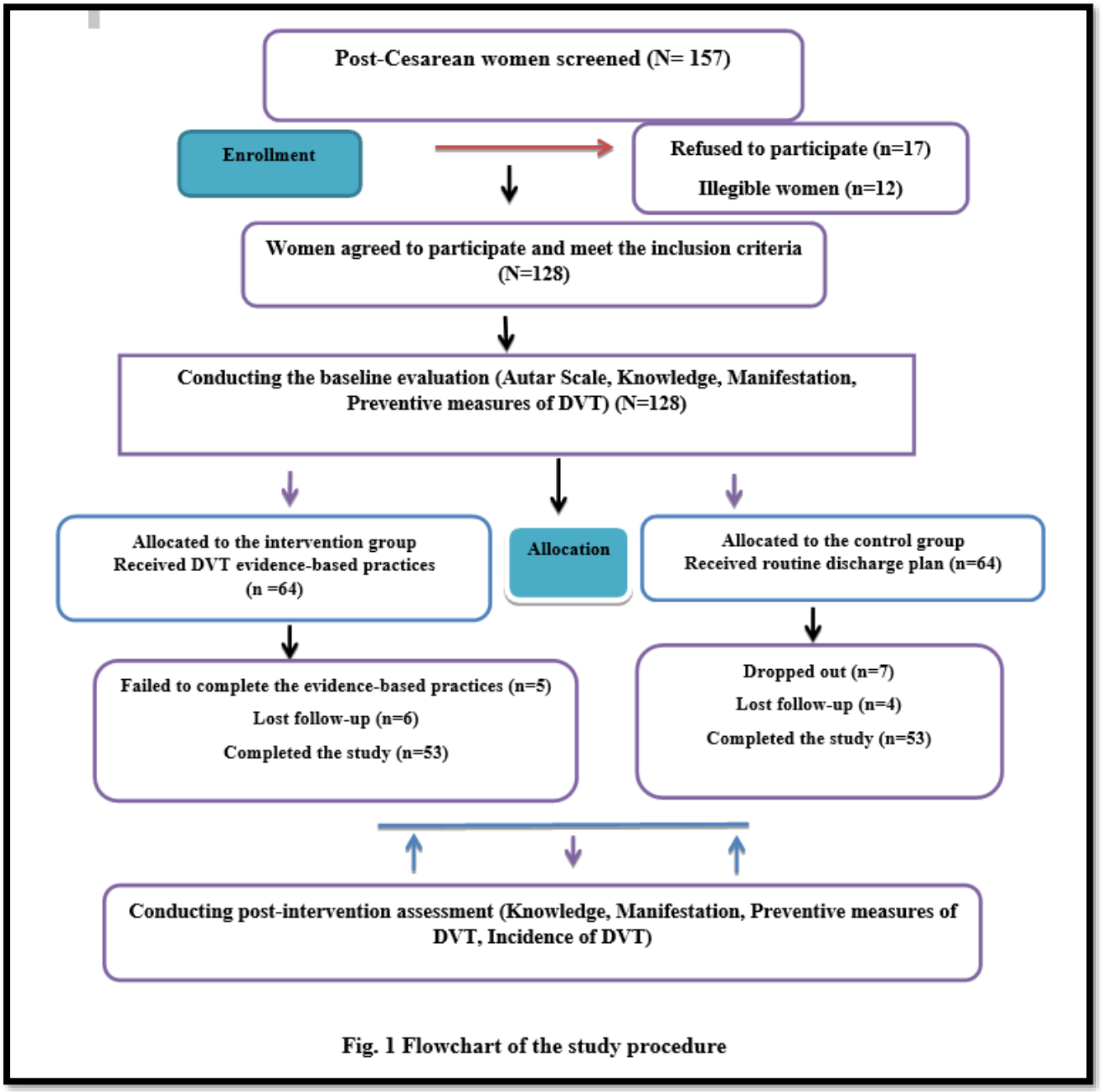

Fig. 1 Flowchart of the study procedure

Tools of data collection

Four tools were used for data collection: A structured interview questionnaire, an Autar DVT risk assessment scale, DVT preventive measures practices, and a DVT manifestations sheet.

1. **A structured interview questionnaire:** it was developed by the researchers after reviewing the related literature **(Ministry of Health, 2025; Abd ELmoniem, Sayed, & Emam, 2023; Ramadan, Amr, & Ashour, 2019)** and included two parts: **First,** the studied women's general characteristics as age, education, occupation, residence, and telephone number, gravidity, parity, previous abortions, medical status and Body Mass Index (BMI). **Second**, women's knowledge level about DVT, which included 19 items as definition, causes, risk factors, symptoms, complications, DVT management, etc.

   Scoring System: The knowledge level was scored from 0 to 19. A score of "1" was provided to the correct answer, while "0" was provided to the incorrect answer. The total score was classified into good knowledge ≥ 75%, average knowledge 50 < 75%, and poor knowledge < 50% **(Abd ELmoniem, Sayed, & Emam, 2023).**

2. **Autar DVT risk assessment scale**: this scale, adopted from **Autar (1994),** assesses the woman's risk for DVT formation. It included 7 risk categories: age-specific group, Body Mass Index (BMI), mobility, special DVT risk, trauma, surgery, and current high-risk diseases. **The first category**, age-specific group, included five age groups from 10 to 30 years, 31 to 40 years, 41 to 50 years, 51 to 60 years, and 61 years and more, which scored from 0 to 5, respectively. **The second category**, BMI, has three sub-categories: underweight (BMI from 16 to 19), average (BMI from 20 to 25), and overweight (BMI from 26 to 30), and scored from 0 to 2, respectively. **The third category**, mobility, included five sub-categories: ambulant scored 0, limited (use self-aids) scored 1, very limited (need help) scored 2, chair-bound scored 3, and complete bed rest scored 4. **The fourth category**, special risk category, involves using oral contraceptives and involves two sub-categories: using oral contraceptives from 20 to 35 years, which scored 1, and from 35 or more scored 2. **The fifth category**, trauma risk category, which includes four sub-categories, head or chest trauma scored 1, spinal trauma scored 2, pelvic trauma scored 3, and lower limb

trauma scored 4. **The sixth category**, surgical interventions include four sub-categories: minor surgery (30 minutes) scored 1, major surgery scored 2, (emergency, thoracic, abdominal, urological, and neurological surgeries scored 3), and orthopedic surgeries scored 4. **The seventh category**, current high-risk diseases, included seven sub-categories: ulcerative colitis scored 1, anemia scored 2, chronic heart diseases scored 3, myocardial infarction scored 4, malignancy scored 5, varicose veins scored 6, and previous DVT scored 7.

Scoring system: The overall score was classified as follows: no risk ≤ 6, low risk from 7 – 10, moderate risk from 11-14, and high risk from 15 or more **(Autar, 1994).**

3. **DVT preventive measures practices:** it was developed by the researchers after reviewing related literature **(Ramadan et al., 2019; Elkattan & Elderiny, 2017)** to assess women's compliance with DVT preventive measures. It includes 10 items: early mobilization, general exercises, foot and leg exercises, leg elevation, deep-breathing exercises, wearing elastic stockings, wearing loose clothes for legs, maintaining hydration, healthy food intake, and receiving anticoagulant drugs. **Scoring system**: each response is based on a 3-point Likert scale; never scored (0), sometimes scored (1), and always scored (2). The overall score was classified as either satisfactory practices (≥ 75%) or unsatisfactory practices (< 70%) **(Ramadan et al., 2019).**
4. **DVT manifestations sheet**: it was adopted from **O'Shaughnessy et al. (2019)** to assess DVT clinical manifestations and involved two parts: **First part:** Clinical assessment: to assess signs of DVT such as leg swelling, calf pain or tenderness, red or discolored skin, skin warmth, muscle cramps, aching in the swollen area, and palpable thrombosed superficial veins. **Second part:** Homan's sign (the dorsiflexion sign test) was defined by John Homan in 1941. Homan's sign test is a physical examination procedure used to test for DVT. **Technique:** The woman was asked to actively extend her knee. Once the knee is extended, the examiner raises the woman's straight leg to 10 degrees, then passively and abruptly dorsiflexes the foot while squeezing the calf with the other hand. Scoring: deep calf pain and tenderness may indicate the presence of DVT or a positive test result.

Validity and reliability of the study tools

Before utilizing the tools, three experts in the fields of woman's health and midwifery nursing checked their content validity to make sure the questions were consistently written and had the intended meaning, and simple adjustments were required and followed effectively. Also, DVT knowledge, Autar risk assessment scale, DVT preventive measures, and DVT clinical manifestation were tested for their reliability in the current study by Cronbach's Alpha test using SPSS version 29. According to Cronbach's Alpha coefficient test results, the internal consistency was 0.899, 0.903, 0.902, and 0.893, respectively.

Pilot study

To test the clarity and applicability of the study instruments, a pilot study was conducted with six post-cesarean women, representing 10% of the sample. These participants were subsequently excluded from the final study sample. Following the results of this pilot, necessary modifications were made to the study tools.

Ethical considerations

Ethical approval was obtained from the research ethics committee of the Faculty of Nursing, Mansoura University (Code No. 0744), to perform the current study. Informed written consent was obtained from the women following a comprehensive explanation of the study's aim and approach. The women were informed that they have the right to withdraw from the study at any time without impacting their clinical care. The privacy and confidentiality of the collected data were maintained.

Research procedure

The study was conducted through four phases: preparatory, assessment, implementation, and follow-up and evaluation.

I. **Preparation phase:** First, the official approval from the Research Ethics Committee, Faculty of Nursing- Mansoura University, was obtained. Then, the study tools were selected and prepared by the researchers after a comprehensive review of the literature, followed by an extensive review of their content validity and reliability. A pilot study was carried out on 10% of the post-cesarean women to ensure the applicability and clarity of the study questionnaire. Certain modifications were considered, so the pilot study was excluded from the main sample. Evidence-based practices for mitigating the risk of DVT were accurately designed and

checked by a panel of three experts in the field of woman's health for their comprehensiveness and accuracy.

II. **Assessment phase**: From the start of June 2025, the researcher started to interview the women in the third trimester of pregnancy during their follow-up visits, introduced herself, discussed the aim and the nature of the study, and checked for the inclusion criteria to participate in the current study. The eligible women's phone numbers were documented, and baseline assessment was completed at this stage, including: Autar DVT risk assessment scale, DVT knowledge, DVT manifestation, and DVT preventive measures.

III. **Implementation phase**: Eligible women were allocated to either the control group or the intervention group (with 53 women in each one). The control group received routine postpartum care, while the intervention group received DVT evidence-based preventive practices for mitigating the risk of DVT, as follows:

Routine postpartum care for the control group includes: proper nutrition, rest and sleep, perineal care, wound care, elastic stockings, contraceptive use, medications, danger signs, and follow-up visits.

DVT preventive measures from evidence-based insights for the intervention group

1. Early Mobilization:

Technique: The researcher assessed the postpartum woman's ability to move as soon as possible after delivery. Once the woman's condition was stable and her energy level had been restored, the researcher assisted her in moving, starting with "dangling" at the bedside and progressing to walking to the bathroom or hallway with support from her companion within 1 to 2 hours post-delivery.

Evidence support: obstetric organizations including Royal College of Obstetrics and Gynecology (RCOG), American College of Obstetrics and Gynecology (ACOG), and Queensland Health (QH) recommended that early mobilization post-cesarean is the first line of defense from developing DVT after delivery regardless of the risk level, and it is the most effective non-pharmacological intervention as walking triggers the calf muscle pump, increasing venous flow by up to 200% **(RCOG, 2015; ACOG, 2018; Queensland Health, 2025).**

2. Foot and Leg Exercises:

Technique: In certain conditions, such as fatigability, dizziness, pain, and lack of control to start walking post-cesarean, early mobilization can be delayed after food and leg exercises during the first hour after delivery. To enhance blood flow in the lower extremities and prevent venous stasis, the researcher started food and leg exercises immediately after delivery. While the woman was in bed, the researcher assisted her to perform "Ankle Pumps" and "Ankle Circles" for 5 minutes during the first hour as follows:

Ankle Pumps: This exercise resembles the motion of pressing a car pedal. It is the most effective way to allow the calf muscles to squeeze the deep veins. While lying on her back, supporting her abdomen with her legs straight, dorsiflexion was performed by pulling her toes and feet upward toward her shins as far as she could, then performing plantarflexion by pointing her toes away from her body, as if pointing at a wall. Hold each position for 2–3 seconds to allow for full venous filling and ejection. The calf muscle acts as a mechanical pump. When it contracts, it increases the pressure in the lower leg, forcing blood through the one-way valves of the veins back toward the heart.

Ankle Circles: It maintains joint mobility and engages smaller auxiliary muscles in the lower leg. The researcher lifted the woman's feet slightly off the bed and instructed her to support her abdomen and rotate her feet in a slowly controlled circular motion, as if drawing a large circle with her big toe, complete several rotations clockwise, then switch to counter-clockwise for 5 minutes during the first hour after birth. These movements ensure that the entire circumference of the lower leg musculature is activated, preventing blood from pooling in the smaller venous branches around the ankle and foot.

Evidence Support: Research indicates that active ankle dorsiflexion significantly increases the peak velocity of blood in the femoral vein, reducing the risk of stagnant "pockets" of blood behind vein valves **(American Society of Hematology (ASH), 2025; Society of Obstetricians and Gynecologists of Canada (CSOG), 2014); RCOG, 2015; ACOG, 2018).**

3. Deep-Breathing Exercises:

Technique: The researcher instructed the woman to inhale deeply through the nose, hold for 3 seconds, and exhale slowly through pursed lips

while she performed leg and foot exercises. Ankle Pumps and Circles for 5 minutes and Deep Diaphragmatic Breaths for 5 minutes every 30 minutes.

Evidence Support: Deep breathing creates a negative intrathoracic pressure. This "respiratory pump" acts as a vacuum, pulling blood from the inferior vena cava toward the heart, facilitating lower limb drainage and controlling pain post-cesarean. Also, it has a synergistic effect when performed simultaneously with Leg Exercises, which creates a "dual-pump" effect as the calf pump pushes blood from the ankles to the thighs. While the respiratory pump pulls blood from the thighs to the heart. This combination "squeezes" the inferior vena cava and sucks blood upward from the femoral and iliac veins in the legs. Research shows this significantly increases the velocity of blood flow, reducing the stasis that leads to DVT **(Miller & Peshock, 2025; Cleveland Clinic, 2024; Smith & Thompson, 2023).**

4. Leg Elevation:

Technique: The researcher instructed the woman to elevate her legs for 15–30 degrees about 15 to 25 cm above the heart level using pillows that were not directly placed behind the knees to avoid compression to the veins and clot formation. The duration was 20–30 minutes, 3 to 4 times a day. Also, the researcher instructed the woman not to apply knee rolls directly under the knee, as it creates pressure on the popliteal vein, significantly increasing the risk of DVT.

Evidence Support: Leg elevation works by utilizing gravity to overcome the resistance of venous valves, reducing venous pressure, enhance value efficiency, increasing the flow velocity in the femoral vein, and managing edema **(The Society for Vascular Surgery, American Venous Forum, and American Vein and Lymphatic Society, 2022).**

5. Wearing Elastic Stockings; Gradual Compression Stocking (GCS):

Technique: First, the researcher instructed the woman to wear elastic stockings with specific structural and functional characteristics that distinguish them from other socks. An appropriate size was selected based on the accurate measurement from the narrowest part of the ankle, the widest part of the calf, and the mid-thigh to ensure a proper fit. Stock length was measured from the heel to either high-thigh or the high-knee. Appropriate stockings should be made of elastic

fibers that allow stretch both horizontally and vertically to maintain consistent pressure during muscle contraction. Stockings were applied smoothly without wrinkles and removed daily for skin inspection.

Evidence Support: Graduated Compression Stockings (GCS) apply external pressure to superficial veins, shunting blood into the deep venous system and increasing flow velocity **(Cochrane review by Sachdeva et al., 2018/2024; RCOG, 2015; ACOG, 2018).**

6. Wearing Loose Clothes:

Technique: The researcher advised the woman to avoid tight waistbands or restrictive leggings and provided a loose-fitting hospital gown or loose pajamas.

Evidence Support: Restrictive clothing can act as a tourniquet, causing "mechanical obstruction" to venous return, a known risk factor for thrombus formation in the post-delivery period **(National Institute for Health and Care Excellence (NICE), 2025).**

7. Maintaining Hydration:

Technique: The researcher maintained regular fluid intake during the labor process and monitored IV fluid intake. After birth, as the woman tolerated oral fluids, warm fluids were encouraged to maintain hydration. The goal was to provide 2–3 liters of fluid per 24 hours (unless contraindicated).

Evidence Support: During postpartum recovery, many physiological changes increase the risk for clotting. Hydration acts as a primary defense mechanism against these factors. A woman's body loses more fluid than it gained during pregnancy; this increases blood viscosity and hypercoagulability to minimize bleeding during delivery and the postpartum period, which increases the risk of clot formation. To control these factors, the woman should replace fluid loss and stay hydrated all the time **(RCOG, 2015; ACOG, 2018).** WHO also highlights that breastfeeding mothers need significantly more fluids, about 3.0 to 3.8 liters of total water intake (from all sources, including food and soups) to maintain milk supply and prevent the blood thickening that leads to DVT **(WHO, 2022)**.

8. Healthy Food Intake:

Technique: The researcher instructed the women to maintain a high-fiber diet to prevent constipation and avoid straining during bowel movement, as it increases abdominal pressure, which momentarily stops venous return from the legs. Diet should be well-balanced,

with sufficient protein for healing, and intake of vitamins C, D, and iron. Increase intake of fruits and green vegetables. Avoid raw or undercooked meat and fish. Limit foods high in fats and sugars, which can contribute to postpartum fatigue and weight retention. Limit caffeine, which can interfere with women's sleep and make the infant more irritable. Diet should be divided into small, frequent meals.

Evidence Support: A healthy diet prevents metabolic complications and promotes vascular integrity. So, the WHO and CDC recommended that daily requirements for postpartum lactating women should include calories+500 kcal, protein 1.1 g/kg of body weight, fiber 25g - 30g per day, and iron 9 mg to 27 mg (depending on blood loss **(WHO, 2023; CDC, 2025)**.

9. Anticoagulant Drugs:

Technique: Anticoagulant drugs were prescribed by the doctor depending on the risk level of DVT. The nurse administered prescribed Low-Molecular-Weight Heparin (LMWH), subcutaneous in the abdomen, to moderate and high-risk-level women while monitoring for signs of vaginal bleeding, bruising, and bleeding gums.

Evidence Support: Anticoagulant drugs are the gold standard for high-risk postpartum women as they overcome the hypercoagulability inherent in the postpartum period and minimize clot formation. The RCOG and the American Society of Hematology (ASH) recommended that pharmacological intervention is the standard of care to slow down the clotting process and prevent DVT **(RCOG, 2015; ASH, 2020).**

IV. Follow-up and outcome evaluation phase

Using the same predetermined tools, women's knowledge regarding DVT, DVT preventive measures practices, and DVT manifestations were reassessed as post-intervention during the first follow-up visit, which was 2 weeks post-delivery. At the end of the postpartum period (six weeks post-delivery), the follow-up was assessed using the same tools; in addition, the incidence of DVT was evaluated. In between the time of intervention and follow-up periods, the researcher conducted telephone calls to postpartum women to remind them about the implementation of evidence-based preventive measures and the time of the next visit.

Data analysis

All statistical analyses were performed using SPSS for Windows version 20.0 (SPSS, Chicago, IL). Continuous data were normally distributed and

expressed as mean± Standard Deviation (SD). Categorical data were expressed in numbers and percentages. Chi-square test (or Fisher's exact test when applicable) was used for comparison of variables with categorical data. Linear regression was used to predict factors affecting DVT incidence. Reliability (internal consistency) test for the questionnaires used in the study was calculated. Statistical significance was set at $P<0.05$.

Results

Table 1 shows that the mean age was 35.9±5.3 years for the intervention group and 35.2±6.1 years for the control group. Regarding level of education, 39.6% and 47.2% of women in the intervention and control groups, respectively, had secondary education. Also, 71.7% and 60.4% of women, respectively, were not working. Most women (75.5% and 66.0%, respectively) lived in urban areas. Regarding obstetric history, multigravidity (Gravida 2 or more) was observed in 79.2% and 73.6% of the groups, while 73.6% and 67.9% were multiparous. The gestational age was 39 weeks or more in 60.4% and 58.5% of women, respectively. There was no significant difference in general characteristics and obstetric history between both groups ($P>0.05$), indicating baseline homogeneity.

Figure 2 illustrates that the distribution of chronic diseases was as follows: 37.9% and 35.3% of women had D.M in the intervention and control groups, respectively; 42.1% and 20.6% had hypertension; 13.8% and 17.6% had previous DVT; 10.3% and 11.8% had thyroid disorders; 6.9% and 14.7% had renal disorders, and 6.9% and 0% had antiphospholipid syndrome.

Figure 3 illustrates that more than three-fourths (77.4% and 75.5%) of the women in the intervention group and the control group were obese.

Table 2 reveals that the intervention group had a moderate and high risk of DVT of 43.4% and 39.6%, respectively, with a mean of 13.9 ± 3.6, compared to 41.5% and 45.3% in the control group, with a mean of 14.4 ±3.4. There was no statistically significant difference in DVT risk assessment between the two groups ($P = 0.790$).

Figure 4 denotes that there was no statistically significant difference between the intervention and control groups in the pre-intervention DVT total knowledge level ($P=0.869$), while post-intervention and follow–up, there was a highly statistically significant

difference between both groups (P<0.001).

Table 3 demonstrates that there were no statistically significant differences regarding compliance with DVT preventive measures between the intervention and control groups, pre-intervention (P>0.05), while highly statistically significant differences were found post-intervention and follow-up between both groups (P<0.001), except for early mobilization (post-intervention, P=0.002), general exercises (post-intervention, P<0.001), and leg elevation.

Figure 5 clarifies that pre-intervention, there was no statistically significant difference between the intervention and control group regarding total compliance with DVT preventive practices (P=0.828). Post-intervention and follow-up, 90.6% and 86.8% of women in the intervention, respectively, had satisfactory practice level compared to 15.1% and 13.2% in the control group, with a highly statistically significant difference between them (P<0.001).

Table 4 indicates statistically significant differences between both groups post-intervention regarding leg swelling, calf pain-tenderness, skin warmth, muscle cramps, and palpable thrombosed superficial veins (P=0.038, 0.034, 0.010, 0.010, and 0.038), respectively. At follow-up, it was found that 9.4%, 5.7%, and 5.7% of the intervention group had calf pain-tenderness, skin warmth, and aching in the swollen area, respectively, compared to 35.8%, 39.6%, and 39.6% of the control group, with highly statistically significant differences (P<0.001).

Table 5 illustrates that 96.2% of the intervention group had a negative incidence of DVT post-intervention, compared to 64.2% of the control group, with a highly statistically significant difference between both groups (P<0.001).

Table 6 presents linear regression results regarding the predictors of DVT incidence among women in the intervention group. Three variables were identified: chronic diseases, knowledge, and preventive measures practices (P=0.013, 0.021, and <0.001), respectively. There is a significantly positive relationship between chronic disease and the incidence of DVT, which suggests that women with chronic diseases have a higher risk of DVT. Based on the Standardized Coefficient, this is the strongest positive predictor (Beta 0.388). There is a significantly

negative relationship between knowledge and DVT, which indicates that as the women's knowledge regarding DVT increases, the risk of DVT significantly decreases (Beta -0.330). The preventive measures practice is the most statistically significant predictor (Beta -0.379). The negative coefficient indicates that better adherence to preventive practices is strongly associated with a reduction in the incidence of DVT. Neither age nor BMI showed a statistically significant impact on the incidence of DVT. This suggests that these physical demographics were not the primary drivers of the outcome (non-significant predictors).

Table 1. Comparison between the general characteristics and the obstetric history of the studied women (N=106)

	Intervention		Control		Chi – Square / Fisher's exact test	
	n (53)	%	n (53)	%	X^2	*P*
Age (Years)						
< 20	4	7.5	10	18.9		
20 - < 30	13	24.5	13	24.5		
30 – 40	14	26.4	16	30.2		
> 40	22	41.5	14	26.4		
Mean ±SD	35.9 ±5.3		35.2 ±6.1		4.483	0.214
Level of education						
Primary	16	30.2	7	13.2		
Secondary	21	39.6	25	47.2		
University or more	16	30.2	21	39.6	4.545	0.103
Occupation						
Working	15	28.3	21	39.6		
Not working	38	71.7	32	60.4	1.514	0.218
Residence						
Rural	13	24.5	18	34.0		
Urban	40	75.5	35	66.0	1.140	0.286
Gravidity						
Gravida 1	11	20.8	14	26.4		
Gravida 2 or more	42	79.2	39	73.6	0.471	0.492
Parity						
Primipara	14	26.4	17	32.1		
Multipara	39	73.6	36	67.9	0.410	0.522
Number of abortions						
None	42	79.2	36	67.9		
1 and more	11	20.8	17	32.1	1.747	0.186
Gestational age (Weeks)						
37 -	8	15.1	8	15.1		
38 -	13	24.5	14	26.4		
39 or more	32	60.4	31	58.5	0.053	0.974

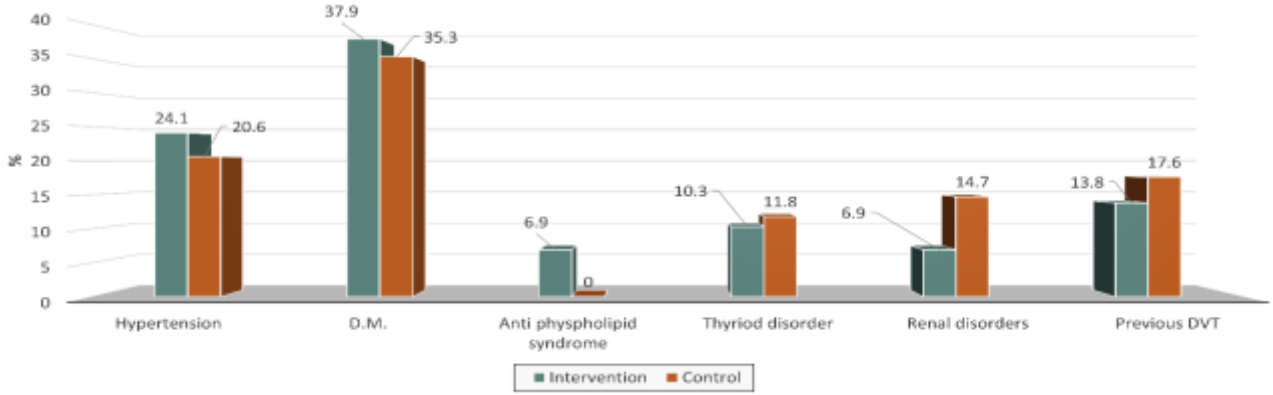

Figure. 2. Distribution of chronic diseases among the intervention and control groups

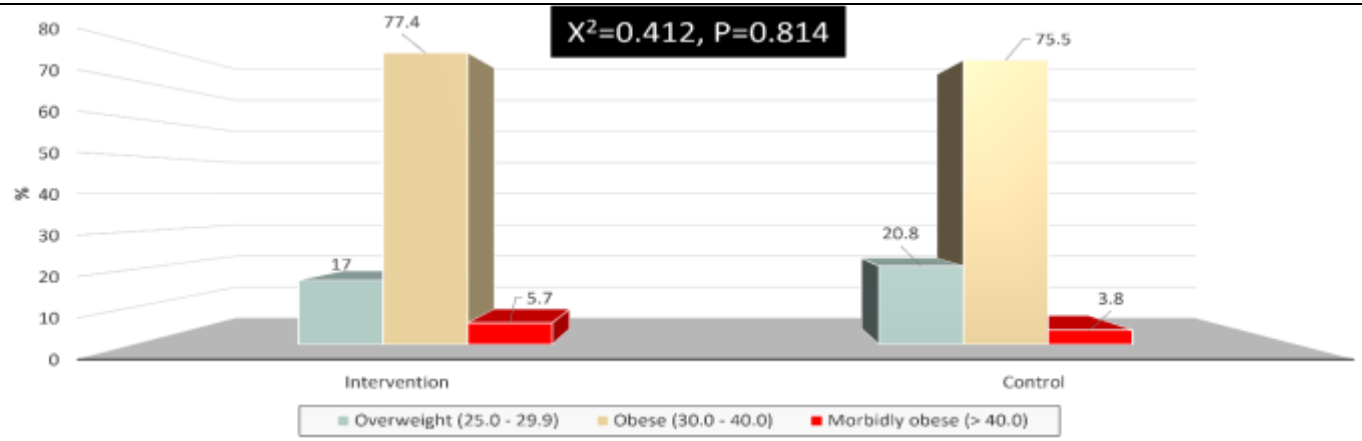

Figure 3. Distribution of Body Mass Index (BMI) among the intervention and control groups

Table 2. Comparison between the Autar DVT risk assessment scale (Pre – intervention)

	Low risk (7 – 10)		Moderate risk (11 – 14)		High risk (15 or more)		Chi – square / Fisher's exact test	Mean ±SD	T – Test
	N	%	N	%	n	%			
Intervention	9	17.0	23	43.4	21	39.6	X^2=0.472,	13.9 ±3.6	T=0.838,
Control	7	13.2	22	41.5	24	45.3	P=0.790	14.4 ±3.4	P=0.404

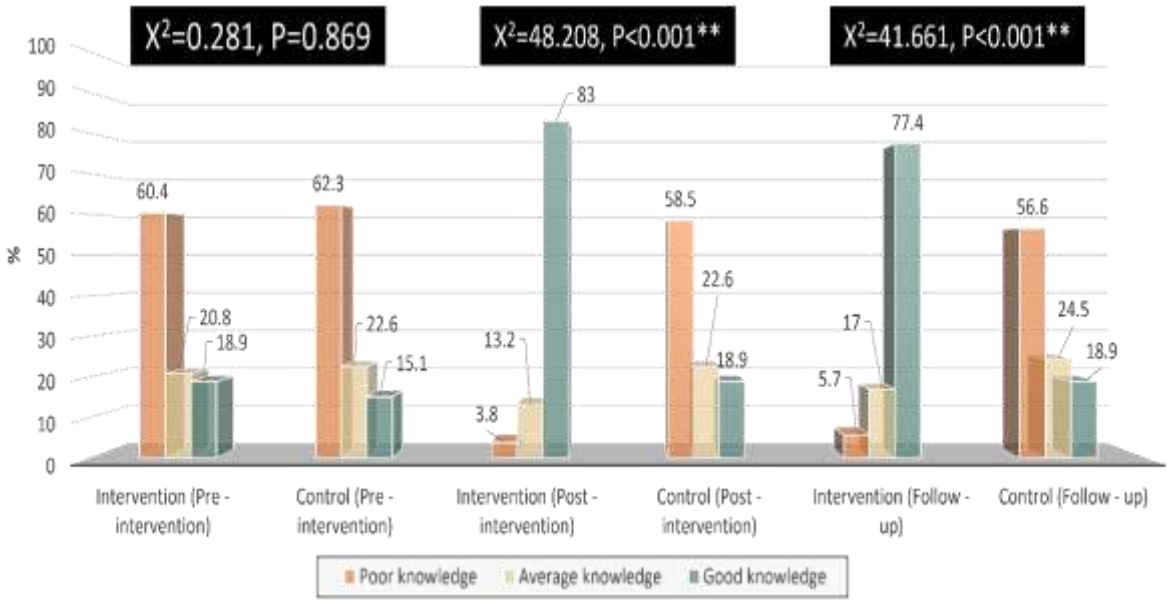

Figure 4. DVT total knowledge level among the intervention and control groups

Table 3. Compliance with DVT preventive measures among the intervention and control groups

	Pre – intervention			Post – intervention			Follow–up		
	Intervention	Control	Sig. test	Intervention	Control	Sig. test	Intervention	Control	Sig. test
	n (%)	n (%)	X^2 (P)	n (%)	n (%)	X^2 (P)	n (%)	n (%)	X^2 (P)
Early mobilization									
Never	23 (43.4)	13 (24.5)		4 (7.5)	17 (32.1)		6 (11.3)	5 (9.4)	
Sometimes	18 (34.0)	28 (52.8)	X^2=4.952,	28 (52.8)	27 (50.9)	X^2=12.866,	15 (28.3)	17 (32.1)	X^2=0.232,
Always	12 (22.6)	12 (22.6)	P=0.084	21 (39.6)	9 (17.0)	P=0.002*	32 (60.4)	31 (58.5)	P=0.891
General exercises									
Never	20 (37.7)	25 (47.2)		6 (11.3)	18 (34.0)		3 (5.7)	10 (18.9)	
Sometimes	26 (49.1)	19 (35.8)	X^2=1.894,	23 (43.4)	32 (60.4)	X^2=23.806,	25 (47.2)	25 (47.2)	X^2=4.909,
Always	7 (13.2)	9 (17.0)	P=0.388	24 (45.3)	3 (5.7)	P<0.001**	25 (47.2)	18 (34.0)	P=0.086
Foot and leg exercise									
Never	12 (22.6)	19 (35.8)		6 (11.3)	16 (30.2)		11 (20.8)	20 (37.7)	
Sometimes	31 (58.5)	25 (47.2)	X^2=2.276,	16 (30.2)	32 (60.4)	X^2=28.657,	15 (28.3)	27 (50.9)	X^2=19.405,
Always	10 (18.9)	9 (17.0)	P=0.320	31 (58.5)	5 (9.4)	P<0.001**	27 (50.9)	6 (11.3)	P<0.001**
Leg elevation									
Never	19 (35.8)	23 (43.4)		7 (13.2)	13 (24.5)		3 (5.7)	8 (15.1)	
Sometimes	19 (35.8)	21 (39.6)	X^2=1.981,	33 (62.3)	32 (60.4)	X^2=3.006,	28 (52.8)	24 (45.3)	X^2=2.604,
Always	15 (28.3)	9 (17.0)	P=0.371	13 (24.5)	8 (15.1)	P=0.222	22 (41.5)	21 (39.6)	P=0.272
Deep-breathing exercise for 10 sec/2hrs/day									
Never	27 (50.9)	28 (52.8)		5 (9.4)	27 (50.9)		9 (17.0)	40 (75.5)	
Sometimes	14 (26.4)	17 (32.1)	X^2=1.109,	13 (24.5)	17(32.1)	X^2=31.022,	26 (49.1)	6 (11.3)	X^2=36.952,
Always	12 (22.6)	8 (15.1)	P=0.575	35 (66.0)	9 (17.0)	P<0.001**	18 (34.0)	7 (13.2)	P<0.001**
Wear loose clothes									
Never	9 (17.0)	10 (18.9)		4 (7.5)	16 (30.2)		4 (7.5)	23 (43.4)	
Sometimes	8 (15.1)	13 (24.5)	X^2=1.789,	27 (50.9)	32 (60.4)	X^2=18.327,	12 (22.6)	24 (45.3)	X^2=39.719,
Always	36 (67.9)	30 (56.6)	P=0.409	22 (41.5)	5 (9.4)	P<0.001**	37 (69.8)	6 (11.3)	P<0.001**
Wearing elastic stocking									
Never	20 (37.7)	14 (26.4)		2 (3.8)	13 (24.5)		4 (7.5)	19 (35.8)	
Sometimes	22 (41.5)	30 (56.6)	X^2=2.490,	29 (54.7)	28 (52.8)	X^2=11.025,	18 (34.0)	26 (49.1)	X^2=24.801,
Always	11 (20.8)	9 (17.0)	P=0.288	22 (41.5)	12 (22.6)	P=0.004*	31 (58.5)	8 (15.1)	P<0.001**
Maintaining hydration and taking enough fluids									
Never	14 (26.4)	11 (20.8)	X^2=0.513,	3 (5.7)	7 (13.2)	X^2=10.339,	8 (15.1)	12 (22.6)	X^2=15.100,
Sometimes	25 (47.2)	26 (49.1)	P=0.774	26 (49.1)	37 (69.8)	P=0.006*	21 (39.6)	35 (66.0)	P<0.001**

Always	14 (26.4)	16 (30.2)		24 (45.3)	9 (17.0)		24 (45.3)	6 (11.3)	
Healthy food intake									
Never	10 (18.9)	9 (17.0)		3 (5.7)	23 (43.4)		4 (7.5)	21 (39.6)	
Sometimes	27 (50.9)	32 (60.4)	X^2=1.048,	12 (22.6)	21 (39.6)	X^2=35.733,	14 (26.4)	23 (43.4)	X^2=29.113,
Always	16 (30.2)	12 (22.6)	P=0.592	38 (71.7)	9 (17.0)	P<0.001**	35 (66.0)	9 (17.0)	P<0.001**
Receiving anticoagulant drugs									
Never	13 (24.5)	15 (28.3)		3 (5.7)	19 (35.8)		2 (3.8)	19 (35.8)	
Sometimes	26 (49.1)	24 (45.3)	X^2=0.223,	20 (37.7)	29 (54.7)	X^2=31.147,	18 (34.0)	27 (50.9)	X^2=32.462,
Always	14 (26.4)	14 (26.4)	P=0.895	30 (56.6)	5 (9.4)	P<0.001**	33 (62.3)	7 (13.2)	P<0.001**

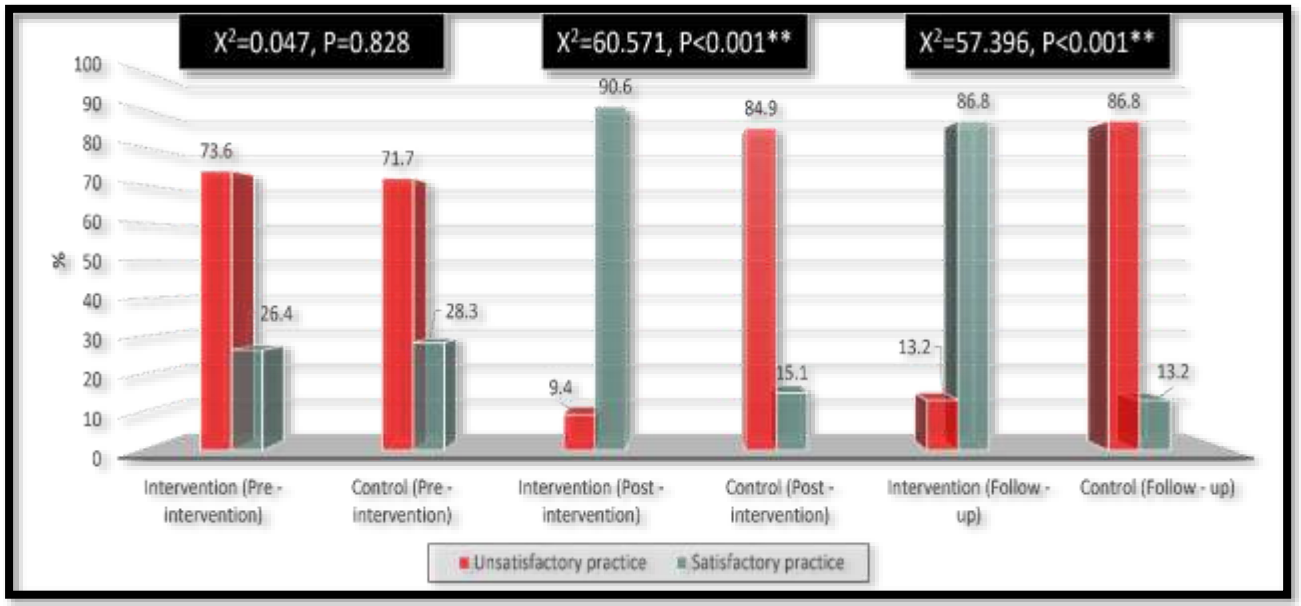

Figure 5. Total compliance with DVT preventive measures practices among the intervention and control groups

Table 4. Comparison between the clinical manifestations of DVT (N=106)

	Intervention		Control		Chi – Square / Fisher's exact test	
	n (53)	%	n (53)	%	X^2	*P*
Pre – intervention						
Legs swelling	12	22.6	17	32.1	1.187	0.276
Calf pain-tenderness	18	34.0	13	24.5	1.140	0.286
Skin discoloration	5	9.4	9	17.0	1.317	0.251
Skin warmth	17	32.1	18	34.0	0.043	0.836
Muscle cramps	11	20.8	12	22.6	0.056	0.814
Aching in the swollen area	5	9.4	9	17.0	1.317	0.251
Palpable thrombosed superficial veins	4	7.5	7	13.2	0.913	0.339
Post – intervention						
Legs swelling	5	9.4	13	24.5	4.283	0.038*
Calf pain-tenderness	7	13.2	16	30.2	4.498	0.034*
Skin discoloration	4	7.5	7	13.2	0.913	0.339
Skin warmth	9	17.0	21	39.6	6.695	0.010*
Muscle cramps	6	11.3	17	32.1	6.719	0.010*
Aching in the swollen area	4	7.5	7	13.2	0.913	0.339
Palpable thrombosed superficial veins	5	9.4	13	24.5	4.283	0.038*
Follow–up						
Legs swelling	4	7.5	16	30.2	8.874	0.003*
Calf pain-tenderness	5	9.4	19	35.8	10.557	<0.001**
Skin discoloration	4	7.5	6	11.3	0.442	0.506
Skin warmth	3	5.7	21	39.6	17.451	<0.001**
Muscle cramps	5	9.4	18	34.0	9.384	0.002*
Aching in the swollen area	3	5.7	21	39.6	17.451	<0.001**
Palpable thrombosed superficial veins	4	7.5	16	30.2	8.874	0.003*

Table 5. DVT incidence among both groups after completion of the intervention

	Intervention		Control		Chi – Square / Fisher's exact test	
	n (53)	%	n (53)	%	X^2	*P*
Negative DVT	51	96.2	34	64.2		
Positive DVT	2	3.8	19	35.8	17.162	<0.001**

Table 6. Linear regression for the predictor variables of the presence of DVT among the studied women (Intervention group)

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.198	0.146		8.218	<0.001**
Age (Years)	0.001	0.027	0.004	0.026	0.980
BMI	-0.020	0.059	-0.049	-0.343	0.733
Chronic diseases	0.172	0.052	0.388	2.385	0.013*
Knowledge	-0.128	0.054	-0.330	-2.392	0.021*
Preventive measures practices	-0.151	0.090	-0.379	-2.568	<0.001**

Discussion

Deep venous thrombosis poses a significant risk for substantial morbidity and mortality among post-cesarean women. The application of evidence-based practices is practical; it enhances the effectiveness and quality of care for women at risk for DVT through the identification of risk on time and the provision of appropriate therapy. This study was designed to evaluate the effect of applying evidence-based practices on mitigating the risk of deep venous thrombosis in the post-cesarean recovery period.

The findings of this study highlighted a multifactorial DVT risk profile among women. It was found that the two groups had a moderate and a high-risk baseline for DVT, with no statistically significant differences between them. A study by **Allam, Elsaadany, Girgis, Elnabawey, & Soliman (2024**) found that the majority of the women in both groups had a moderate to high risk of getting DVT, with no statistically significant difference. Similarly, a prospective study concluded that a high percentage of the study sample had a moderate to high risk of venous thromboembolism **(Bharti et al., 2024)**.

The elevated risk in the current study can primarily be attributed to the finding that more than three-fourths of the women in the intervention group and the control group were obese. Diabetes mellitus affected more than one-third of women in both groups. Hypertension showed a high percentage in the intervention group, whereas it was present in one-fifth of the control group. In the context of post-cesarean recovery, obesity acts as a potent independent risk by reducing fibrinolytic activity and promoting venous stasis. Furthermore, diabetes and hypertension contribute to increased blood viscosity, creating a pro-thrombotic state. These comorbidities, combined with the surgical trauma of the cesarean section, have a

synergistic effect, significantly increasing the risk for DVT.

The present study findings showed that there was a highly statistically significant difference between the intervention and control groups regarding the total knowledge level of DVT post-intervention and at follow–up. Related studies have shown that nursing education significantly enhances DVT-related knowledge of participants **(Daniel, 2025)**. A study by **Allam et al. (2024)** demonstrated statistically significant differences and improvements in women's knowledge about venous thromboembolism before and after educational sessions. **Abd ELmoniem, Sayed, & Emam (2023)** investigated the effect of implementing evidence-based nursing practice guidelines on DVT prevention in postpartum women and further supported this finding, confirming that women who received the evidence-based nursing practice guidelines exhibit a higher level of knowledge regarding DVT than those who didn't. The improvement in women's DVT theoretical knowledge in the present study may be due to the positive effect of the evidence-based sessions that significantly improve their health literacy by providing correct, applicable information covering relevant topics like risk factor identification, symptom awareness, and prevention. Addressing critical gaps in the understanding of DVT increases knowledge scores substantially among women.

The present study's findings revealed a significant improvement in the compliance with DVT preventive measures practices score and total preventive practices regarding DVT in the intervention group post-intervention and follow-up. The majority of women had a more satisfactory practice level than the control group, with a highly statistically significant difference between them. Consistent with the present study, **Abd ELmoniem, Sayed, & Emam (2023)** concluded good compliance with DVT preventive measures among women post-intervention. Another Egyptian study **(Hashem, Abdelmenem, & EL-Said, 2023)** conducted to determine the effect of nursing intervention on nurses' performance regarding the prevention of DVT among postpartum women reported a similar finding. It showed a highly statistically significant improvement in the total practice scores of the nurses regarding the prevention of postpartum DVT after intervention. These similarities among the findings of the current study may be attributed to the successful sessions promoting the practical application of preventive measures and fostering adherence to healthier behaviors, which is vital for reducing morbidity.

Regarding DVT clinical manifestations among women, statistically significant differences were found between the two groups concerning leg swelling, calf pain-tenderness, skin warmth, muscle cramps, and palpable thrombosed superficial veins post-intervention, as these manifestations were higher in the control group. Additionally, it was found that more than a quarter of women in the control group had calf pain-tenderness, skin warmth, and aching in the swollen area at follow-up. Consistent with this finding, a study by **Abd ELmoniem, Sayed, & Emam (2023**) demonstrated a significant decrease in DVT symptoms in the intervention group post-intervention, with a highly statistically significant difference between the intervention and control groups. Moreover, **Ahmed, AboZead, Yousef, & Taha (2021)** found a statistically significant difference between the study and control groups regarding DVT signs and symptoms (calf muscle redness and swelling) after implementing the nursing educational protocol.

The improvement in clinical manifestations in the current study is due to the beneficial role of targeted interventions that promote blood flow, enhance venous return, and effectively reduce pain and swelling in the legs, such as early mobilization and general exercises. Furthermore, wearing elastic stockings helps reduce pain and swelling. Additionally, maintaining hydration and taking enough fluids prevents blood viscosity and supports the elasticity of the vein walls. As a result, comprehensive nursing interventions have a positive impact on decreasing DVT manifestations among women.

The current study demonstrated that the incidence of DVT post-intervention was significantly lower in the intervention group than in the control group, with a highly statistically significant difference between them. This finding is congruent with a study by **Wan et al. (2023),** which showed that the incidence of symptomatic Vein Thromboembolism (VTE) following caesarean section was significantly lower in the intervention group than in the control group. The application of nurse-assisted early warning intervention may be an effective method for preventing VTE following caesarean section. This result is supported by **Abd ELmoniem, Sayed, & Emam (2023),** who reported the effectiveness of evidence-based nursing practice guidelines in decreasing DVT occurrence in postpartum women. In the present study, this could be explained by the fact that receiving anticoagulants prevents clot formation and/or growth. Another important key is wearing elastic stockings that reduce the incidence of DVT by preventing venous stasis.

The findings of the current study demonstrated that the implementation of evidence-based insight significantly mitigated the risk of DVT among post-cesarean women. This outcome aligns with a retrospective study conducted by **Chen et al. (2025),** which evaluated the impact of an evidence-based standardized nursing protocol on lower-extremity deep vein thrombosis prevention in acute stroke patients. It demonstrated that a standardized care model based on evidence-based concepts was significantly effective in preventing DVT and improving patients' clinical outcomes. It advocates for the wider implementation of such protocols in clinical practice to optimize outcomes in high-risk patients. The significant effect of systematic nursing intervention in preventing DVT was confirmed, a finding supported by **Wang et al. (2025).** As well, the prevention of venous thrombosis and adverse complications after implementing the evidence-based clinical nursing path was demonstrated by **Chen et al. (2022).**

The positive finding of the current study can be attributed to implementing nursing practices based on clinical research, which ensures that preventive care is customized to the women's specific needs. Another important element was a personalized DVT risk assessment to evaluate the risk and provide timely care. Evidence highlights the importance of a multidisciplinary care approach to address DVT and prevent it, combining nursing care, medical management, and women's education and training. This confirmed the importance of applying evidence-based practices to reduce care variability and ensure ongoing improvements in maternity care quality.

Conclusion:

Based on the current study results, implementing the evidence-based preventive measures significantly mitigates the risk of developing DVT among women during the post-cesarean recovery period. It was concluded that there was a highly statistically significant difference between the two groups regarding the DVT total knowledge before and after the intervention. Manifestations of DVT showed a significant reduction in the intervention group compared to the control group after the intervention. Also, the DVT preventive measures showed a satisfactory improvement in the intervention group compared to the control group.

Recommendations:

Based on the study findings, the following is recommended:

1. Incorporate a structured DVT awareness session for DVT-risk women scheduled for a cesarean section.

2. Distribute pamphlets or digital infographics during the cesarean section recovery period that clearly outline the early DVT warning signs and the importance of following the evidence-based preventive measures.
3. Develop an effective screening tool to identify post-cesarean women with pre-existing risk conditions and provide frequent monitoring to identify early signs of DVT.
4. Conduct regular training for maternity health care staff on the specific evidence-based practices regarding controlling DVT.
5. Establish a 48-hour post-discharge follow-up call or telehealth check-in to monitor for the specific manifestations, especially for high-risk women post-cesarean.

Future Researches:

1. Conduct a follow-up study to assess the long-term adherence to these preventive measures.
2. Replicate this study across multiple centers or geographic regions to determine if cultural or socioeconomic factors influence the "knowledge-to-adherence" relationship.

Study Limitations

Despite the positive outcomes of this study, there are certain limitations. First, the use of a quasi-experimental design without randomization can increase the chance for selection bias. Second, the sample was restricted to a specific setting at Mansoura University Hospital, which may limit the generalizability of the findings to other settings, socioeconomic levels, or cultural contexts. Finally, short-term period follow-up may not capture the sustainability of behavioral or coping improvements over time.

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Conflict of interest

The authors declared there was no conflict of interest.

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Effect of Health Instructions on Nursing Students' Awareness regarding Risks of Self-Prescribing Medications

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Abstract

Background: Self-prescribing medications is a significant public health concern. It is prevalent among university students leading to severe health problems. **Aim,** to evaluate the effect of health instructions on nursing students' awareness regarding risks of self-prescribing medications. **Study design:** A quasi-experimental study design. **Setting: -** at Faculty of Nursing, Tanta University. **Subjects:** Simple random sampling of 200 nursing students from the fourth academic year, at the previous setting. **Tools of data collection:** Two tools were used. **Tool I: Students' knowledge regarding risks of self-prescribing medications questionnaire:** composed of two parts**:** Part (1): Socio-demographic characteristics of the students and their past history of self-prescribing medications. Part (2): Students' knowledge about risks of self-prescribing medications. **Tool II: -Students' beliefs regarding risks of self-prescribing medications questionnaire. Results: -** Ninety percent of nursing students had previously self-prescribing medications either to themselves or to others. Before giving health instructions, only 12.5% of nursing students had high level of knowledge and this percentage increased to 86% immediately post then changed to 78.5% one-month post giving health instructions. Before giving health instructions, only 47.5% of nursing students had positive beliefs regarding risks of self-prescribing medications and this percentage increased to 93% immediately post then changed to 85.5% one-month post giving health instructions. **Conclusion and recommendations: -** The health instructions were effective in improving nursing students' knowledge and beliefs regarding risks of self-prescribing medications. So, continuous students' education is recommended concerning risks of self-prescribing medications.

Keywords: Health instructions, nursing students' awareness, Risks of self - prescribing medications

Introduction

Self-prescribing medications is global health issue that is expanding among various populations. Worldwide, self-prescribing medications has been reported as being on the rise with prevalence ranging from 11.7% to 92% across the world **(Rathod et al., 2023).** As well as prevalence of self prescribing medication of antibiotics increased from 2.6% to 86.5% globally **(Saif et al., 2024).**

Globally, Self-prescribing medications is a prevalent practice among university students. It is a significant public health concern and common behavior among population, leading severe health problems that affect the families' and individuals' health **(Siraj et al., 2022).**

According to Word Health Organization **(WHO**), self-prescribing medications involve the use of medications by the consumer to treat self diagnosed disorders or symptoms, or the intermittent or continued use of medications prescribed by a physician for chronic or recurrent diseases or symptoms **(Loni et al., 2023).**

In Egypt, according to a cross sectional study done by **Mahrous et al., (2024,** among all medical college students over the six academic level from the faculty of medicine at Misr University For Sciences and Technology concluded that regular self-prescribing medications was reported by 17.7% of the students, and 59.2% commit self-prescribing medication when getting sick. Analgesics and antipyretics were the most often for self prescription medications with 82.3%. Senior students (5^{th}, 6^{th} years) were significantly more likely to self-prescribe drugs with 71.3% **(Mahrous et al., 2024).**

Many reasons contribute to self-prescribing medications as suffering from mild disease, for saving time, avoiding long waiting to see a doctor, inexpensiveness of the practice and previous experience of illness. There are many diffierent sources of self prescribing medications such as pharmacy, families, friends and medical information sources from internet and academic books **(Abuhamdah & Naser, 2024).**

Some of common self prescribing medications are analgesics, anti-pyretics, antibiotics, anti-acids, antitussives, antihistamines, vitamins and stimulants for relieving complaints like a headache, fever, abdominal discomfort, sore throat, cough, anemia, epigastric pain and stress **(Al-Omrani, Marwah, Al-Whaib, Mekkawy & shokr, 2023).**

University students often face academic demands and pressures, particularly during examinations. Self prescribing medications by university students is used to combat academic stress and relieve symptomatic problems to self and others. During these stressful times, maintaining

healthy and avoiding self prescribing medications are crucial for their wellbeing **(Younis, Daoud & Atlam, 2022).**

The absence of clear guidelines and policies for medication dispensing has led to unchecked access, allowing pharmacies and drug shops to provide medications without prescription oversight. This lack of regulation enables customers to obtain medications freely, regardless presence of legal prescription. To combat the dangers of self prescribing medications, new policies, interventions, and strategies are necessary. Health authorities are key to creating comprehensive programs and providing education on safe medication practices to control risks associated with self prescribing medications **(Yismaw et al., 2023).**

Community health nurses' roles become broader and more comprehensive. As health professional, community health nurses are expected to take active role in assessing needs, taking initiative programs and protocols of care to support health of nursing students. As member of the health-care team, community health nurses participate in health screening to identify health problems and people at risk in the community, enabling early interventions, participate in health promotion campaigns to raise awareness of health issues and disease prevention **(Flaubert et al., 2021).**

Furthermore, community health nurses focus on health education and provide clear health guidance to members of the community especially nursing students to increase their awareness about self-prescribing medications promoting their attitudes and behaviors, ensuring that nursing students not only avoid self-prescribing medications but also become advocators for safe medications practice within the community and clinical environments **(Lee, Flores, Tucker, Gakumo & Dawson, 2023).**

Significance of the study

Self-prescribing medications are an increasing public health problem worldwide. It is a major problem among university students, especially nursing students. The prevalence of self-prescribing medications in university students was 95%, and prevalence of self-prescribing medications in medical students is higher (97.2 %) than in non -medical students (44.7 %) **(Kokabisa et al., 2024).** The consequences of self-prescribing medications include drug abuse and misuse, misdiagnosis, incorrect treatment choice, long use of medications, overdose and unreasonable use of drugs which can lead to death **(Smeda, Almakrabi, Hasssan, Algool, 2023).** A limited number of studies have been conducted related to this issue in Egypt. Therefore, the aim of the

present study is to evaluate the effect of health instructions on nursing students' awareness regarding risks of self-prescribing medications.

Aim of the study: The study aimed to evaluate the effect of health instructions on nursing students' awareness regarding risks of self-prescribing medications

Research hypotheses: -

H1. The level of nursing students' knowledge regarding risks of self-prescribing medications was expected to be improved after receiving of health instructions. **H2**. The nursing students' beliefs regarding risks of self-prescribing medications were expected to be enhanced after receiving of health instructions.

Subjects & Method

Study design:

Quasi experimental design was used in this study.

Setting:

This study was conducted at Faculty of Nursing, Tanta University.

Subjects:

Simple random sampling of 200 nursing students (20%) was selected from the fourth academic year 2024-2025, Faculty of Nursing, Tanta University. As the total number of nursing students was 1031 in the academic year 2024 -2025.

Tools of the study:

Two tools were used by the researcher in order to collect the necessary data for this study as following: -

Tool (l): Students' Knowledge Regarding Risks of Self Prescribing Medications Questionnaire: -

This tool was developed and used by the researcher after reviewing the related literatures. (**El Ezz & Ez-Elarab, 2011; Helal & Abou-ElWafa, 2017; Sallam, Khallafallah, Ibrahim & Okasha, 2009).** It comprised the following two parts: -

Part 1: Socio-demographic characteristics of the students and their history of self-prescribing medications:

A-Socio-demographic characteristics of the student: - This part included data about the student's age, sex, residence, with whom reside, marital status, family income, parents' education and occupation.

B- Past history of self-prescribing medications: -

It included questions as previous prescription or taken any medication for the students himself or for others without consulting a doctor, frequency, to whom, reason, types of prescribed medications, exposure to risks of self-prescribing medications and types of risks.

Part 2: Students' knowledge about risks of self-prescribing medications:

This part was used to assess knowledge about risks of self-prescribing medications. It included: -

A- Students' knowledge about risks of self-prescribing medications.

This part contained multiple choice questions. It covered the following items: Self-prescribing medications (definition, types, factors affecting patterns of use, risks of self-prescribing medications, sources of medication used and sources of student's information).

B- General information about self-prescribing medications

This part included yes or no questions. The example of questions as if every drug can cause adverse side effects, if self-prescribing medications can hide symptoms of a possible serious disease and if self-prescribing medications with antibiotics can cause antibiotic resistance.

Scoring system:

A Score "one" was given for each correct answer and "zero" was given for an incorrect answer and don't know. The scores for all items were summed and then converted into a percent score. Total score for knowledge was ranged from 0 to 40 and was classified as follows:

- **Low knowledge leve**l: < 60 % of the total score.
- **Moderate knowledge level:** 60 % - 75 % of the total score.
- **High knowledge level:** > 75 % of the total score.

Tool (II): Students' Beliefs regarding Risks of Self-Prescribing Medications questionnaire:

This tool was developed by (**James & French., 2008; Rusu et al., 2022)** and was adapted by the researcher to measure students' beliefs about self-prescribing medications. It included (13) questions as: I think self-prescribing medication puts me at risk of legal action, I think self-prescribing medications is unacceptable and harmful and I believe that self-prescribing medications can lead to death.

Scoring system: -

A five point Likert scale was used with 5 responses ranging from strongly agree (5) to strongly disagree (1) for positive statements as: 5 = strongly agree, 4 = agree, 3 =uncertain, 2 = disagree and 1 = strongly disagree. This score was reversed for negative statements as strongly agree = 1 and strongly disagree = 5.

Total score was ranged from (13 - 65) and were summed and then converted into a percent .The total score was classified as follows:

- **Positive beliefs**: ≥ 75% of the total score.
- **Negative beliefs**: < 75% of the total score.

Method

- **Obtaining approval:**
- An official permission to conduct the study was obtained from the Dean of the Faculty of Nursing, Tanta University to obtain the approval and cooperation to carry out this study.
- The dean of the faculty was informed about the objectives of this study in order to obtain her permission to collect the necessary data.

Ethical considerations:

- Approval of the Scientific Research Ethical Committees of the Faculty of Nursing, Tanta University was obtained to conduct this study with code (503/8/2024).
- An informed consent was obtained from all the study subjects after providing appropriate explanation about the purpose of the study.
- Each participant was informed that he / she has the right to withdraw from the study at any time.
- Nature of the study doesn't cause any harm and / or pain for the entire subjects.
- Confidentiality of the collected data and privacy of the studied subjects were put into consideration.

Developing the study tools:

- Tool (I) was developed by the researcher after reviewing the related literatures.
- Tool (II) was adapted by the researcher.
- The study tools were tested for its face and content validity by a jury of five professors' expertise in the field of community health nursing before conducting the study. Total questionnaire content validity index was found to 95%.
- Reliability was calculated for the study tools using Cronbach's Alpha test. Total questionnaire Cronbach's Alpha was 0.888.

Pilot study

A pilot study was carried out by the researcher on 10 % of the subjects (20 students) for testing the tools for its clarity, applicability and to identify obstacles that was encountered during data collection and to determine the length of time needed to collect the data from each nursing student. Accordingly, the necessary modifications were done as removing a question and rephrasing of other questions. Those students were excluded from the study sample.

- **Developing the health instructions:**

- The health instructions were carried out according to the following phases:

i) Assessment phase:

- During this phase, the researcher used the pre designed tools (I &II) to assess nursing students' knowledge and beliefs regarding self-prescribing medications as baseline data as a pre-intervention assessment.

ii) Planning phase:

- This phase was used to plan for giving health instructions to the nursing students after the pre assessment phase. It included the following steps:

a- Formulating goal and setting objectives: -

- The general goal of health instructions: was to enhance nursing students' awareness regarding risks of self-prescribing medications.

-The specific objectives of health instructions: were formulated to achieve the goal and the aim of the study and consisted of five sessions.

b- Preparing contents: A booklet containing the necessary information about self-prescribing medications was developed by the researcher. The contents of the booklet included: definition of self-prescribing medications, prevalence, magnitude of the problem, sources of medications used, factors affecting patterns of use, types, consequences, reasons, risks, preventive strategies and role of community health nurse in correcting malpractices regarding self-prescribing medications.

c- Determine the teaching methods and audiovisual aids that were used in giving health instructions:

- Lectures and discussions and brain storming were used as teaching methods.
- Power point presentation and booklet containing information and pictures related to self-prescribing medications were used as teaching aids.

iii) Implementation phase:

- The researcher met the nursing students at community health nursing laboratory, in the faculty of nursing, Tanta University, two days in a week at free time of clinical and theoretical schedule and gave them health through five sessions. The duration of each session was ranged from 45-60 minutes.

The sessions were as following: -

Session (1): Health instructions' orientation and expectations: The aim of this session was to orient the nursing students about brief introduction and purpose of the health instructions, sessions and objectives of each session and the expected outcomes after giving health instructions.

Session (2): An overview about self-prescribing medications:

The aim of this session was to give nursing students an overview about self-prescribing medications as: (definition, prevalence, magnitude of the problem globally and in Egypt and sources of self-prescribing medications).

Session (3): Factors, types and common disorders of self-prescribing medications:

The aim of this session was to inform the nursing students about factors affecting patterns of use, types of drugs used, common disorders treated by self-prescribing medications.

Session (4): Reasons, risks and consequences of self-prescribing medications:

The aim of this session was to inform the nursing students about reasons of self-prescribing medication, risks and consequences of self-prescribing medications among nursing students.

Session (5): Preventive strategies and role of the community health nurse regarding self-prescribing medications:

The aim of this session was to inform the nursing students about preventive strategies and practices which can reduce self-prescribing medications and roles of the community health nurse in the prevention and managing this phenomenon.

iv) Evaluation phase:

The aim of this phase was to evaluate the effect of the health instructions on nursing students' awareness regarding risks of self-prescribing medication

This phase was done three times as following:

- **First time (pre-test):** Before implementation of the health instructions for the nursing students using the previously mentioned tools (tool I&II) to collect data about self-prescribing medications.
- **Second time (immediate post-test):** Immediately after implementation of health instructions using tool I (part 2), and tool (II).
- **Third time:** After one month of implementation of the health instructions using tool I (part 2), and tool (II).

6- Statistical analysis of data :

The collected data were coded, entered, tabulated and analyzed using SPSS (Statistical Package for Social Science) version 23. Reliability is measured by using Cronbach's Alpha. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data that describe a categorical set of data by frequency, percentage or proportion of each category, the Friedman test is used for one-way repeated measures analysis of variance by ranks (χ^2). For relation between variables, Mont Carlo Exact test)MCET (and Fisher Exact Test (FET) were used. Correlation between variables was evaluated using Pearson's correlation coefficient ®.

Results

Table (1): It shows the distribution of the studied nursing students according to their socio-demographic characteristics. This table represents that students' ages ranged from 21 to 23 years, with a mean age of 21.8 ± 0.7 years . Student who aged from 22 to less than 23 years old constituted a large proportion (41.5%) of the studied students. As regard to sex, more than half (58%) of the students were males and more than two thirds (69.5%) of them resided in rural area.

More than two thirds (68.5%) of the students reported that, monthly income of their family was enough. Concerning parents education, the table showed that basic education was prominent education among student' father and mother, as it represents 39% and 44% respectively, and university education constitutes the second prominent education (38.5% and 34.5%) respectively.

Slightly more than one-third (35.5%) of the students' fathers were

employees, while more than one-quarter (27.5%) of them had craftsman work and more than half (56.5%) of the students' mothers were housewives.

Table (2): Represents the distribution of the studied nursing students regarding their past history of risks self-prescribing medication. The table illustrated that, approximately one third (33.5%) of the nursing students exposed to risks associated with self-prescribing medications and 68% of those who had risks were experienced drug allergy and 17.9% of those who had risks were experienced failure to improve the condition.

Figure (1): Represents distribution of the studied students regarding the main sources of self-prescribing medication. The figure shows that pharmacies were the most common source of self-prescribed medications, accounting for 86.5%, while home medications was the second source which represents 76.5% and those acquired from relatives or friends making up 28.5%.

Table (3): Represents distribution of the nursing studied students regarding the total knowledge score about self-prescribing medication before, immediately post and one month after giving health instruction. The table shows that, highly statistically significant improvement in the total knowledge score before, immediately post and one month after giving health instructions ($p = 0.001$). Before giving health instructions, only 12.5% of the nursing students had high level of knowledge and this percentage increased to 86% immediately post then changed to 78.5% one-month post giving health instructions.

Table (4): Represents distribution of the studied nursing students regarding total beliefs score about risks of self-prescribing medication before, immediately post and one-month post health instructions. The table illustrates that, there was statistically highly significant difference and improvement concerning total beliefs score before, immediately post, one-month post giving health instructions as $p= 0.001$. Before giving health instructions, only 47.5% of nursing students had positive beliefs regarding risks of self-prescribing medications and this percentage increased to 93% immediately post then changed to 85.5% one-month post giving health instructions.

Table (5): Represent relation between socio- demographic characteristics of the studied nursing students and their total knowledge scores regarding self-prescribing medication before, immediately post and one-month post health instructions. The table illustrates that, there was statistically highly significant relations between total knowledge scores of the studied

nursing students and their age, residence, monthly income of family, and there was statistically highly significant relation between sex and total knowledge scores of studied nursing students immediately post and one-month post giving health instructions.

Table (6): Represents the relation between socio- demographic characteristics of the studied nursing students and their total beliefs score regarding self-prescribing medication before, immediately post and one month post health instructions. The table illustrates that, there was significant relationship between the total beliefs scores of studied nursing students and their age, monthly income of family and mothers' education immediately post and one month post giving health instructions and significant relation between sex, only before giving health instructions as < 0.05.

Table (7): Relation between total nursing students' knowledge scores and their total beliefs scores before, immediately post and one-month post health instructions. The table illustrates that there was a statistically significant relationship between total students' knowledge scores and total students' beliefs scores before, immediately post and one-month post giving health instructions as p< 0.05 as 20% of the nursing students who had positive beliefs achieved high level of knowledge before giving health instructions compared to 88.1% and 84.2% had high level of knowledge immediately post and one-month post giving health instructions respectively.

Table (1): Distribution of the studied students in relation to their socio-demographic characteristics

Socio-demographic characteristics	Studied students (n=200)	
	N	%
• **Age (years)**		
21<22	70	35.0
22<23	83	41.5
≥23	47	23.5
Range	(21-23)	
Mean & SD	21.8± 0.7	
• **Sex**		
Male	116	58
Female	84	42
• **Residence**		
Rural	139	69.5
Urban	61	30.5
• **Monthly income of family**		
Enough and save	44	22
Enough	137	68.5
Not Enough	19	9.5
• **Father's education**		
Illiterate	2	1
Can read and write	16	8
Basic education	78	39
General secondary / technical diploma	27	13.5
University / postgraduates	77	38.5
• **Mother's education**		
Illiterate	4	2
Can read and write	13	6.5
Basic education	88	44
General secondary / technical diploma	26	13
University / postgraduates education	69	34.5
• **Father's Job**		
Professional work	27	13.5
Craftsman work	55	27.5
Farmer	31	15.5
Employee	71	35.5
Freelance work	16	8
• **Mother's Job**		
Housewife	113	56.5
Worked	87	43.5

Table (2) Distribution of the studied nursing students regarding their past history of risks of self-prescribing medication.

Items	Studied students (n=200)	
	N	%
Previous exposure to the risks of self-prescribing medications		
Yes	67	33.5
No	133	66.5
IF yes, Reported risks of self-prescribing medication #(n=67)		
Drug allergy	46	68
Poor prognosis	12	17.9
Deterioration of the condition	9	13.4
Stomach ulcer	9	13.4
Weakened immunity	2	3
Drug interaction	6	9

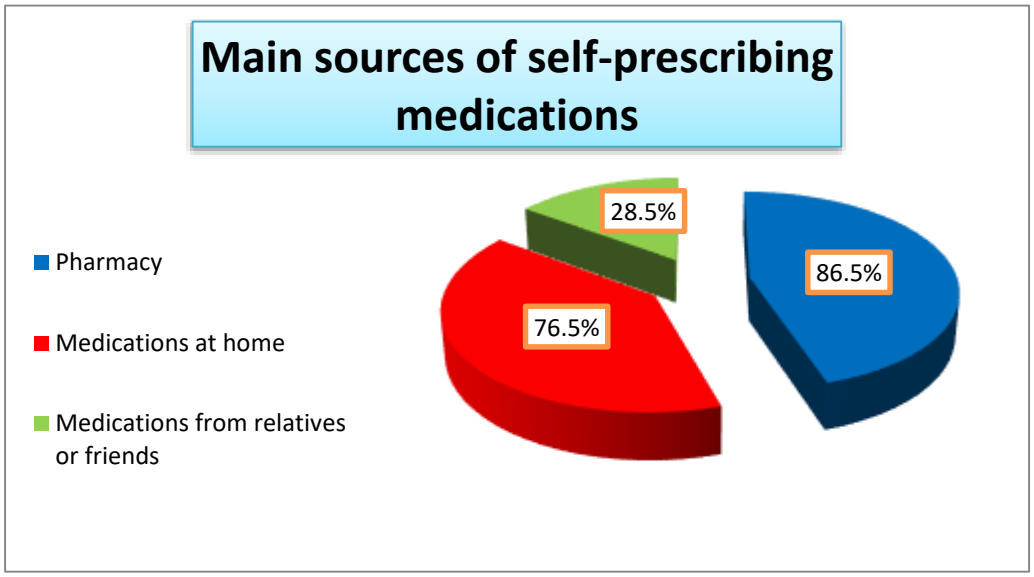

Figure (1): Distribution of the studied students regarding the main sources of self-prescribing medication

Table (3): Distribution of the nursing studied students regarding the total knowledge score about self-prescribing medication before, immediately post and one month after giving health instruction

Total knowledge scores	The Studied Students (n=200)						
	Before		Immediately post		One month after		X^2 P
	N	%	N	%	N	%	
Low	123	61.5	0	0.0	26	13	299.93 0.001**
Moderate	52	26	28	14	17	8.5	
High	25	12.5	172	86	157	78.5	

Significant at p<0.0

Table (4): Distribution of the studied nursing students regarding total beliefs score about risks of self-prescribing medication before, immediately post and one month post health instructions

Total beliefs score	The Studied Students (n=200)						
	Before		Immediately post		One month after		X2 P
	N	%	N	%	N	%	
Negative beliefs	105	52.5	14	7	29	14.5	207.75 0.001**
Positive beliefs	95	47.5	186	93	171	85.5	

Significant at p<0.05

Table (5): : Relation between socio- demographic characteristics of the studied nursing students and their total knowledge scores regarding self-prescribing medication before, immediately post and one month post health instruction

Items of socio-demographic characteristic	Total nursing students (n=200)																			
	Total knowledge Scores																			
	Before						X2 P	Immediately post						X2 P	One month post						X2 P
	Low (n=123)		Moderate (n=52)		High (n=25)			Low (n=0)		Moderate (n=28)		High (n=172)			Low (n=26)		Moderate (n=17)		High (n=157)		
	N	%	N	%	N	%		N	%	N	%	N	%		N	%	N	%	N	%	
• **Age**																					
21<22 (n=70)	56	80	9	12.9	5	7.1	18.90 0.001**	0	0.0	27	38.6	43	61.4	54.03 0.001**	26	37.1	10	10	34	48.6	67.59 0.001**
22<23 (n=83)	47	56.6	26	31.3	10	12.1		0	0.0	1	1.2	82	98.8		0	0.0	7	8.4	76	91.7	
≥23 (n=47)	20	42.6	17	36.2	10	21.2		0	0.0	0	0.0	47	100		0	0.0	0	0.0	47	100	
• **Sex**																					
Male (n=116)	71	61.2	32	27.6	13	11.2	0.64 0.726	0	0.0	27	23.3	89	76.7	19.73 0.001**	26	22.4	13	13	77	66.4	26.37 0.001**
Female(n=84))	52	61.9	20	23.8	12	14.3		0	0.0	1	1.2	83	98.8		0	0.0	4	4.8	80	95.2	
• **Residence**																					
Rural (n= 139)	98	70.5	30	21.6	11	7.9	17.09 0.001**	0	0.0	28	20.1	111	79.9	14.28 0.001**	26	18.7	14	10.1	99	71.2	15.80 0.001**
Urban (n=61)	25	41	22	36.1	14	23		0	0.0	0	0.0	61	100		0	0.0	3	4.9	58	95.1	
• **Monthly income of family**																					
Enough and save (n=44)	43	97.7	1	2.3	0	0.0	MCET 0.001**	0	0.0	26	59.1	18	40.9	95.28 0.001**	26	59.1	7	15.9	11	25	MCET 0.001**
Enough(n=137)	65	47.4	47	34.3	25	18.2		0	0.0	2	1.5	135	95.5		0	0.0	8	5.8	129	94.2	
Not Enough (n=19)	15	78.9	4	21.1	0	0.0		0	0.0	0	0.0	19	100		0	0.0	2	10.5	17	89.5	

*** Significant at p<0.05 (two sides) ** Highly significant at p<0. 01 (two sides) EET. Fisher Exact Test**

Table (6): Relation between socio- demographic characteristics of the studied nursing students and their total beliefs score regarding self-prescribing medication befor, immediately post and one-month post health instructions

Items of socio-demographic characteristics	Total Nursing Students (n=200)													
	Total Beliefs scores													
	Before				X2 P	Immediately post				X2 P	One month post				X2 P
	Negative (n= 105)		Positive (n= 95)			Negative (n= 14)		Positive (n= 186)			Negative (n= 29)		Positive (n= 171)		
	N	%	N	%		N	%	N	%		N	%	N	%	
• **Age**															
21<22 (n=70)	47	67.1	23	32.9	9.3	11	15.7	59	84.3	13.1	19	27.1	51	72.9	15.4
22<23 (n=83)	38	45.8	45	54.2	0.009**	3	3.6	80	96.4	0.001**	8	9.6	75	90.3	0.001**
≥23 (n=47)	20	42.6	27	57.4		0	0.0	47	100		2	4.3	45	95.7	
• **Sex**															
Male (n=116)	78	67.2	38	32.8	24.06	10	8.6	106	91.4	1.12	18	15.5	98	84.5	0.23
Female(n=84)	27	32.1	57	67.6	0.001**	4	4.8	80	95.2	0.29	11	13.1	73	86.9	0.63
• **Residence**															
Rural (n= 139)	75	54	64	46	0.38	12	8.63	127	91.4	1.86	21	15.1	118	84.9	0.13
Urban (n=61)	30	49.2	31	50.9	0.533	2	3.3	59	96.7	0.172	8	13.1	53	86.9	0.712
• **Monthly income of family**															
Enough and save (n=44)	34	77.3	10	22.7	21.54	8	18.2	36	81.8	11.32	11	25	33	75	7.3
Enough(n=137)	68	49.6	69	50.4	0.001**	6	4.4	131	95.6	0.003**	18	13.1	119	86.9	0.027*
Not Enough (n=19)	3	15.8	16	84.2		0	0.0	19	100		0	0.0	19	100	

*** Significant at p<0.05 (two sides) ** Highly significant at p<0. 01 (two sides) EET. Fisher Exact Test**

Table (7): Relation between total nursing students' knowledge scores and their total beliefs scores before, Immediately post and one month post giving health instructions

Total studied students (n=200)																					
Total nursing students Knowledge scores																					
Total beliefs Scores	Before							Immediately post							One month post						
	Low (n=123)		Moderate (n=52)		High (n=25)		X^2 P	Low (n=0)		Moderate (n=28)		High (n=172)		X^2 P	Low (n=26)		Moderate (n=17)		High (n=157)		X^2 P
	n	%	n	%	N	%		n	%	n	%	n	%		n	%	n	%	n	%	
Negative	79	75.2	20	19	6	5.7	19.03	0	0.0	6	42.9	8	57.1	5.89	13	44.8	3	10.4	13	44.8	4.04
Positive	44	46.3	32	33.7	19	20	0.001**	0	0.0	22	11.9	164	88.1	0.015*	13	7.6	14	8.2	144	84.2	0.038*

*** Significant at p<0.05 (two sides)** **** Highly significant at p<0. 01 (two sides**

Discussion

Self-prescribing medications have emerged as a widespread and concerning public health issue, particularly among students in health-related fields. Nursing students who represent a vital component of the future health care workforce, are not only responsible for delivering patient care but also for promoting safe and evidence based health practices within the community. Their behaviors and attitudes toward safe medications use can significantly influence public health outcomes **(Vučić, 2025)**.

If the behavior of self-prescribing medication is left unaddressed, it will have risks not only to their personal well-being but also to their future role as health providers, advocator and educator **(Lukovic, Kaur & Kumar, 2022).** Therefore, the current study aimed to evaluate the effects of health instructions on nursing students' awareness regarding risks of self-prescribing medications.

Knowledge is a fundamental determinant of health related behaviors and plays an important role in shaping individuals' beliefs, decisions, and practices regarding medication use and preventing inappropriate drug use. The present study revealed that more than three fifth of nursing students had low knowledge level before giving health instructions **(Table 3**). This may be attributed to presence about two thirds of nursing students lived in rural area where there is limited access to health services and poor awareness about risks self-prescribing medications risks. Residence plays role in shaping knowledge of nursing students, there was highly significant relationship between residence and total knowledge scores of the nursing students throughout three phases of the study **(Table 5)**, as rural students initially had low level of knowledge compared with urban students, indicating limited access to reliable health information. However, after health instructions, there was a marked improvement among rural student immediately after and one month after giving health instructions. This emphasizes the value of health instructions in overcoming geographic disparities. A similar finding was reported by **Kifle, Mekuria, Anteneh & Enyew, (2021),** who noted that the educational sessions significantly improved rational drug-use knowledge among rural Ethiopian pharmacy students. This finding is supported by **Tan et al., (2025)** who conducted a study to assess self-medication among university students in Guangdong province, China: a cross-sectional study using the KAP model, reported that students' knowledge about self-medication was found to be inadequate.

Following giving of the health instructions, a dramatic improvement in students' knowledge levels was observed, marked shift from low level to high level of knowledge as the majority of nursing students had high level of knowledge immediately post and one month post giving health instructions (**Table 3),** This improvement may be attributed to the effectiveness of the provided health instructions which was focused, evidence-based information and enhanced students' understanding about self-prescribing medications risks. This mirrors the findings of **Kumar et al., (2023**), who reported an improved knowledge in Bachelor of Medicine, Bachelor of Surgery students following role of sensitization and awareness program on knowledge, attitude, views and practice of self-medication. Additionally, a study made by **Hanafy, Gad, El Bourgy & Wahdan, (2020)**, documented similar improvement in the score of knowledge after implementation of educational program among University students on their self-medication knowledge, attitudes and practices.

Concerning relation between socio-demographic characteristics and total knowledge regarding self-prescribing medications, there was statistically highly significant positive relation between age and total knowledge scores through three phases of the study as students aged 23 and more obtained high level of knowledge through three phases of the study **(Table 5)**. This indicates that older students had gained more ability to obtain retention of knowledge than other age group. This is supported by the World Health Organization, when reported that health literacy is influenced by age, gender, educational attainment, and income **(WHO, 2025).** These results are in contrast with **Abdel Rahman, Salem & Hassan, (2022)**, who found a significant improvement in medication knowledge among nursing students after a structured educational session, regardless of age differences.

There was highly significant relation immediately post and one-month post giving health instructions between sex and total knowledge score of nursing students, where female students achieved high knowledge levels than males. This may be attributed to females' greater engagement with educational materials and their willingness in obtaining more information than males **(Table 5)**. This is supported by a research on gender and public health knowledge during the COVID-19 pandemic which found that female respondents exhibited significantly higher health knowledge scores than male respondents, suggesting that women may engage more actively with health information and have superior knowledge retention in public health

contexts **(Sinyolo et al., 2025).** Additionally, study conducted by **Abasiubong, Ekott, & Edet, 2020),** revealed that, female nursing students demonstrated more responsible medication behaviors and higher post-training knowledge scores compared to males.

Family monthly income is considered a key socioeconomic factor that influences individuals' access to health information, educational resources, and healthcare services. In this study, there was highly significant relationship between monthly family income and total knowledge scores of nursing students **(Table 5),** more than one fifth of nursing students from families with enough and save income demonstrated the most significant improvement in knowledge after giving health instructions. Economic stability may enhance access to health resources and academic materials. These findings agree with **Mahmoud & Abed (2023**), who conducted a study to determine socioeconomic determinants of self-medications among nursing students in Egypt and reported that, socioeconomic status significantly influenced health knowledge and self-medication practices.

Reaching and obtaining this medication is very important as there are many source of medications such as pharmacy, home, relatives or friends. From this point, this study found that, the majority of nursing students reported that pharmacies are the most prominent source of self-prescribing medications followed by medications available at home **(Figure 1)**. These findings highlight the dominant role of easily accessible sources particularly community pharmacies and household medicine supplies in facilitating the practice of self-prescribing medications. This finding is in the same line with **Cataño, Paz, Tenorio, & Buitrago, (2022),** who reported that, pharmacies were the primary source of self-prescribing medication for 95% of students. Furthermore, a study made by **Osemene & Lamikanra, (2020)**, reported that, leftover or previously prescribed drugs were commonly reused without consulting a physician. In the contrast line, relatives and friends considered the least frequently used source of self-prescribing medications constituted a slight more than one quarter, this finding aligns with **Sahin & Demir, (2024),** who found that, 30% of nursing students in their study used medications shared by relatives during the COVID-19 pandemic.

Knowledge about self-prescribing medications is very important to shape student's beliefs as an effective knowledge can formulate positive beliefs about self-prescribing medications. The current study showed that, more than half of nursing students had negative beliefs regarding risks of self-prescribing

medications before giving health instructions, this may be attributed to that about more than three fifth of nursing students had low level of knowledge before giving health instructions. While, most of nursing students had positive beliefs immediately post and one-month post giving health instructions **(Table 4).** This improvement can be attributed to majority of nursing students had high level of knowledge after giving health instructions. These findings are with the same line of study conducted by **Bijani, Haghsenad & Ghassemi, (2019),** which demonstrated that applying the Health Belief Model positively modifies students' perceptions by strengthening their understanding of the potential severity and susceptibility to the risks of self-prescribing medications.

In addition, there was highly significant relation between sex and total beliefs scores of nursing students only before giving health instructions **(Table 6),** as female students had more positive beliefs regarding responsible safe medication practices compared to male students. This may be explained by the tendency of females to be more health-conscious, cautious, and likely to seek professional advice. This result is consistent with **Shankar et al., (2020),** who reported that, female students were less likely to misuse medications than males.

Financial stability may reduce the tendency to self-medicate, as these students can afford professional healthcare consultations. Conversely, those from lower-income families may perceive self-prescribing as a cost saving alternative. A highly significant relationship was found between monthly income of students' family and their total beliefs scores **(Table 6),** as the income of more than one fifth of nursing students with enough and save displayed more positive beliefs regarding safe medication use before health instructions, while the majority of these students displayed positive beliefs post giving health instructions. This finding agrees with **Ali, Alhazmi & Alshahrani, (2021**) who highlighted that, economic factors significantly influence self-medication beliefs among university students. Also, this is consistent with the findings of **Hussain, Malik, Ashfaq & Parveen, (2020)** who noted that, students from higher socioeconomic backgrounds were less likely to justify self-medication practices.

Knowledge and beliefs are closely interconnected components that collectively influence individuals' health-related decisions and behaviors. The current study revealed a highly significant positive correlation was found between the nursing students' total knowledge and their total beliefs regarding the risks of

self-prescribing medication across all the study phases **(Table 7)**. These results can be rationalized as when students understood the potential adverse outcomes of unsupervised medication use, their beliefs shifted toward caution and professional consultation before self-prescribing. Therefore, the health instructions were effective in strengthening both cognitive (knowledge) and affective (belief) domains.

The positive relation aligns with the findings of **Alduraibi & Altowayan, (2022),** who reported that increased knowledge among medical and pharmacy students significantly confirmed a strong association between knowledge, attitudes, and practice directed more positive attitudes toward safe medication practices. Similarly, **Shitindi, Msuya, Kilonzo., 2024 ; Tohan et al., (2024),** confirmed a strong association between knowledge, attitudes, and practices of self-medication among university students, emphasizing that, enhanced awareness directly contributes to better behavioral beliefs and safer self-care decisions.

Conclusion

The present study concluded that, health instructions were effective in improving nursing students' awareness presented in knowledge and beliefs regarding risks of self-prescribing medications. There was highly statistically significant improvement in students' knowledge and beliefs after giving the health instructions. Also there was a highly statistically significant relationship between the total students' knowledge scores and the total students' beliefs scores before, immediately post and one-month post giving health instructions as $p<0.01$.

Recommendations: -

Based on the findings of the present study, the following recommendations are suggested: -

1. Integrate a health education on the risks of self-prescribing medications into nursing curriculum, particularly within ethics and pharmacology courses.
2. Incorporate role-playing in clinical training to demonstrate the real-life consequences of self-prescribing medication.
3. Launch targeted awareness campaigns using digital media platforms (e.g., Instagram, Facebook, student portals) to highlight the dangers of self-prescribing medication.
4. Collaborate with local health authorities to implement awareness programs about risks of self-prescribing medications focused on youth and university populations.
5. Regularly assess students' knowledge, attitudes, and practices (KAP) regarding self-prescribing medication through structured surveys and evaluation tools.

6. Advocate for the implementation of national policies that restrict over-the-counter (OTC) access to prescription medications in order to reduce misuse and promote responsible medication use.
7. Further researches are needed to explore factors influencing self-prescribing medications and its behaviors consequences among students from different age groups and academic disciplines.

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Effect of Educational Intervention Based on Pender's Health Promotion Model on Quality of Life and Self-Efficacy for Chronic Obstructive Pulmonary Disease Patients

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Abstract

Background: Chronic Obstructive Pulmonary Disease is counting a foremost global health concern with high incidence and mortality rates worldwide. **Aim:** To evaluate the effect of educational intervention based on Pender's health promotion model on quality of life and self-Efficacy of chronic obstructive pulmonary disease patients. **Subject and Methods: Design;** A quasi-experimental study was carried out**. Setting;** the study was conducted in the Chest Tanta University Hospital**. Sample;** A purposive sample of (60) patients with chronic obstructive pulmonary disease was involved**.** Tools: four tools were used for data collection; **Tool (I); "**Chronic Obstructive Pulmonary Disease Structured Interview Questionnaire:" It consisted of 3 part; Part (1): "Socio-demographic data of the patients**".** Part (2): "Clinical data for COPD patients". Part (3): Patients' Knowledge Assessment Sheet. **Tool (II):** Pender's Health Promotion tool. **Tool (III):** Health related quality of life scale. **Tool IV**: Chronic Obstructive Pulmonary Disease Self-Efficacy Scale. **Results;** the results exposed high statistically significant improvement in the total level of COPD patient's knowledge about chronic obstructive pulmonary disease, enhancement in the total level of health related quality of life and self-efficacy of COPD patient. Similarly, there was a substantial statistically significant distinction among control group and study group regarding Pender health promotion model. **Conclusion:** the educational intervention based on Pender's health promotion model was efficient& successfully increase patient knowledge regarding COPD, enhancing patients' quality of life and self-efficacy. **Recommendations:** Nurses should take part in educational programs based on health promotion model for enhancing their knowledge and practice. incorporating a Pender-based health promotion program into the routine follow-up and discharge procedures for all COPD patients.

Keywords: Chronic Obstructive Pulmonary Disease, Pender health promotion model, Quality of life, self-efficacy.

Introduction

Chronic obstructive pulmonary disease (COPD) is highly prevalent, treatable and mostly preventable respiratory disease that are characterized by persistent respiratory symptoms such as cough, dyspnea, and sputum production, progressive airflow limitation and tissue destruction that interferes with normal breathing (**Celli et al. 2022; Ritchie, & Wedzicha, 2020).**The incidence of COPD affects more than 400 million people, remains the third reason of death worldwide **(de Oca, Perez-Padilla, Celli, Aaron,& Wehrmeister, 2025).** The number of global cases of COPD is estimated to increase to about 600 million by 2050. The Global Burden of Disease (GBD) data estimate that COPD-attributable deaths increased from 2.50 million in 1990 to 3.72 million in 2021 (**Stong& Strenger, 2025**).In addition to this, according to appraisal of Tanta University Hospital Statistical Records; it was revealed that around (150) patients in chest hospital during the year of 2023 were admitted with COPD (**Statistical Analysis Record, Tanta University Hospital, 2023).**

Chronic Obstructive Pulmonary Disease is a heterogeneous lung conditions that involve bronchitis and/or emphysema and this highlights that COPD is not a single disease but a collection of related conditions impacting different parts of the lung (**GOLD, 2025**).

Genetic predisposition and prolonged exposure to toxic particles and gases interact in a complicated way to cause Chronic Obstructive Pulmonary Disease (**GOLD, 2025**). Exacerbation of symptoms and a decline in quality of life are hallmarks of the normal course of COPD (**Lee, Oh, Lee, Lee, SD., & Lee, JS. 2023)**.

Physical function and daily activities are significantly hampered by these symptoms, which get worse over time (**American Lung Association, 2024; Crisan, et al. 2025).** Improving the quality of life for COPD patients can achieve by a number of methods, including screening and early intervention for factors like sleep impairment, anxiety and depression, and physical activity patterns with efficient disease management (**Shaimaa, et al. 2025).**

Self-efficacy is defined as an individual's belief in their ability to perform the behaviors required to create particular performance attainments, is a crucial concept in the management of COPD (**Shamsuddin, Ahmad, Sutan, & Ibrahim, 2025).** It has a significant impact on how symptoms are perceived, treatment adherence, and overall well-being (**Crisan, et al. 2025).**

Understanding and encouraging healthy habits in COPD patients can be successfully guided by Pender's Health Promotion Model (HPM). This model can be used to effectively guide understanding and promoting health

behaviors among COPD patient. It remains a very useful and pertinent approach to guide interventions in the treatment of chronic obstructive pulmonary disease. Its focus on proactive health behaviors, individualization, and self-efficacy aligns perfectly with the long-term, self-management needs of COPD patients (**Mateusz, 2024**).

Nurses utilize the Pender model to restructure the self-initiated patient-environment interaction. They are a part of the interpersonal environment that affects COPD patients throughout their life. Additionally, they use it to enhance the health of the patients they are caring for. This is accomplished via the patient's propensity to control their own conduct, which enables them to engage with their surroundings and change over time (**Santos, et al. 2025**).

A nurse has significant responsibilities in the care of COPD patients. They afford patient with techniques that encourage them to adopt healthy habits, assist them internalize positive behaviors, and include them in the treatment process. Pender's HPM-based nursing intervention demonstrated its beneficial effects on self-efficacy perception, recognition of benefits and obstacles associated with behavior change, improved patient participation in their health and the role of social support. Nurses use their positions as educators, counselors, managers, researchers, and caregivers to carry out their responsibilities (**Santos, et al. 2025**).

The aim of the study is: To evaluate the effect of educational intervention based on Pender's health promotion model on quality of life and self-Efficacy of chronic obstructive pulmonary disease patients.

Research hypothesis:

The total level of patients' knowledge, self-efficacy, and quality of life is expected to improve after receiving educational intervention**.**

Subjects and Method

Research Design: quasi experimental design was used in this study**.**

Study settings: The study was conducted at the Chest Tanta University Hospital, at third and fourth floor.

Subjects: A purposive sample of (60) patients with chronic obstructive pulmonary disease was included in the study and evaluated before, immediately after, and two months after the implementation of educational intervention.

Study tools: Four tools were used. **Tool I:** "**Chronic Obstructive Pulmonary Disease Structured Interview Questionnaire**": There were three parts: **Part (1):** "Socio-demographic data of the patients" that included patient's code, age, sex, marital status, level of education, occupation and residence. **Part (2):** "Clinical data for COPD patients". **Part (3):** Patients' Knowledge

Assessment Sheet: The researcher created it after looking over relevant literature. (**Guyatt, & Feeny1993; Mohammed, et al. 2012; Oleanane, (2019); Lari, Tahmasebi & Noroozi 2018; Pender 2012; & Uysal 2014)**. it includes: a) Knowledge about chronic obstructive pulmonary disease.

b) Knowledge about management of chronic obstructive pulmonary disease. The Scoring system as following: Correct and complete answer scored (2), correct and incomplete answer scored (1), don't know or incorrect answer scored (0). The total scoring system of the patients, knowledge was calculated and categorized as the following: High level >75% of the total score, Moderate ≥ 50% - 75% of the whole score and Low < 50 % of the whole score.

Tool II: Pender's Health Promotion tool: The tool was developed by (**Pender, Murdaugh, Parsons, 2011).** and was modified by the researcher based on literatures review (**Meryem, &Karagozoglu 2021; Pender, Murdaugh, & Parsons 2010)**. It contained declarations about perceived benefits, perceived barriers, self-efficacy, social support, and activity-related affect. **Scoring system;** every item was appraised using a 5-point Likert scale ranging from 1 (completely disagree/not confident at all) to 5 (completely agree/ very confident). Higher scores indicate better benefits, self-efficacy, social support, and positive effects. The questionnaire was reverse-coded for all negatively phrased items. **Tool (III)**: **Health related quality of life scale;** This tool was developed by **(Aggarwal A, Agarwal R, Gupta, Jindal 2010**; **Alvi, Kumar, Dhaliwal, Paulson, Agrawal, Koul 2018)** through use of **St. George's respiratory Questionnaire (SGRQ)** to quantify health related quality of life among patient with COPD. It was included two parts. **Part I** symptoms score, (Questions 1 to 7) covers the patients' recollection of their symptoms over a preceding period that may range 1 month to 1 year and **Part 2** the activity and impacts scores (Questions 8 to 14) addresses the patients' current state (i.e. how they are these days). The Activity score just measures disturbances to patients' daily physical activity. The Impacts score covered a wide range of disturbances of psycho-social function. **Scoring system;** all items were rate on a 5-point Likert scale ranging from 1 (Very good), 2 (Good), 3 (Fair), 4 (Poor), 5 (Very Poor). Total score range from (14-70), Lower scores indicated better health quality of life and higher score indicated poor health quality of life. Low (<60%), moderate (60 %: <80 %), High (≥80%).

Tool IV: **Chronic Obstructive Pulmonary Disease Self-Efficacy Scale (CSE):** This tool was developed by (**Emme, Mortensen, RydahlHansen, Østergaard, &**

Phanareth 2012) and was modified according to literature review (**Ahmed & Bahgat 2022).** It consists of 13 items to measure self-efficacy associated with COPD. It includes: Physical Exertion Factor, Weather/Environment Factor, and Behavior Risk Factor. **The scoring** was conducted with the sum of the items. Items were scored by ordinal 5 points Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree). Total score ranged from (0-52), with a higher score indicating a greater level of COPD self-efficacy. The level of self-efficacy was categorized as; Low (<60%), moderate (60% < 80%), High (≥80%).

Methods: permission ethical consideration: Ethical approval was obtained from Scientific Research, Ethical Committee, code number 308/10/2023; the entire sample was not harmed by the study's design.

Validity of tools: The developed tools were examined for contented validity for clarity and applicability by professionals from the medical-surgical nursing at the faculty of nursing and chest physicians.

A pilot study: was carried out on (10%) of sample from selected participants before starting actual study. Alterations were done by the researcher before the main study those were excluded from the actual sample.

- **Reliability of the tools:** The reliability for the study tools was calculated by Cronbach's Alpha test.

- **Field work:** -Data was gathered during a 12-month period, started from January 2024 to the end of January 2025. -The study was conducted through four phases (Assessment, planning, implementation, and evaluation).

– **Assessment Phase:**

-Patient Assessment was conducted by the researcher for both study and control groups using tool I part 1 and 2 before educational intervention; **Tool I part 1**: -was used to gather basic information on patients, **Tool (I) Part (2):** was used to gather clinical data for COPD patients. Tool II, Tool III and tool IV used three times before, immediately after, and two month after educational intervention as the following; **Tool (II):** the researcher was applied Pender health promotion model to assess patients' perceived benefit from engaging in health behavior, perceived barrier that prevent him from participating in healthy behavior and physical activity, patients' confidence regarding performing healthy behavior, patients' social support, and the emotion that dominating him regarding follow health behavior.

Tool (III): was employed to assess health related quality of life among patient with COPD.

Tool IV: used to measured self-efficacy associated with COPD. The researcher assessed patient self-

confidence regarding physical exertion factor, weather/environment Factor, and behavior risk factor.

–Planning phase:

-The researcher prepared the educational intervention based on Pender's Health Promotion Model centered on the patient needs and extensive reviewed of related literature. The goal of implementing educational intervention was to increase COPD patients, knowledge, self-efficacy, and quality of life.

- An illustrative structured colored booklet was organized and written in simple Arabic language supported by illustrative pictures as a guide for the patients.

- Different materials for intervention were used as video, booklet, and group discussion, power point which was prepared by the researcher, demonstration and re-demonstration for all procedure.

- Teaching method was included: lecture, group discussion, demonstration and remonstration pre and posttest were done every phase.

–Implementation phase:

-educational intervention was applied to study group throughout 4 basic phases. The time for each phase was about 30-45 minutes.

First phase: the researcher assessed patients' knowledge regarding to COPD and were equipped with all necessary knowledge.

Second phase (perceived benefits and perceived barriers):

- The study focuses on boosting patient's awareness of the advantages, benefits, barriers, and self-efficacy of COPD management behaviors as engaging in weight-bearing activities, quitting smoking and eating healthy.

- Patients also were educated on the negative effects of obesity and physical inactivity. Barriers were evaluated within the capacity; Information regarding his fitness regimen has been provided in light of his medical background. A particular training regimen was designed with the obstacles of dyspnea and knee pain.

Third phase; (self-efficacy, activity and demographic features)

Perceived Self-Efficacy;

- The patient did not have enough faith in his own abilities to exercise, eating healthy diet and change life style behaviors, medications regimen and weight management. To enhance self-efficacy, the weight success attained during each phase through exercise and weekly monitoring, Patients were interviewed with a dietitian about weight management and were promote following his diet as he remained hospitalized.

-The concept of activity-related affect was defined by the researcher as pleasant emotions both during and after exercising, eating a healthy diet, and learning how to counteract the situational and interpersonal influences of preventative behaviors of COPD.

-In terms of **Activity-related affect**, Interviews were conducted with the patient, in every meeting the details about how the patient experienced adherence to his diet and exercise regimen to avoid experiencing activity-induced weariness. To make sure patients didn't surpass the anaerobic threshold during each activity, heart rate and SpO2 were continuously monitored. Peak heart rate was calculated based on age, risk profile, and SpO2 interval.

Fourth phase (interpersonal influences and behavioral factors): In order to perceive the interpersonal influences positively, Family members were interviewed, given the information they needed, and told how they could help the patient. All members of the medical staff as well as other patients helped the patients manage their weight and engage in physical activity.

-For **situational influences**, This phase lasted two months and included re-evaluating functional capacity, body fat analysis, weight, and blood tests for discharge planning, as well as using music to boost patient motivation during exercise and planning phases concurrently with patient groups he enjoyed talking with.

- **Control group**: the patients were received the usual nurse care; as assessing breathing (rate, depth, lung sound, SpO_2), medication administration as bronchodilator / steroids, oxygen therapy, ensuring adequate hydration.

–Evaluation phase:

Each patient in the study and control groups underwent three evaluations**:** before, immediately after and two month post educational intervention using tools I, II, III and IV.

Statistical analysis: -The collected data was organized, tabulated, and statistically assessed using SPSS software, a statistical computer package version 29. For quantitative data, the range, mean, and standard deviation were calculated.

- The Chi-square test ($\chi 2$) was used to compare qualitative data. The independent sample T-test was performed to compare the means of the variables for the two groups. To compare group variable means, the paired samples T-test were employed. The F-value of analysis of variance (ANOVA) was computed for comparison of means for variables over three intervention periods in a group or for more than two variables (**Gerstman 2008)**.

Results: Table (1): Distribution of the studied chronic obstructive pulmonary disease patients regarding their socio-demographic characteristics, the table showed that most of the studied patients of control and study group were in old age stage (50 to 60) years old respectively. Also, more than half of them were male, the majority of them from rural area and greater than one third was illiterate. It

was found that more than one third of the studied Patient have other profession, third of them were employee. Additionally, it was noticed that the majority of studied patients were married.

-Table (3): Distribution of the studied COPD patients regarding their total knowledge about COPD among the studied groups during periods of intervention: The table illustrates that there was highly statistically significant improvement in the total level of COPD patient's knowledge about COPD throughout immediately after and two months after implementation of educational intervention at p value = 0.000*.

-Table (4): Mean scores of Pender health promotion domains of the studied COPD patients between the studied groups throughout periods of intervention: This table illustrates that there was highly statistical significant difference between control group and study group regarding Pender health promotion model immediately after and two months after educational intervention.

-Figure 1: Distribution of the studied COPD patients concerning their total level of health related quality of life throughout periods of intervention. The figure illustrates that there was a high statistically enhancement in the total level of health related quality of life of COPD patient's in study group throughout immediately after and two month after implementation of educational intervention. Where about (30.00%) of studied patients had better quality of life pre implementation of educational intervention, while (66.67%) of them had immediately post and about (90.00%) after two-month post implementation of educational intervention.

-Figure 2: Distribution of the studied COPD patients about their total level of self-efficacy among the studied groups through periods of intervention. This figure shows that there was highly statistically improvement in the total level of self-efficacy of COPD patient's in study group throughout immediately after and two months after implementation of educational intervention. Where about (16.67%) of studied patients had moderate self-efficacy and (0.0%) had high self-efficacy pre implementation of educational intervention, while (33.33%) had moderate self-efficacy and (6.67%) of them had high self-efficacy immediately post implementation of educational intervention and about (33.33%) of them had after two months post implementation of educational intervention.

-Table (5): Correlation between Pender health promotion model and total knowledge score of COPD and their health level related quality of life and self-efficacy of the studied COPD patients among studied groups throughout periods of intervention.

This table showed that there was mild positive non-significant correlation between Pender health promotion model and total Knowledge score among study group throughout periods of intervention as “r” value is 0.296, 0.088, and 0.041respectively. The table also revealed that there was mild positive non-significant correlation between Pender health promotion model and total self-efficacy among study group throughout periods of intervention as “r” value is 0.112, 0.214, and 0.233 respectively. This table also showed that there was mild positive non–significant correlation between Pender health promotion model and patient quality of life among study group throughout periods of intervention as “r” value is 0.160, 0.259, and 0.297 respectively.

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

Characteristics	The studied COPD patients (n=60)				χ^2 P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
Age (in years)					
▪ (20-<30)	1	3.33	0	0.00	
▪ (30-<40)	1	3.33	0	0.00	3.274
▪ (40-<50)	8	26.67	11	36.67	0.351
▪ (50-60)	20	66.67	19	63.33	
Range	**(27-60)**		**(40-60)**		t=0.443
Mean ± SD	**51.47±7.624**		**52.23±5.649**		P=0.660
Gender					
▪ Male	20	66.67	18	60.00	FE
▪ Female	10	33.33	12	40.00	0.789
Residence					
▪ Rural	26	86.67	25	83.33	FE
▪ Urban	4	13.33	5	16.67	1.00
Level of education					
▪ Illiterate	11	36.67	12	40.00	
▪ Read and write	4	13.33	4	13.33	
▪ Primary education	3	10.00	2	6.67	0.413
▪ Secondary/Diplome	5	16.67	6	20.00	0.981
▪ Bachelor/Post studies	7	23.33	6	20.00	
Occupational status					
▪ Craft works	6	20.00	7	23.33	
▪ Employee	10	33.33	9	30.00	0.130
▪ Professional work	2	6.67	2	6.67	0.988
▪ Other	12	40.00	12	40.00	
Marital status					
▪ Married	26	86.67	24	80.00	FE
▪ Widowed	4	13.33	6	20.00	0.731

FE: Fisher' Exact test

Table (3): Distribution of the studied COPD patients regarding their total knowledge about COPD among the studied groups throughout periods of intervention

Total knowledge level	The studied COPD patients (n=60)													
	Control group (n=30)						χ^2 P	Study group (n=30)						χ^2 P
	Pre		Immediately		Post 2 months			Pre		Immediately		Post 2 months		
	N	%	N	%	N	%		N	%	N	%	N	%	
▪ Low	18	60.00	14	46.67	17	56.67	1.164	20	66.67	0	0.00	0	0.00	
▪ Moderate	12	40.00	16	53.33	13	43.33	0.559	10	33.33	1	3.33	7	23.33	**95.598**
▪ High	0	0.00	0	0.00	0	0.00		0	0.00	29	96.67	23	76.67	**0.000***
Range	**(20-56)**		**(20-63)**		**(20-62)**		F=0.871	**(20-56)**		**(47-84)**		**(45-84)**		**F=129.187**
Mean ± SD	**37.93±11.735**		**42.03±13.263**		**39.07±12.225**		P=0.422	**37.93±10.566**		**74.53±6.590**		**69.83±11.008**		**P=0.000***
Control Vs. Study t , P	0.00 , 1.00		**12.020 , 0.000***		**10.244 , 0.000***									

>75% High (50-75) % Moderate <50% Low

* Statistically significant at level P<0.05

Table (4): Mean scores of Pender health promotion domains of the studied COPD patients among the studied groups throughout periods of intervention

Pender domains	The studied COPD patients (n=60) Range Mean ± SD							
	Control group (n=30)			F P	Study group (n=30)			F P
	Pre	Immediately	Post 2 months		Pre	Immediately	Post 2 months	
A. Perceived benefits	(55-72) 62.83±3.742	(55-72) 62.93±3.841	(55-72) 62.90±3.754	0.005 0.995	(58-72) 62.90±3.111	(63-72) 67.70±2.231	(63-72) 67.13±2.460	**29.906** **0.000***
Control Vs Study t , P	0.075 , 0.940	**5.878 , 0.000***	**5.166 , 0.000***					
B. Perceived barriers	(41-70) 56.20±7.360	(43-70) 56.33±7.107	(43-70) 56.20±6.825	0.004 0.996	(41-70) 55.90±7.535	(40-62) 54.33±5.365	(40-62) 54.13±5.178	**15.321** **0.047***
Control Vs Study t , P	0.156 , 0.877	1.230 , 0.224	1.321 , 0.192					
C. Self-efficacy	(14-33) 24.07±5.632	(14-33) 24.07±5.632	(15-33) 24.50±5.191	0.062 0.940	(14-33) 24.27±5.489	(17-41) 31.40±6.295	(17-41) 31.07±6.280	**13.356** **0.000***
Control Vs Study t , P	0.139 , 0.890	**4.755 , 0.000***	**4.414 , 0.000***					
D. Social support	(29-62) 42.27±9.555	(29-62) 42.27±9.555	(29-62)	0.002	(29-62)	(35-61)	(35-61)	9.281 0.158
Control Vs Study t , P	0.784 , 0.436	1.795 , 0.078	1.929 , 0.059					
E. Activity-related effect	(22-42) 30.70±4.145	(22-42) 30.70±4.145	(22-42) 30.73±4.059	0.001 0.999	(22-42) 31.13±4.761	(25-38) 32.27±2.612	(25-38) 32.23±2.609	1.031 0.361
Control Vs Study t , P	0.376 , 0.708	1.751 , 0.085	1.703 , 0.094					
Total Pender score	**(195-245) 216.07±13.054**	**(195-245) 216.30±13.262**	**(195-245) 216.73±13.557**	0.019 0.981	**(196-245) 218.53±13.169**	**(203-259) 231.97±12.987**	**(203-259) 231.37±13.100**	**10.089** **0.000***
Control Vs Study t , P	0.729 , 0.469	**4.623 , 0.000***	**4.251 , 0.000***					

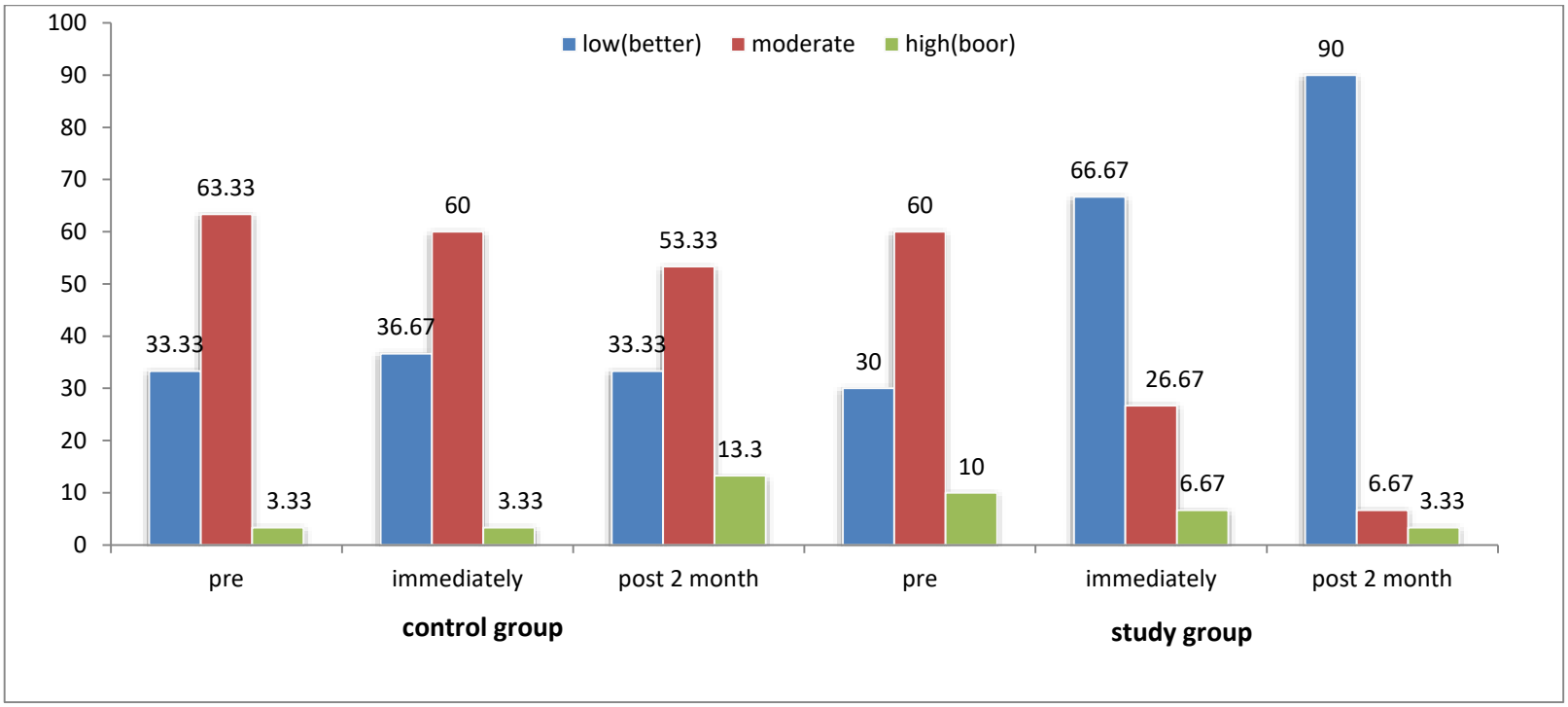

Figure 1: Distribution of the studied COPD patients regarding their total level of health related quality of life throughout periods of intervention.

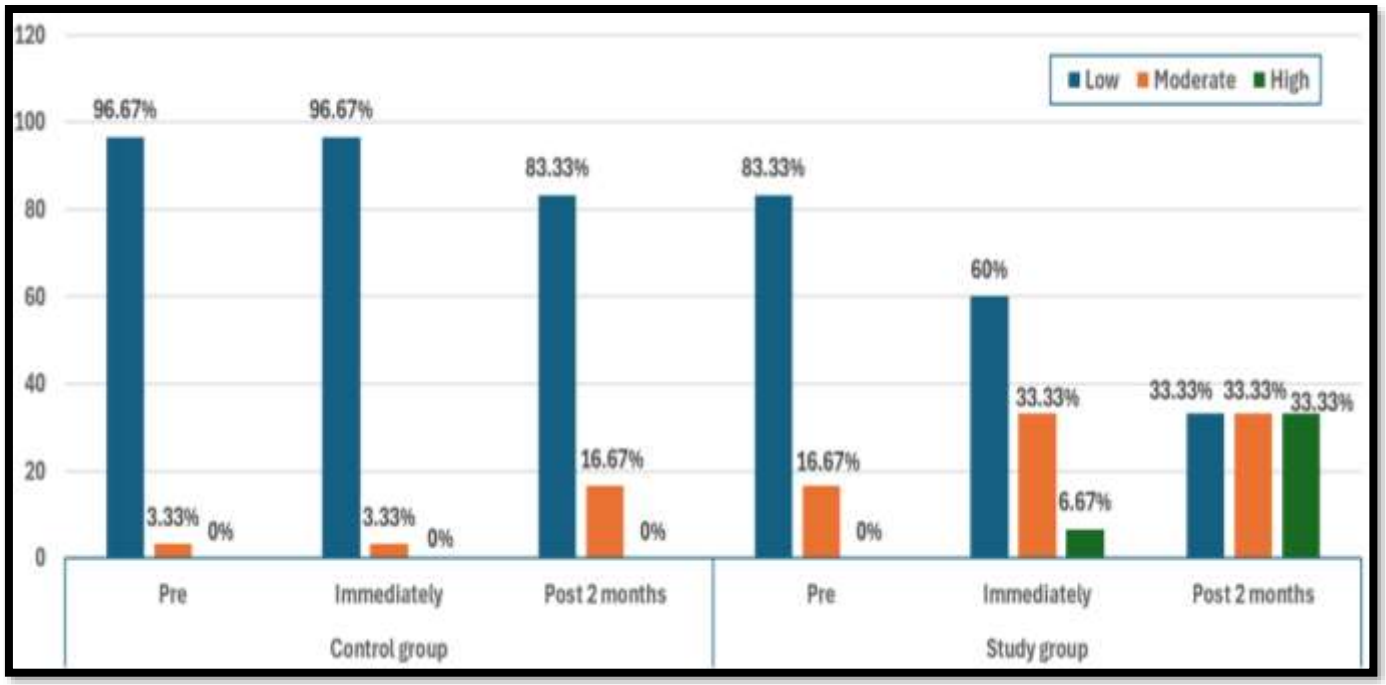

Figure 2: Distribution of the studied COPD patients regarding their total level of self-efficacy among the studied groups throughout periods of intervention

Table (5): Correlation between Pender health promotion model and total knowledge score of COPD and their health level related quality of life and self-efficacy of the studied COPD patients among studied groups throughout periods of intervention

Tool	The studied COPD patients (n=60) Pender health promotion model											
	Control group (n=30)						Study group (n=30)					
	Pre		Immediately		Post 2 months		Pre		Immediately		Post 2 months	
	R	P	R	P	r	P	r	P	r	P	r	P
1. Total knowledge score	0.342	0.064	0.258	0.169	0.248	0.186	0.296	0.112	0.088	0.645	0.041	0.829
2. Level of self-efficacy	0.172	0.365	0.234	0.214	0.155	0.413	0.112	0.556	0.214	0.257	0.233	0.215
3. Level of health related quality of life	0.141	0.458	0.148	0.436	0.086	0.653	0.160	0.397	0.259	0.167	0.297	0.111

Discussion

Chronic obstructive pulmonary disease (COPD) is a common chronic illness caused by the respiratory tract's increased inflammatory reaction to harmful particles or gases. It has the potential to worsen into a major illness with a high death and disability rate, such as respiratory failure and pulmonary heart disease (**Yentes, Fallahtafti, Denton, & Rennard 2020)**.

The finding of the current study shown that majority of the studied patients of both group were in old age stage with a mean age was 51.47 ± 7.624 and 52.23 ± 5.649, respectively. This result was consistent with (**Samsudin, Nasir, Ali, & Ismail 2023)** who stated that the COPD prevalence was highest in the 41- 60 age group. The finding also in agreement with (**Habibzadeh, et al. 2021)** who stated that the participants in the intervention and control groups had respective mean ages of 56.8 ± 11.11 and 57.9 ± 9.75.

As regarded to gender, the present study showed that both groups are predominantly male. This finding was in harmony with **Samsudin, Nasir, Ali, & Ismail 2023)** who found that males constituted 66.7% of the COPD cases. **According to residence,** the present study displayed that majority patients of both groups are from rural area. This is in accordance with **(Ibrahim, & Abd El-Maksoud 2018)** stated that 72.5% of studied patients were lived in rural area.

In relation to educational level, the present study revealed that more than third of both group were illiterate**.** This finding is in agreement with (**Mohammed et al. 2020)** who reported that about one third of studied patient were illiterate while two fifth were secondary. this finding in contrary to **Masoudi, Lotfizade, Gheysarieha, & Rabiei 2020)** who reported a majority of participants holding a bachelor's degree. **Concerning to occupational status,** the existing study portrayed that most of studied patient were working. The finding was supported by **(Mohammed**, **et al. 2020)** who stated that more than half of studied patient were working. But the same result is contradicted with (**Masoudi, et al. 2020)** who informed that a plurality of people in both groups was unemployed.

Concerning to the patients' knowledge about COPD, the results of this study exhibited that there was a high statistically significant improvement in the total level of COPD patient's knowledge about chronic obstructive pulmonary disease throughout immediately after and two months after implementation of educational intervention. The result of present study is congruent with **(Joseph, et al. 2025**) who indicated

that significant gains in illness knowledge were found through post-education study.

Concerning Pender health promotion domains of the studied COPD, the result of current study exposed a high significant improvement in the total health promotion score among COPD patients in study group compare to control group. In contrast, the control group's score remained stagnant; suggesting the routine care alone is insufficient to trigger significant behavioral change in health promotion for COPD patients. This in line with (**Assiri, Alqurishah, AlDohan, AlQurayshah, Al Salaim, Al duways, Lslom 2023)** who mentioned that the test group's health behavior had significantly improved.

Regarding quality of life, the results of the present study showed that there was a high statistically significant improvement in the total level of health related quality of life of COPD patient's in study group throughout immediately after and two months after application of educational intervention. This finding was in harmony with **Bijani, Niknam, Karimi, Naderi, Dehghan 2022**) who clarified that both immediately and three months after the intervention, the quality of life scores in the intervention group were noticeably higher. There was no discernible change in the control group.

Regarding to self-efficacy, the current finding revealed that there were high statistical improvements in the total level of self-efficacy of COPD patients in study group throughout immediately post and two months after implementation of educational intervention. This finding is in agreement with **(Jalali, Ziapour, Ezzati, Kazemi, Kazeminia 2023)** who stated that following the intervention, the intervention group's mean self-efficacy score rose ($P < 0.001$) in comparison to the control group. Also the result is congruent with **(Vakilian, Mahmoudi, Oskouie, Firouzian, Khachian 2021)** who stated that the mean score of self-effcacy increased in the intervention group after the intervention ($P < 0.001$) compare to the control group.

Regarding correlation between Pender health promotion model and total knowledge score, health level related quality of life and self-efficacy of the studied COPD patients. The finding of this study indicated that the application of the Pender health promotion model among COPD patient resulted in mild positive correlation with studied variable. This suggests that as the application of health promotion model components increases, there is a corresponding increase in knowledge, self-efficacy, and quality of life.

The finding of present study is congruent with **(Torres, et al. 2025**)

who reported that the participants' adoption of healthy lifestyles was positively impacted by the educational intervention, which was founded on Nola Pender's Health Promotion Model. Similarly, **(Özel, Korkut, Gürpınar 2025)** reported that in contrast to the control group, which had a large decline in mean scores, the intervention group's self-efficacy levels dramatically increased following the intervention. The shift from weak pre-test correlation to stronger post- test correlation in the study group-particularly in the domain of self-efficacy and quality of life focus the model's effectiveness in shifting patient behavior from passive reception of care to active health promotion. While some correlation didn't reach statistical significance may be due to minor sample size (n=30 per group) and short follow up period.

Conclusion

The present study's results allow for the conclusion that the educational intervention based on Pender's health promotion model was effective& successfully increase patient knowledge regarding COPD, enhancing quality of life and self-efficacy for chronic obstructive pulmonary disease patients**.**

Recommendations

In light of the current study's findings, it is advised that:

Recommendation for nurse:

- Nurse should participate in educational intervention based on health promotion model for enhancing their knowledge, practice, and provides better care.
- Newly graduated nurses should be firstly exposed to training before their actual care of patient.

Recommendation for administration:

- Integration of health promotion program based on Pender model into the standard discharge and follow up protocol for all COPD patients.
- Availability of educational center in the chest department for patient continuing education

Recommendation for research:

- It's recommended that replication of study in various contexts and large sample size to confirm and generalize the results of current study.

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Relation between Nurses' Competency, Job Stress and Professional Quality of Life among Nurses Working at Mental Health Hospital

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Abstract

Background: Nurses working in mental health hospitals face unique challenges that impact their competency, job stress and professional quality of life. **Aim of Study:** This study aimed to assess the relationship between nurses' competency, job stress and professional quality of life among nurses working in mental health hospital. **Subject and setting:** A total of 100 nurses who were working directly involved in patients care were recruited Tanta Mental Health Hospital affiliated to the Ministry of Health and Population. **Study design:** This study used a descriptive correlational research design. **Tools:** the tools used in the study were; Mental Health Nurses' Competency Questionnaire، Psychiatric Nurse Job Stressor Questionnaire and Professional Quality of Life Questionnaire. Results: The results found that the majority of the studied nurses (83%) had high level of competency and approximality one third of them (37%) had low level of job stressor and minority of them (27%) had high level of stressor, while approximality one third of them (36%) had moderate level of job stressor and the results revealed that above half (61%) of studied nurses had moderate level of professional quality of life. **Conclusion:** The findings emphasize the impact of job stressors, particularly those related to patient attitudes and nursing practices, on nurses' quality of life. job stress is a significant factor that affecting professional quality of life among mental health nurses. Addressing job stressors is crucial for improving nurses' well-being and quality of care. **Recommendations:** Encourage and specialized programs related to mental health nursing competencies.

Keywords: Job Stress, Nurses' Competency, Professional Quality of Life.

Introduction

Psychiatric nursing is considered one of the most challenging fields jobs globally. Nurses dealing with patients who have psychological issues may face intense interpersonal interactions, fluctuations in patient conditions, emotional instability and psychological discomfort can all be stressful and challenging for nurses caring for patients with psychological disorders **(Goudarzian et al. 2024).** Those caring for psychiatric patients may also have to handle intense emotions and unexpected conduct **(Babapour et al. 2022).**

The Transaction Model defines stress as the stimulus that requires from the internal or external environment and taxes or exceeds the sources of adaptation of an an individual or social system individual social system **(Rigney 2023).** Psychiatric nurses frequently suffer from mental health illnesses when their physical and mental well-being is not sufficiently supported, they frequently suffer mental health issue, which can have a negative influence on health care services, but also a major contributor to attrition and widespread shortages in the nursing profession **(Lazarus 2020**). Many job stressors in psychiatric nursing face issues such as job dissatisfaction, a disconnect between theoretical knowledge and practical application, insufficient support from multidisciplinary teams and a significant burden of administrative tasks they must manage. Common sources of stress include bad working relationships between nurses and physicians and other medical professionals, difficult patient and family connections and communication, emergency situations, a tremendous workload, understaffing and a lack of support or helpful criticism from senior staff of nursing **(Alyousef& Alhamidi 2023).** Pychiatric mental health nurses face significant job stress and they experience the highest levels of stress in the worksetting (**Hudays et al.2024).** Job related stress defined as an interactive situation between worksetting and the individual performing it, resulting in psychological and physiological changes that can impair normal functioning and performance **(Agu,2021).** Job stress can harm an individual's physical and mental well-being and eventually impair job productivity **(Unaldi, et al 2020).**

Psychiatric nurses frequently experience job-related stress. Research across various countries and regions indicates that between 37.8% and 74.8% of nurses report such stress, typically at moderate or higher levels **(Lakeman et al, 2023)**. A range of factors such as social support, self-efficacy, coping mechanisms and job burnout influences the relationship between job stress and clinical

performance and these elements also have a notable impact on nurses' health outcomes. **(Chen et al 2020).** Job-related stress causes dissatisfaction, occupational burnout and adversely affects the clinical skills of nurses **(Zakeri et al 2021).**

The majority of healthcare workers worldwide are nurses. The clinical competency of nurses is a critical concern across numerous medical disciplines, leading to swift changes within healthcare systems, the provision of safe and cost-effective services, enhanced community health awareness, growing expectations for higher quality care, and health organizations' aspirations to employ a skilled workforce **(Boyd et al 2024).** "Competency"encompasses the knowledge, skills, judgment, and professional attributes necessary to practice nursing safely and ethically within defined scopes of practice and in specific clinical contexts **(Kim et al, 2024).** clinical competency is a key issue across various medical fields, especially as healthcare systems rapidly evolve, impacting the delivery of safe, high-quality and cost-efficient care **(Alharbi 2024),** enhanced community health awareness, growing expectations for higher quality care, and health organizations' aspirations to employ a skilled workforce (**Sheikhbahaeddinzadeh et al 2022).** Clinical competence plays a key role in ensuring patient safety and satisfaction. Studies indicate that higher levels of clinical skill are linked to greater patient satisfaction and this competence is closely associated with critical thinking abilities and the degree of commitment individuals show toward their organization **(Jafari et al 2019).** It includes two dimensions; the first is emotional/ moral competency. The second is therapeutic communication **(Setoodeh et al, 2025).** Due to continuous changes in healthcare environments, it is essential to regularly evaluate nurses' clinical competence. At the same time, their quality of life may be poor, which could potentially impact their professional performanc **(Koutra et al, 2025).** Recently, greater attention has been shifted on concepts related to the professional quality of life and work effectiveness of nurses, including their clinical function and competence **(Sukut et al 2022).**

Professional quality of life describes how individuals experience satisfaction or strain in their work as caregivers or helpers. It is shaped by a combination of positive and negative elements inherent in their professional roles **(Monroe et al, 2020)**. It influenced by work, personal characteristics, workplace conditions and the health status of the people they care for **(Chen et al 2021).**

Professional quality of life consists of two interconnected aspects: positive and negative influences, with overall well-being depending on the balance

between them **(Todaro-Franceschi, 2024).** It includes two dimensions; compassion satisfaction defined as a favorable measure of one's professional quality of life and describes the satisfaction that comes from doing one's job well. Additionally, compassion fatigue refers to unfavorable reactions to prov a favorable, which captures adverse emotional responses that arise from caring for individuals affected by trauma, particularly common in trauma-exposed professions **(Hamaideh et al. 2024).**

Poor professional quality of life is linked to increased levels of work-related stress, anxiety, and burnout. These factors contribute to reduced job performance and result in substantial costs for organizations **(Leitão et al, 2021).**

The professional quality of life among nurses has been studied in both general and mental health care settings worldwide (**Lobo et al, 2024).** Nurses face a higher risk of burnout and secondary traumatic stress compared to other healthcare professionals, largely due to extended shifts, heavy administrative duties, and difficulties with supervision and staffing challenges present in both mental health and general healthcare settings. As a result, their overall professional quality of life plays a crucial role in job satisfaction and their decision to remain in the profession **(Alonazi et al, 2023).**

Significance of the study

Rapid pace of change in healthcare systems today underscores the need for safe and cost-effective services. As a result, making sure nurses' competence has become crucial, as it directly impacts patient safety and remains a primary priority of many health systems and the top priorities of nursing programs **(Shdaifat et al, 2023).** Certain work-related factors may influence quality of life among professionals. Psychiatric nurses often face burnout and low job satisfaction due to various factors, such as unreasonably high professional demands, limited ability to cope with emotional challenges and stress, absence of positive outlook, and inadequate support from coworkers and teams. This study therefore aims to examine the relationship between nurses' competence, work-related stress, and their overall professional quality of life.

The Aim of Study:

Assess relation between nurses' competency, job stress and professional quality of life among nurses working in mental health hospital.

The Research Questions:

1- What are the levels of nurses' competency?
2- What are the levels of job stress among nurses?
3- What is the relationship between nurses' competency, job stress and

professional quality of life among nurses working at mental health hospital?

Subjects and Method

Research design:

Descriptive correlational design was used in the current study

Setting:

Present study was conducted at Tanta Mental Health Hospital affiliated to the Ministry of Health and Population. With a total capacity of 107 beds; the hospital is organized into four wards: two for female patients, providing 40 beds, and two for male patients, offering 67 beds. This hospital provides healthcare services to El-Gharbeya, El-Menofeya, and Kafr El-Sheikh governorates, 7 days a week - 24 hours a day.

Subjects:

Atotal of all nurses who are working directly with patients at previously mentioned setting and available at the time of collecting data included in this study. Subjects were selected from the previous setting according their willingness to participate in this study.

Tools for data collection:

The data was collected by using the following tools: -

This tool was divided into two parts as follows:

Tool 1: Mental Health Nurses' Competency Questionnaire:

Part I: Personal characteristics of nurses: It includes items such as: (age, sex, residence, marital status, qualification, and years of experience in psychiatric nursing field)

Part II: Mental Health Nurses' Competency Questionnaire:

Nurses' competency scale which was developed by **(Moskoei et al 2017)** and adopted by the researcher. It was developed to measure the nurses' competency as perceived by mental health nurses, and it consisted of 45 items. This tool divided into 2 subscales.

-**The first is emotional/ moral competency;** it includes 12 items from 1 to 12.

-**The second is therapeutic communication;** it includes 33 items from 13 to 45.

Scoring System

The tool was developed using a ranking system combined with a five-point Likert scale (where never 0, rarely 1, sometimes 2, mostly3, and always 4)

The total score is ranged from (0 - 180).

The total score will be categorized according to statistical cutoff point into levels:

High level of psychiatric nurses' competency (75%)

- Moderate level of psychiatric nurses'competency (60:75%)
- Low level of psychiatric nurses' competency (60%)

Tool 2: Psychiatric Nurse Job Stressor Questionnaire:

It was developed by **(Yada, 2011)** and adopted by the researcher. It

measures the level of job stress among registered psychiatric nurses, and it is consisted of 22 items and divided into four factors.

- **Psychiatric Nursing Ability;** it includes 9 items from 1- 9 items related to the ability of psychiatric nurses. Such as (I think that I can nurse and correspond as the case requires)
- **Attitude of Patients;** it includes 6 items from 10- 15 items related to attitude of patients toward psychiatric nurses.
- **Attitude about Nursing;** it includes 5 items from 16- 20 items related to the attitude of nurses toward psychiatric nursing.
- **Communication;** it includes 2 items 21 and 22 items related to communicating with patients and the patients' families.

Scoring system:

Each item uses a five-point Likert-type scale, scored as follows: never 0, rarely1, sometimes 2, mostly 3, and always 4, to evaluate job-related stress in psychiatric nursing. The overall score ranges from (22-88), the total score will be categorized according to statistical cutoff point into levels.

- High level of Psychiatric Nurse Job Stressor**: >** 66
- Moderate level of Psychiatric Nurse Job Stressor: 53-66
- Low level of Psychiatric Nurse Job Stressor: < 53-66

Tool 3: Professional Quality of Life Questionnaire (ProQOL):

It was developed by **(Stamm, B.H. 2010),** and adopted by the researcher**.** It measures the positive and negative effects of working with people who have experienced extremely stressful events. It consisted of 30 items. This tool divided into three subscales;

- Compassion Satisfaction sub-scale 10 items.

- Burnout sub-scale 10 items.

- Trauma/Compassion Fatigue sub-scale 10 items.

Scoring system:

Response of psychiatric nurses will be measured on a five points Likert Scale ranging with 1=Never 2=Rarely 3=Sometimes 4=Often 5=Very Often. Reverse the scores on the following 5 items: (1, 4, 15, 17 and 29). The total score will be categorized according to statistical cutoff point into levels

- High level of Professional Quality of Life (75%)
- Moderate level of Professional Quality of Life (60:75%)
- Low level of Professional Quality of Life (60%)

Methods:

The study was implemented according to the following steps:

1. An Official permission letter to conduct the study was obtained from the dean of the Faculty of Nursing to the director of setting of study to obtain their permission and cooperation for data collection.

2. Ethical considerations: -

- Approval of The Scientific Research Ethical Committee of the Faculty of Nursing was obtained with code (418-6-2024).
- Informed consent was obtained from the nurses after explanation of the purpose of the study.
- The nurses were reassured about the confidentiality of obtained information and their privacy.
- Respecting the right of the nurses to withdraw at any time during data collection.

-The study was designed in such a way that it did not cause any harm or discomfort to the participants.

3. The study tools were translated into Arabic language by the researcher and were tested for content internal validity by a jury composed of five experts in psychiatric nursing field. Necessary modifications were done including clarification, omission of certain items adding others, and simplifying work related words.

4. The study tools were tested for reliability by using Cronbach's alpha test and was found 0.759, 0.851 and 0.912 respectively for tool 1part 2, tool 2 which represented highly reliable tools.

5. A pilot study was carried out on 10% 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. Accordingly, there weren't any subjects were excluded from the actual study, because there was not any significant modification.

6. Actual study:

-Researcher met study subjects at room of nurses then the researcher introduce herself to nurses and greeting them. The researcher explains the aim of study. The data was collected from each nurse individually as self-administered with presence of the researcher to assess level of competency, job stress and professional quality of life among nurses working at mental health hospital.

-The data was collected from (3-5) nurses each day/ three days / per week filling of the questionnaire ranged from 20 to 30 minutes. The duration of data collection was taken form a period of 4 months (from first October 2024 to end January 2025).

7. Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS software statistical computer package version 26. For quantitative data, the range, mean and standard deviation were Calculated, and for qualitative data, comparison between means of variables was done by utilizing Chi-square test (χ^2), paired samples T-test was used for correlation between variables and was evaluated using Pearson and

Spearman's correlation co-efficient 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 the results of tests of significance (**).

Results:

Table (1): Present the studied nurse' socio–demographic characteristics. It was found that the age of most studied nurses ranged between (30-40) years old with mean age of (36.26±9.148). Two quarter of studied nurses were females (77%), and most of studied nurses were married (85%). More than half of nurses (59%) were living in urban and (41%) were living in rural. As regard to professional status and professional qualification level it was noticed that the two quarter of nurses (73%) were staff nurse and had diplome degree, while 22% were head nurses, and had bachelor degree and 5% were supervisors. In relation to the years of experience in psychiatric nursing work. 55% of nurses had (5–10) years of experience, while (25%) of them had more them (10) years of experience in psychiatric nursing. **Figure (1):** Illustrates distribution of the studied nurses regarding their total competency level. It was showed that the majority of the studied nurses (83%) had high total level of competency, and most of them (89%) had high emotional and moral competency level, also the two quarters of them (79%) had high level of therapeutic communication. **Figure (2):** The data show how the nurses in the study were distributed based on their levels of job-related stress. About one-third (37%) experienced low levels of stress, while a slightly smaller portion (27%) reported high levels. Another third (36%) fell into the moderate stress category. **Figure (3):** Shows how the participating nurses were distributed based on their professional quality of life. The findings indicated that a majority (61%) experienced a moderate level, about one-third (34%) reported a low level, and a small portion (5%) demonstrated a high level of professional quality of life. **Table (2):** Demonstrates percentage comparison between total competency, job stressor and professional quality of life levels of studied nurses. It was found that there is a statistical significant positive relation between nurses' job stressor and professional quality of life (r =30.369, p< 0.000), while there is no significant statistical relation between nurses' competency and professional quality of life (r =3.279, p <0.512). **Table (3):** Clarifies correlation between total competency, job stressor and professional quality of life domains of studies nurses. It was found that, there is no significant statistical correlation between competency and professional quality of life (r= -0.040, p-value = 0.694). There is a positive significant

correlation between attitudes of patients' domain of job stressor and professional quality of life (r= 0.587, p = 0.00**), and also between attitudes about nursing domain of job stressor and professional quality of life (r= 0.525, p = 0.000**). While, there is highly positive statistical significant correlation between total nurses' job stressor and professional quality of life (r= 0.554, p-value = 0.000**). **Table (4):** Illustrates the relation between nurses' competency and their socio–demographic characteristics of studied nurses. This table shows that there is no significant relation between all nurses' socio–demographic characteristics and their competency. **Table (5):** Examines the connection between job stressors and the socio-demographic traits of the nurses involved in the study. The findings indicate no significant association between any of the nurses' socio-demographic characteristics and their reported work-related stressors. **Table (6):** Presents relation between professional quality of life and their socio–demographic characteristics of the studied nurses. This table shows that there is a positive statistical significant relation between nurses' professional qualification level and their socio–demographic characteristics at (r =7.210, P= 0.001). While it was found that there is no significant relationship between professional quality of life and the rest of all socio–demographic characteristics of the studied nurses.

Table (1): Percentage Distribution of the Studied Nurses According to their Socio–demographic and Characteristics (n=100).

Characteristics	The studied nurses (n=100)	
	N	%
Age (in years)		
▪ (20-<30)	22	22.0
▪ (30-<40)	45	45.0
▪ (40-<50)	18	18.0
▪ (50-60)	15	15.0
Range	(24-58)	
Mean ± SD	36.26±9.148	
Sex		
▪ Male	23	23.0
▪ Female	77	77.0
Marital status		
▪ Single	11	11.0
▪ Married	85	85.0
▪ Divorced	1	1.0
▪ Widow	3	3.0
Residence place		
▪ City	59	59.0
▪ Village	41	41.0
Professional Status		
▪ Staff nurse	73	73.0
▪ Head nurse	22	22.0
▪ Supervisor	5	5.0
Professional qualification level		
▪ Diplome	73	73.0
▪ Bachelor	22	22.0
▪ Post studies	5	5.0
Years of Experience in psychiatric nursing		
▪ < 5	20	20.0
▪ (5-10)	55	55.0
▪ >10	25	25.0
Range	(1-15)	
Mean ± SD	8.95±4.181	

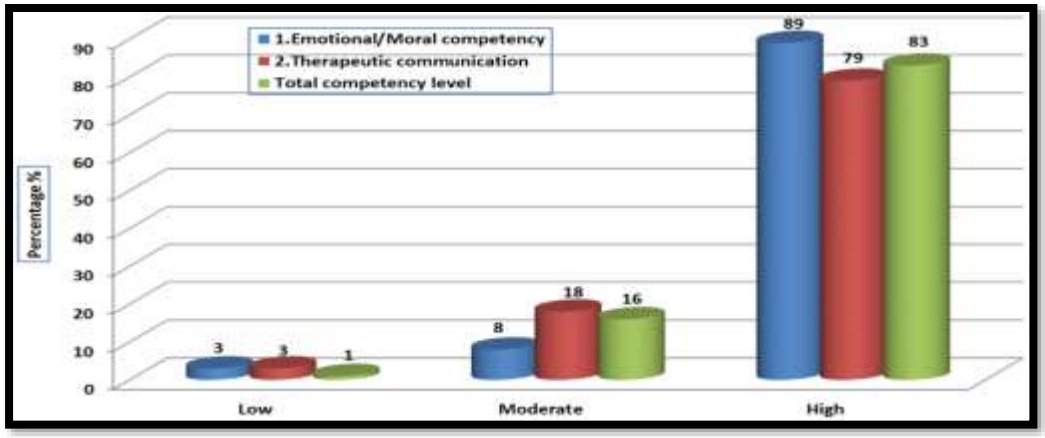

Figure 1: Distribution of the Studied Nurses Regarding their Total Competency Level.

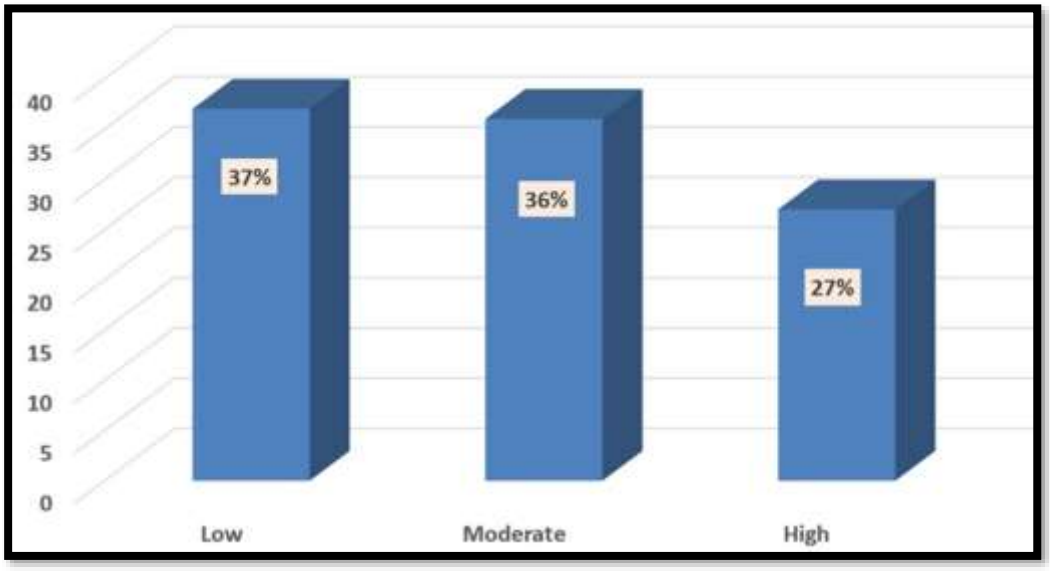

Figure 2: Distribution of the Studied Nurses According to their Total Psychiatric Nurses' Job Stressor Level (n=100).

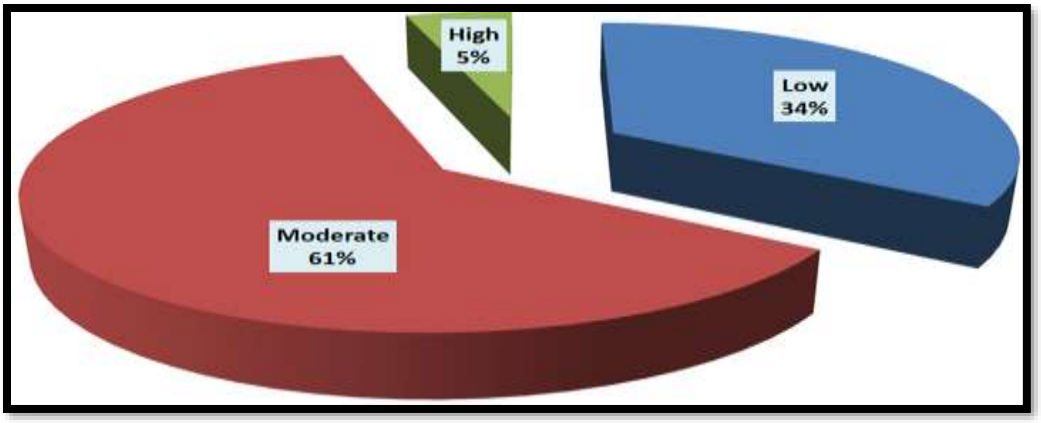

Figure 3: Distribution of the Studied Nurses According to their Level of Professional Quality of Life.

Table (2): Relationship between Total Competency, Job Stressor and Professional Quality of Life Levels of Studied Nurses (n=100).

Item	Professional quality of life (n=100)						χ^2 P
	Low (n=34)		Moderate (n=61)		High (n=5)		
	N	%	N	%	N	%	
Nurses' Competency level							
▪ Low	0	0.0	1	1.0	0	0.0	3.279 0.512
▪ Moderate	7	7.0	9	9.0	0	0.0	
▪ High	27	27.0	51	51.0	5	5.0	
Nurses' Job stressor level							
▪ Low	25	25.0	11	11.0	1	1.0	**30.369 0.000***
▪ Moderate	6	6.0	28	28.0	2	2.0	
▪ High	3	3.0	22	22.0	2	2.0	

* Significant at level P<0.05 .

Table (3): Correlation between Total Competency, Job Stressor and Professional Quality of Life Domains of Studies Nurses (n=100).

Nurses' Competency Domains	The Professional quality of life (n=100)	
	R	P
1.Emotional/Moral competency	-0.196	0.050
2.Therapeutic communication	0.022	0.832
Total competency score	-0.040	0.694
Nurses' Job Stresser Domains		
1.Psychiatric nursing ability	0.129	0.203
2.Attitude of patients	**0.587**	**0.000****
3.Attitude about nursing	**0.525**	**0.000****
4.Communication	0.176	0.079
Total nurses' job stressor score	**0.554**	**0.000****

r: Pearson' correlation coefficient

* Significant at level P<0.05 .

** Highly significant at level P<0.05 .

Table (4): Relation between Nurses' Competency and their Socio–demographic Characteristics (n=100).

Characteristics	The studied nurses (n=100) Total competency score	F/t P
Age (in years)		
▪ (20-<30)	150.41±19.461	
▪ (30-<40)	152.58±14.417	0.326
▪ (40-<50)	**154.94±16.843**	0.807
▪ (50-60)	150.40±16.295	
Sex		
▪ Male	150.04±18.977	0.528
▪ Female	**152.84±15.320**	0.469
Marital status		
▪ Single	146.27±17.286	
▪ Married	152.95±15.882	0.961
▪ Divorced	137.00±0.00	0.414
▪ Widow	**157.67±22.008**	

Residence place ▪ City ▪ Village	 **153.12±16.450** 150.88±15.878	 0.462 0.498
Professional status ▪ Staff nurse ▪ Head nurse ▪ Supervisor	 151.79±17.408 150.68±11.614 **164.80±9.910**	 1.659 0.196
Job qualification level ▪ Diplome ▪ Bachelor ▪ Post studies	 151.92±16.257 150.73±15.989 **162.80±14.890**	 1.180 0.312
Years of experience in psychiatric nursing ▪ < 5 ▪ (5-10) ▪ >10	 153.40±15.333 150.64±16.710 **154.68±15.861**	 0.601 0.550

* Significant at level P<0.05 .

Table (5): Relation between Nurses' Job Stressor and their Socio–demographic Characteristics (n=100).

Characteristics	The studied nurses (n=100) Total job stressor score	F/t P
Age (in years)		
▪ (20-<30)	**61.00±11.136**	
▪ (30-<40)	54.82±11.594	1.619
▪ (40-<50)	58.72±11.390	0.190
▪ (50-60)	59.47±13.757	
Sex		
▪ Male	56.39±13.878	0.295
▪ Female	**57.94±11.338**	0.588
Marital status		
▪ Single	53.18±16.582	
▪ Married	58.22±11.270	0.856
▪ Divorced	**65.00±0.00**	0.467
▪ Widow	53.00±11.533	
Residence place		
▪ City	56.37±11.421	1.485
▪ Village	**59.32±12.525**	0.226
Professional status		
▪ Staff nurse	58.08±12.444	0.817
▪ Head nurse	55.05±9.810	0.445
▪ Supervisor	**61.40±12.720**	
Job qualification level		
▪ Diplome	**58.42±12.275**	2.00
▪ Bachelor	57.05±10.376	0.141
▪ Post studies	47.60±9.813	
Years of experience in psychiatric nursing		
▪ < 5	57.65±13.096	
▪ (5-10)	57.09±12.008	0.136
▪ >10	**58.60±11.117**	0.873

* Significant at level P<0.05 .

Table (6): Relation between Professional Quality of Life of Nurses and their Socio–demographic Characteristics.

Characteristics	The studied nurses (n=100) Professional quality of life score	F/t P
Age (in years)		
▪ (20-<30)	106.09±8.263	
▪ (30-<40)	99.42±14.600	2.410
▪ (40-<50)	105.56±13.768	0.072
▪ (50-60)	**107.80±13.284**	
Sex		
▪ Male	98.70±16.024	3.545
▪ Female	**104.61±12.291**	0.063
Marital status		
▪ Single	99.27±12.807	
▪ Married	**104.02±13.273**	1.310
▪ Divorced	114.00±0.00	0.276
▪ Widow	92.33±17.502	
Residence place		
▪ City	102.03±13.318	1.189
▪ Village	**105.00±13.461**	0.278
Professional status		
▪ Staff nurse	**104.18±12.052**	0.806
▪ Head nurse	100.05±16.474	0.449
▪ Supervisor	103.80±18.033	
Professional qualification level		
▪ Diplome	104.18±12.204	**7.210**
▪ Bachelor	**104.91±13.901**	**0.001***
▪ Post studies	82.40±12.954	
Years of experience in psychiatric nursing		
▪ < 5	99.70±14.412	
▪ (5-10)	103.60±12.729	1.021
▪ >10	**105.32±13.975**	0.364

* Significant at level P<0.05

Discussion

Psychiatric-mental health nursing is recognized as one of the most demanding specialties within the nursing profession. **(Puchkors et al 2024).**

Nurses caring for psychiatric patients often face intense interpersonal interactions, dynamic changes in patients, emotional instability and psychological distress that can be very stressful and challenging stress **(Flaws et al 2023).**

Regarding the competency domains among the studied nurses, the findings revealed that emotional and moral competency had the highest mean score, whereas therapeutic communication competency had the lowest mean score. The high level of emotional and moral competency may be explained by the ethical nature of mental health nursing, where nurses are continuously exposed to patients experiencing psychological distress and vulnerability. This requires nurses to demonstrate empathy, emotional regulation, respect for patients' rights, and adherence to ethical principles. Moreover, psychiatric nurses often receive training that emphasizes ethical practice, compassion and emotional support, which may enhance this domain of competency. This result was similar to the study conducted by**, Ahmed et al. (2022)**, found that psychiatric nurses scored highly in emotional competency. Additionally, study done by, **Yang & Kim (2025)** who reported that emotional competency was significantly higher among mental health nurses. In contrast, this result was contradicting with the study conducted by **Khalil et al. (2025)**, stated that communication competency was one of the weakest domains among mental health nurses. The present study explored the total mean scores of psychiatric nurses' job stressor domains among the studied nurses. The findings revealed that the job stressor dimension had the highest mean score among the job stressor dimensions reported by the studied psychiatric nurses. In contrast, the communication domain recorded the lowest mean score, suggesting that communication-related factors were the least perceived sources of job stress among the participants. This finding explained by responsibility for patient safety, continuous exposure to challenging patient behaviors, a significant issue impacting care quality and nurse well-being, high patient ratios, emotional demands, and limited resources contribute to burnout and turnover. This finding is consistent with the study of**, Abd Alrahman Hassan et al. (2024)** ,reported that work-related stressors had the highest impact on nurses working in mental health. The finding of the communication domain recorded the lowest mean score aligns with the study conducted by **Almeida-Meza et al. (2025),**

found that indicated that psychiatric nurses often perceive communication with colleagues and supervisors as a supportive factor rather than a stressor. And similarly supported by, **Smith (2022),** found that experienced psychiatric nurses reported lower stress levels. However, this finding contradicts other studies. For example, **Cranage & Foster (2022)**, reported that nurses identified communication difficulties as a major source of stress.

Concerning the professional quality of life domains among the studied nurses. The findings of this study indicate that psychiatric nurses experience a high level of compassion fatigue, including secondary traumatic stress and burnout, which suggests that prolonged exposure to patients' emotional and psychological distress significantly impacts their professional quality of life. On the other hand, the compassion satisfaction among the nurses was relatively low, indicating that the positive rewards and fulfillment from caregiving are limited. Overall, the results suggest that psychiatric nursing, with its high emotional demands and stressful environment, poses significant challenges to nurses' well-being and professional satisfaction. These findings are supported by the research. Of **Marshman et al. (2022)** , reported that psychiatric nurses are particularly susceptible to compassion fatigue due to the high emotional labor required in mental health settings. Similarly**, Alreshidi (2023)**, found lower compassion satisfaction among psychiatric nurses. This result was contradicting with the study conducted by **Hamaideh et al. (2024)**, reported that psychiatric nurses had high levels of compassion satisfaction and low levels of burnout, indicating a better professional quality of life.

The findings of this study indicate that nurses' job stressors are significantly associated with their professional quality of life, whereas nurses' competency levels do not show a significant relationship with professional quality of life. This suggests that the psychological and work-related stress experienced by nurses has a stronger impact on their well-being and professional satisfaction than their clinical skills or competency. These findings are supported by the research of**, Alonazi et al. (2023),** which has consistently shown that there is high levels of job stress, secondary traumatic stress and reduced professional quality of life among nurses. And similarly**,** by **Cecere et al. (2023)** , found that job stress significantly impacts nurses' quality of life. Additionally, study done by, **Rayani (2024) ,** found that psychiatric nurses' professional quality of life is driven more by psychological stressors than by their competency levels.

The findings of current study demonstrate that nurses' competency, overall, is not significantly correlated with professional quality of life, suggesting that possessing high clinical or emotional competency skills alone may not directly influence nurses' well-being or satisfaction in professional quality of life. However, specific domains of nurses' job stressors, particularly attitudes toward patients and perceptions about nursing, were positively associated with professional quality of life. More broadly, the total job stressor score was strongly correlated with professional quality of life, indicating that the way nurses perceive and respond to workplace stressors has a critical impact on their professional satisfaction and emotional well-being. These results are supported by, **Alonazi et al. (2023)** , found that overall competency does not correlate with professional quality of life. On the other hand, was incompatible by **Brajković et al. (2025)** who reported that the strong influence of work-related stress on professional quality of life, secondary traumatic stress, and overall quality of life among nurses. And this result was contradict with the study conducted by **Sibuea et al. (2024)** , found that factors other than competency, such as work environment or support systems, play a significant role in shaping nurses' professional quality of life.

The results of this study indicate that there is no significant relationship between nurses' competency and their socio-demographic characteristics, including age, gender, marital status, place of residence, professional status, educational qualification, and years of experience. This suggests that the professional competence of psychiatric nurses may be more strongly influenced by factors such as formal training, ongoing education, and practical experience in the workplace, rather than by personal characteristics (e.g., age, gender). These findings are supported by **Abdullatif (2023)** , reported that demographic variables such as age or gender do not necessarily predict nursing competency. This result is contradict with the study conducted by **Fatemi et al. (2024)** ,reported that certain demographic factors, such as years of experience or higher educational qualifications, can enhance nursing competency.

The results of this study indicate that nurses' job stressors are not significantly associated with their socio-demographic characteristics, including age, gender, marital status, place of residence, professional status, educational qualification, and years of experience. This suggests that the experience of work-related stress among psychiatric nurses is largely independent of personal or demographic factors, highlighting that occupational stressors are more

influenced by organizational, environmental, and job-specific factors rather than individual characteristics. This result was in the same line with the study of **Wei et al. (2025)** who reported that the findings underscore job stresses independent of their socio-demographic characteristics. Conversely, this result was incongruent with some studies by, **Ren et al. (2023)**, have suggested that certain demographic factors, such as years of experience or educational level, may influence job stress.

The current study illustrates that there is significant association between the professional quality of life of nurses and educational qualification, that the nurses holding a bachelor's degree reporting higher professional quality of life compared to those with diploma or postgraduate studies. This suggests that formal education may enhance nurses' confidence, knowledge, and ability to cope with workplace challenges. Conversely, the study found no significant relationship between professional quality of life and other socio-demographic characteristics. This implies that factors beyond personal characteristics, don't play a more vital role in shaping nurses' professional quality of life. These results are supported by previous studies, **Aloufi (2025)**, highlighted the role of educational preparation in promoting professional quality of life and job stress among nurses. Similarly, **Hamaideh et al. (2024), emphasized** that professional development opportunities, rather than demographic factors, strongly influence nurses' perceptions of their work environment and overall professional quality of life. However, a research of **Hamaideh et al. (2024),** suggested that demographic variables such as age or experience might influence perception of work-related stress, thereby indirectly affecting professional quality of life. This means studies suggested that education and development opportunities have a greater influence on nurses' professional quality of life, rather than demographic factors like age or experience. Overall, **Lobo et al. (2024)** in their findings found the underscore of the importance of supporting continuous professional education, workplace support systems, and job stress improving nurses' professional quality of life, especially in psychiatric settings.

Conclusions:

Results of the present study confirm research hypothesis on relationship with nurses' competency, work related stress and professional quality of life in mental health hospital settings. Where it was found that there is a statistical significant positive relation between nurses' job stressor and professional quality of life, while that is no significant statistical relation between nurses' competency and professional quality of life. There is a

positive significant correlation between attitudes of patients' domain of job stressor and professional quality of life, and also between attitudes about nursing domain of job stressor and professional quality of life. While, there is highly positive statistical significant correlation between total nurses' job stressor and professional quality of life. The findings emphasize the impact of job stressors, particularly those related to patient attitudes and nursing practices, on nurses' quality of life.

Recommendations

Recommendation for nurses:

- Provide professional training programs focused on psychiatric nursing skills and therapeutic communication.
- Encourage participation in workshops, conferences and specialized programs related to clinical competencies in mental health nursing.
- Develop stress-management programs such as mindfulness training, relaxation techniques, and resilience workshops.
- Provide ensure nurses facing work-related stress have access to psychological support, counseling, and employee assistance programs.
- Strengthen leadership support by ensuring that nurse managers recognize workload challenges and provide constructive feedback.

Recommendation for organization:

- Provide regular training and workshops to improve nurses' skills and confidence in managing complex psychiatric cases.
- Encourage healthcare institutions to prioritize mental health nurses' well-being as part of quality-care standards.
- Develop policies that support continuous education, fair scheduling, and adequate rest periods.
- Conduct regular assessments of wowk related stress levels and professional quality of life to identify areas needing improvement.

Recommendation for further researcher:

- Conduct longitudinal studies to assess how improvements in competency and stress management affect long-term outcomes for nurses and patients.

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Discharge Plan on Mothers' Self Efficacy Regarding Children Undergoing Stem Cell Transplantation

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Abstract

Background: For pediatrics, children with ineffective or dysfunctional marrow, stem cell transplantation serves as a cure. Before the administration of healthy cells, children take conditioning regimen, high-dose chemotherapy and immune-suppressive which induce a state of profound, long-term immune deficiency. Consequently, post-discharge recovery necessitates rigorous home-based clinical management, a burden of care that falls primarily on mothers, who act as the central coordinators of their child's complex medical needs. **Aim:** This study aimed to assess discharge plan on mothers' self-efficacy regarding their children undertaking stem cell transplantation. **Research design:** The present study used descriptive research design. **Setting:** The Bone Marrow Transplantation unit of Tanta International Teaching Hospital. **Subjects:** All available mothers (40) providing direct care for their children and all children (40). **Tools:** Three tools were utilized: Tool I: Mothers' Knowledge interview schedule form, Tool II: Mothers' Reported Practices, Tool III: Self-Efficiency **Results** Majority of the mothers had low knowledge and unsatisfactory reported practice and nearly half had low self-efficacy. **Conclusion:** Mothers had low knowledge, unsatisfactory reported practice and low self-efficacy regarding discharge plan for their children undergoing stem. Cell Transplantation **Recommendation:** Discharge plans should be routinely included in pediatric transplantation units to ensure preparation of mothers prior to hospital discharge and on building self-efficacy. Replicate the study with a larger sample.

Keywords: Children, Discharge plan, Stem cell transplantation, Self-efficacy

Introduction

Stem cell transplant is the usual treatment for children with a variety of hematological, oncological or immunodeficiency. disorders, such as severe aplastic anemia, thalassemia, Fanconi anemia, sickle-cell disease, leukemia, and severe, combined immunodeficiency disease **(Edson, Carter, Blacken, & Goldman,2024).** children undergo a preparing regimen of both chemotherapy and immunosuppressing, reliant on the underlying disease, the prime objective is the ablation of the child's dysfunctional marrow trailed by administration of viable beneficial stem cells, to fully replace the failed bone marrow, prior to transplantation **(West, Varnes & Hudspeth, 2023).** Children face weighty encounters during the process of stem. cell transplantation, including rigorous chemotherapy effects, regulated diet, long hospital stays and isolation **(Ward et al., 2020).** While medical stability allows hospital discharge, it often occurs before the child's immune system has totally recovered. This transition creates a high risk for life-threatening illnesses and potential readmission. So, families face the immense tasks of opposing a 'normal' daily routine while strictly managing the heavy burdens of weak immunity, long recovery, multiply medication, and special diet **(Tang, Landery Covington & Ward, 2019)**.

Significance of the study

Since its limited introduction in 1989, Egypt's, hematopoietic stem cell program has grown significantly, now encompassing 15 specialized facilities. across the country. As this therapy become a global standard for various disorders, the rising number of Egyptian pediatric survivors, highlights an important need for sustained medical follow-up and specialized long-term care.

(Passweg et al., 2025; Niederwieser et al., 2021; Mahmoud et al., 2020). Children undergoing stem cell transplantation require multi-layered and continuous care after hospital discharge, which places a substantial burden on family caregivers, particularly on mothers as they are primary caregivers. Previous studies have indicated that pediatric caregivers experience high levels of stress and face significant challenges in managing post discharge care, including infection prevention, child's nutrition, medications and monitoring child's health which may adversely affect child's outcomes if not adequately provided **(Bhatt et al., 2025)**

Aim of the Study:

The study aims to assess discharge plan on mothers' self-efficiency about their children undergoing SCT.

Research questions:

1. What's mother's knowledge about the discharge plan for their children

undergoing stem cell transplantation?

2. What's mother's reported practice about discharge plan for their children going through stem cell transplantation?
3. What's mother's self-efficiency about discharge plan for their children undergoing stem cell transplantation?

Subjects and Method

Study design: The present study used descriptive research design.

Study Setting:

The study was carried out at the Bone Marrow Transplantation unit of Tanta International Teaching Hospital

Subjects:

All available mothers (40) who provide direct care for their children at the previously mentioned setting were involved. in the present study.

All kids (40) who are admitted to bone marrow transplantation unit undergoing stem cells transplantation.

Tools of data collection

Three tools were used to gather the necessary knowledge from the study sample

Tool I: Mothers knowledge, interview schedule form:

It was formed by the researcher after revising the associated literature **(Elsantawy, Bahgat, Elshanshory & Dawood 2023).** It was divided into two parts:

Part (1): Socio-demographic characteristics of study subjects, which include:

a-Mothers' socio demographic attributes such as age, level of education, enterprise, house, and number of kids in family.

b-Personal characteristics of child's as age, gender, birth order and number of siblings, medical history of children which include diagnosis, occurrence of stem cell transplantation side effects and complications.

Part (2): Mothers' knowledge regarding care of their children after stem cell transplant at home: child transportation, home isolation room, cleaning and infection control, medications, diet plan, medicine adherence and follow up.

Scoring system for mothers' knowledge was as follows:

Each question was marked from 0-2 grades. Right and complete answer was scored (2), correct and imperfect answer was scored (1) and don't know was scored (0). The summation of all inquiries was 26.

Total score system for mothers' knowledge was classified as the following:

- High level of knowledge was deemed from 70 % to 100%.
- Moderate level of knowledge was deemed from 50 to less than 70%
- Low level of knowledge was deemed less than 50%

Tool II: Mothers reported practices; this tool was created by the

researcher after reviewing recounted literature (**Sebaq. & Deraz, 2021**) regarding the following: leaving the hospital and transportation, home, child's room, kid's daily hygiene, infection control measures, diet plan and nutrition, medication, immunizations and follow up.

Scoring system for informed practice:

The subitems reported practice contained 82 items; each item was counted 0 -1 grades. Done was counted (1) and not done was scored (0). The calculation of items was 82.

Overall score of the mother's informed practice was classified as follows:

- Satisfactory total score ≥ 60%, when the total score ranged from 50 to 82.
- Unsatisfactory total score <60%, when the total score was less than 50.

Tool III: Self-efficacy measurement: This tool was established by **(Yu et al. 2020),** and it was adjusted by the researcher to determine mothers' self- efficiency in caring for their children regarding the following:

- Preserve the child's condition stable and free of symptoms.
- Follow and continue in following the treatment plan even when difficult.
- Watch health condition of the kid routinely.
- Distinguish changes in the health of the kid if they occur.
- Keep appointments for routine or regular health care.
- Give prescribed medicines without missing a dose.

Scoring system:

Each item of the scale is rated on five Likert point measure one (Never), two (Rarely), three (Sometimes), four (Often) and five (always).

The whole score was achieved, by summing the score of each item as follows:

– low self-efficacy <50%
– moderate self-efficacy 50 < 75%
– high self-efficacy ≥75 %

Method

The research was performed through the following stages:

1-Administrative procedure:

An official approval to conduct the study was attained from the Dean of the Faculty of Nursing. Tanta University and from the administrators of Bone Marrow Transplantation Unit at Tanta Universal Educational Hospital to obtain their approval and cooperation for carrying out the present study.

2-Ethical considerations:

a- Ethical approval was taken from the Scientific Researcher Ethical Committee member of Faculty of Nursing, Tanta University before conducting. The study code number was 348-12-2023.

b- Confidentiality and privacy were taken into consideration regarding the data collection and were maintained by coding number. Informed consent was taken from, mother to contribute in this study

after explanation of the aim and benefits by the researcher. Nature of the study did not cause any harm to the sample.

3-Tools Development: Three tools were used. Tools **I** and **II** were created by the researcher based on the assessment of recent associated literature. Tool **III** was developed by **Yu (2020)** and was adjusted by the researcher to measure mothers' self-efficiency.

4-Content validity: The tools of the study were giving to a board of five specialists in the field of pediatric nursing, to check content validity and clarity of the tools and revisions were carried out in consequence. The content validity index was > 95%.

5- Pilot study is applied on 10% No. 4 mothers admitted at pediatric in the stem cell transplant unit to test the clarity and feasibility of the tools.

6- Reliability of the tools the study was tested by the pilot subjects. The test of reliability indicates high reliability of the tools used for data gathering in the present study. tools were tested through internal consistency, and the value of Cronbach's alpha coefficient were 0.739 for tool I, 0.823 for tool II, and 0.911 for tool III.

7- Statistical analysis

The collected knowledge was coded, entered, tabulated and analyzed using SPSS (Statistical Package for Social Science) version 23. Reliability is measured by using Cronbach's Alpha. For measurable statistics, the range, mean and standard deviation were estimated. For qualitative data, which defines a categorical set of data by frequency, percentage or dimension of each category.

Results:

Table (1): Describes division of the mothers researched according to socio- demographic properties. It was detected that 37.5% of them were between 30 and less than 40 years with the mean ±SD **(31.6 ± 6.5)**. As regards habitation more than 2 quarters (72.5%) of them settle in rural side and most of the mothers (97.5 %) are wedded. Regarding level of education 45% of mothers had completed preparatory school, while 72.5% of them were housewives and 40% of the mothers have three kids in the family.

Figure (1): Illustrates allocation of studied children according to their age, it was found nearly half (42.5%) of children aged from five to less than ten years old, with mean of 6.87 years.

Figure (2): Shows division of researched children according to their gender, it was evident that 52.5% of the kids were male and 47.5% were females.

Table (2): Exhibits allocation of the mothers studied according to overall knowledge score about discharge plan, found majority (85%) of the mothers had low total scores of knowledge level.

Table (3): Illustrates mean scores of the mothers studied practice about their kids about discharge plan. It was found that the total mean reported practice score was 33.86±7.65 out of possible 82.

Table (4): Illustrates proportion division of the mothers studied, associated to their reported practice total scores regarding home care; it was stated that common of mothers (85%) had insufficient level of practice, about discharge plan.

Table (5): Illustrates mothers' mean and standard deviation according to their total self-efficacy score, it was noted that 47.5% of the mothers had low self-efficiency score.

Table (6): Demonstrates correlation between mothers' total knowledge scores, total informed practices and total self-efficiency scores regarding discharge plan. The study showed a positive connection between total knowledge and informed practice and self-efficiency.

Table (1) Percentage distribution of the studied mothers according to socio-demographic characteristics (n=40)

Items	Total Studied mothers (n=40)	
	No	%
– Age		
< 25	5	12.5
25<30	14	35
30<40	15	37.5
≥40	6	15
Range	(21-46)	
Mean & SD	31.6 ± 6.5	
– Residence		
Rural	29	72.5
Urban	11	27.5
– Marital Status		
Married	39	97.5
Divorced	0	0.0
Widow	1	2.5
– Educational Level		
Completed Primary School	1	2.5
Completed Preparatory School	18	45
Completed Secondary School	12	30
University Education	9	22.5
– Number of children in the family		
1	4	10
Two	13	32.5
3	16	40
More than 3	7	17.5

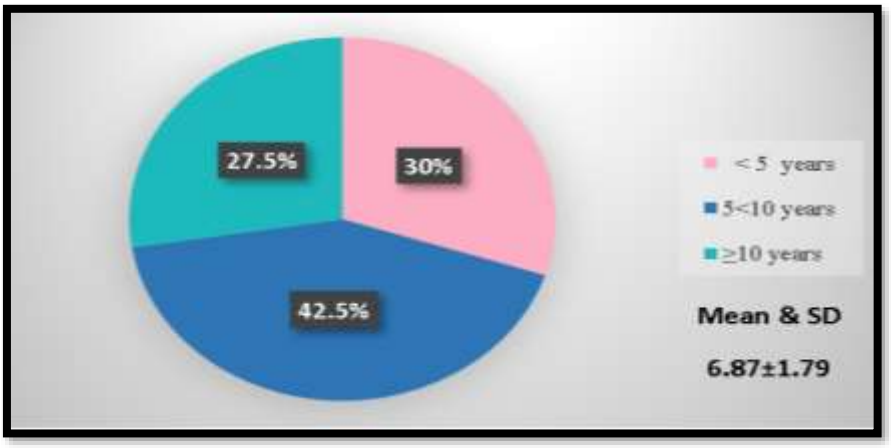

Figure (1): studied children according to their age

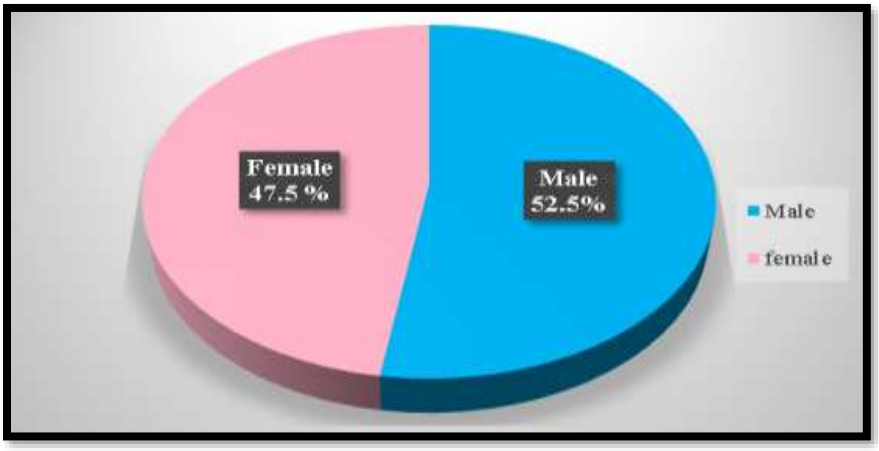

Figure (2): children according to their gender

Table (2): Proportion division of the studied mothers total knowledge score about home care after stem cell transplantation

Items	Total Studied mothers (n=40)	
	No	%
Low	34	85
Moderate	1	2.5
High	5	12.5
Range	6-23	
Mean & SD	10.57±3.75	

Table (3): Mean results of the mothers researched reported practice about their kids discharge plan

Mean scores of researched mothers reported practice	Range Mean & SD
Leaving the hospital and methods of transportation (0-5)	(0-5) 2.53±1.26
Home preparation (0-4)	(0-4) 1.90±0.87
Kid's room: (0-7)	(0-7) 1.80±0.89
Child daily hygiene: (0-8)	(0-6) 3.05±1.41
Infection prevention measures: (0-7)	(0-7) 2.22±1.12
Care of central venous catheter: (0-7)	(0-7) 3.75±1.87
Cooking guidelines and nutrition: (0-9)	(1-7) 3.40±1.23
Managing Decreased appetite: (0-4)	(0-4) 0.75±0.03
Managing oral mucositis, and swallowing difficulties (0-9)	(0-9) 2.60±1.58
Managing nausea and vomiting: (0-6)	(0-4) 1.20±0.95
Managing diarrhea: (0-6)	(0-4) 1.35±0.99
Medications adherence (0-5)	(0-5) 4.05±1.01
Follow immunization schedule (0-1)	(0-1) 0.73±0.23
Follow up (0-4)	(0-4) 1.52±0.96
Total mean & SD (0-82)	(24-49) 33.86±7.65

Table (4): Percentage division of the mothers studied regarding their overall informed practice scores regarding home maintenance

Total Reported Practice Scores	The studied mothers (n=40)	
	No	%
Unsatisfactory <60%	34	85
Satisfactory ≥ 60%	6	15
Range (0-82)	(24-49)	
Mean & SD	33.86±7.65	

Table (5): Mothers' mean and standard deviation according to their total self-efficacy score

Items	The studied mothers (n=40)	
	No	%
Low <50%	19	47.5
Moderate 50 < 75%	12	30
High ≥75 %	9	22.5
Range	(25-50)	
Mean & SD	33.38±8.82	

Table (6): Correlation among mothers' total knowledge and overall practices scores and total self-efficacy grades (n=40)

****Substantial at P <0.01 (two sides) * Considerable at P <0.05 (two sides**

Items	Total Knowledge Scores		Total Reported Practice Scores	
	r	P-value	r	P-value
Reported practice	0.147	0.365	---------	---------
Self-efficacy	0.50	0.001**	0.357	0.023*

Discussion

Stem cell transplantation is an intense yet effective healing modality for managing both malignant and non-malignant disorders. Prior to the transplantation, children undergo intensive conditioning chemotherapy and immunosuppressor therapy to eliminate dysfunctional bone marrow, followed by infusion of healthy stem cells from a donor or the child. **(West et al., 2023).** This process results in extreme immunosuppression that may persist for weeks to months after transplantation. Although children are discharged once clinically stable, they require continued home-based care. The transition from hospital to home is therefore a challenging "hospital-at-home" phase, placing considerable physical and psychosocial demands on both the child and the mother. **(Maleki, Nayeri, Hamidieh & Pouraboli, 2024)**. Consequently, the present study aims to measure mothers' knowledge, reported practice and self-efficacy about discharge plan of their kids undertaking stem cells transplantation**.**

Concerning the studied mothers' sociodemographic properties**,** the results of the current study clarified that beyond than one-third of the mothers were between 30 and less than 40, this e results were matching with **Loiselle et al., (2016)** who steered a research about "Predictors of health- among hematpoetic stem cell transplant receivers" and demonstrated that the one third of caregivers age of 35 to 40 years.

Concerning the children's personal attributes studied, this study revealed that closely half of the kids were aged from 5 to 10 years old. The study also bared that faintly more than half children were males. Also, these findings also fall in line with **Kandy et al., (2025)** who directed a study entitled "Outcomes of hematpoetic stem cell transplantation from related donors in pediatrics: visions from a single center in United Arab Emirates" reported that nearly half of the children were aged from 5 to 10.

These outcomes were in synchronization with **Elsantawy et al., (2023)** who conducted their study entitled "Effect of Implementing Demonstrate Based Nursing Guidelines on Nurses' Performance and Clinical Effects for Children Undergoing. Stem Cells, Transplantation" demonstrated that most the children were males.

Regarding the mothers' total knowledge scores for post-transplantation home care, the calculations of the existing study denoted that the bulk of mothers had poor data concerning the discharge plan. these results were reliable with **Yılmaz & aksoylar (2018)** who directed study entitled "The Knowledge Needs of Mothers concerning Care at Home for kids who Undertook Stem Cell Transplants" It

was conveyed that most mothers proven a substantial need for educational guidance to effectively manage home-based care,

Results of mother's informed practices revealed that most mothers struggled to meet satisfactory standards for discharge care.

These results were in harmony with **Mohamed, Soliman, El-Sayied, & Talaat (2021)** who directed a study about "Nursing Interference for Caregivers of Post Bone Marrow Transplantation at Home" It was reported that only one-third of caregivers demonstrated a good level of reported repetition.

About the mothers' perceived competence the study revealed that nearly half of the study group possessed suboptimal self-efficacy scores.This result was in unity with **Jacobs et al., (2020)** who conducted a study about "Enhanced Cope and Self-Efficiency in Caregivers of Stem Cell Transplant children: Recognizing Mechanisms of a Multimodal Psychosocial Interference" the findings indicated that prior to the intervention the majority of caregivers had low self-efficacy levels compared to after the BMT-CARE educational intervention, most caregivers showed high caregiving self-efficacy.

The findings of this study indicate a significant positive association linking mother's knowledge levels and their reported practice.

The current finding was in harmony with **Mohamed (2021)**, in research about "Nursing Intervention for Caregivers of kids post Bone Marrow Transplantation at Home" as they confirmed that, caregivers' overall knowledge was positively associated with their total practice scores in providing home care for children after bone marrow transplantation.

Conclusion

Built on this study results it can be established that mothers had low knowledge, unsatisfactory reported practice and low self-efficiency regarding discharge plan for their children undergoing stem cell transplantation.

Recommendation:

Built on the present study conclusions, the subsequent advices were suggested:

- Discharge plans should be routinely included in pediatric transplantation units to ensure preparation of mothers prior to hospital discharge on
- Discharge plans should focus on building mother's self-efficiency.
- Replicate the study with a larger sample.

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Effect of Educational Module about Self Care Progressive Muscle Relaxation on Hemodialysis Patients' Sleep Quality, Activity of Daily Living and Quality of Life

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Abstract

Background: Hemodialysis negatively affects patients' lifestyles and daily activities. Self-care and progressive muscle relaxation Health education is a potent strategy for enhancing sleep quality, activities of daily living, and quality of life. **Aim:** Evaluate the effect of educational module about self-care progressive muscle relaxation on hemodialysis patients' sleep quality, activity of daily living and quality of life. **Subjects & Methods: Setting:** Hemodialysis unit at Tanta University hospital, Egypt. **Sample:** A convenience sample of 60 adult hemodialysis patients of both sex. **Data collection tools:** Four tools were used; **Tool 1:** Structured Patient Assessment Interview Questionnaire, **Tool 2:** Structured Sleep Assessment Questionnaire, **Tool 3:** Kidney Disease Quality of Life Short Form (KDQOL SF 36) and **Tool 4:** Hemodialysis Patient 'self-care progressive muscle relaxation technique practice observational checklist". **Results:** Good sleep quality increased from 10% to 83.3% in the control group. Independence in daily activities was higher in the study group (86.7% post) compared to the control group (23.3% post). Quality of life improved significantly, with(62.20 ± 11.52 post)in the study group versus 91.70 ± 13.64 in the control group. Good performance of the PMR technique increased from 6.7% pre to 86.7% post in the study group. **Conclusion:** Significant positive outcomes were found in sleep quality, daily activity independence, progressive muscle relaxation performance, and quality of life. **Recommendations:** Integrating PMR in the standard nursing care of hemodialysis patients. Conduct follow-up studies to evaluate the long-term impact of PMR.

Keywords: Activity of Daily Living, Educational Module, Hemodialysis Patients, Progressive Muscle Relaxation Technique, Quality of Life, Self-Care, Sleep Quality.

Introduction

disease (CKD) is a serious medical condition that negatively impacts persons' physical, social, and psychological health, diminishing their overall quality of life **(Hussien et al., 2021)**. This is a major health concern, impacting over 10% of the global population, which equates to around 800 million people worldwide ***(Kovesdy, 2022).*** It is among the major health issues in Egypt. About 13% of adults have chronic kidney disease (CKD), which has a substantial impact on morbidity, mortality, and medical expenses. ***(Chesnaye et al., 2024).***

Based on the most recent WHO data, which was released in 2020. In Egypt, kidney disease accounted for 21,087 deaths, or 3.93% of all deaths. The age-adjusted death rate is 32.58 per 100,000 people ***(Farag & El-Sayed, 2022).*** The burden of CKD has grown by 36% in Egypt, following the global trend, and from 2009 to 2019, it ranked fifth among the main causes of death ***(Darwish & Brown, 2024)*** 89% of patients with ESKD receive hemodialysis (HD) worldwide. Over 2.5 million people receive renal replacement therapy, and by 2030, that figure is expected to quadruple to 5.4 million ***(Soliman et al., 2025).***

The Egyptian Society of Nephrology and Transplantation (ESNT) reported in its 9th Annual Report of the Egyptian Renal Registry that the prevalence of ESRD has increased to 483 patients per million in Egypt. The average age is 49.8 ± 19 years ***(Hassaballa et al., 2022).*** Males represented 55.2 % while females were about 44.8 %. People with chronic kidney disease (CKD) have a high burden of symptoms, a low quality of life, and higher rates of morbidity and mortality ***(Speyer et al., 2024).*** Poor sleep is a major risk factor for mortality and a lower quality of life in those with chronic kidney disease ***(Gela et al., 2024).***

When diet and medication are unable to control chronic kidney disease (CKD), renal replacement treatment (RRT), which includes hemodialysis (HD), peritoneal dialysis, and renal transplantation, is required ***(Zhang & Yuan, 2023).*** The HD procedure can cause side effects in patients, including exhaustion, cramping in the muscles, sleeplessness, and restless legs syndrome, which can have a detrimental impact on the patient's quality of life ***(Kalantar-Zadeh et al., 2021; Hakverir & Gündogdu, 2024).*** Additionally, anxiety, depression, and sleep problems are interconnected and have a mutually reinforcing effect, making them important factors that impair patient recovery and prognosis, both of which have a significant negative impact on patient quality of life ***(Heidenreich et al., 2022; Wu et al., 2025).***

Patients undergoing HD may have sleep concerns, such as difficulty falling or waking up, frequent nightly

awakenings, restless wakefulness, daytime sleepiness, and reduced daytime performance, all of which could have a detrimental effect on the quality of their sleep ***(Alshammari et al., 2023***). 40–83% of people receiving HD therapy report having sleep issues. Patients with HD have poor sleep, which has a detrimental impact on their quality of life. Sleep hygiene, music therapy, cognitive therapy, and relaxation techniques are examples of non-pharmacological methods that can lessen insomnia and enhance the quality of sleep ***(Huda et al., 2024; Yang et al., 2023).***

One technique for lowering stress and anxiety is progressive muscle relaxation. The goal of using this technique is to raise awareness of the tension, ease tense muscles, and teach a technique for releasing all of the muscles ***(Syisnawati et al., 2022).*** Muscle loosening is referred to as muscle relaxation. The premise behind progressive muscle relaxation is that negative emotional states and psychosomatic disorders stem from a psychic-biological state known as nervous muscle pressure rise ***(AI-yyan et al., 2024).***

Deep breathing exercises, meditation, reflexology, and progressive muscle relaxation exercises (PMRE) are examples of relaxation therapies. Individual contraction and muscle group relaxation from the face to the feet are features of the PMRE kind of relaxation exercise. PMRE may be practiced anywhere, is simple to learn, and has no negative consequences. ***(Evans & Bee, 2022).*** Peace of mind results from muscle relaxation since total relaxation of the body's limbs prevents an emotional condition ***(Akram et al., 2025).***

To put it another way, relaxing counteracts the consequences of increased muscle pressure on the body and stops the development of negative thoughts and feelings like anxiety and tension ***(Oladejo, 2021).***

Progressive muscle relaxation is a noninvasive, low-cost technique without difficulties that patients can complete on their own ***(Boughdady et al., 2024).*** In order to provide these patients with high-quality care, ensure their safety, and optimize treatment outcomes, the nurses' expertise and comprehension of the unique characteristics of hemodialysis are essential. ***(Michou, 2025).***

Patients undergoing HD are immediately under the care of nurses, who also provide care to minimize problems. Patients frequently feel powerless to manage their illness. Patients with chronic HD frequently have psychological issues like anxiety and sadness as a result of these ongoing pressures ***(Engels & van Duijn, 2022).***

Nursing interventions can significantly lower the risk of complications and improve the health of patients with end-stage renal disease. ***(Al Shammari et al., 2024).***

Ensuring patients have adequate rest and sleep is one of the most important duties of nurses. Nurses should determine and address the reasons behind patients' discomfort and sleep disturbances ***(Foy et al., 2023).***

Educational module on PMR emphasize patient empowerment through self-care by providing individuals with practical skills that can be independently practiced and integrated into daily life ***(Sella et al., 2023; Toussaint et al., 2021).*** Contemporary nursing literature emphasizes that relaxation-based educational interventions are cost-effective, safe, and easily implemented in clinical settings, making PMR a valuable component of comprehensive nursing care aimed at enhancing long-term health outcomes and resilience ***(Abbo Bacia, 2025).***

Educational modules are considered an effective nursing strategy for educating patients undergoing hemodialysis, as they provide structured, systematic, and patient-centered learning experiences during nursing interventions. They also enhance patients' understanding of their condition, promote active participation in care, and improve adherence to non-pharmacological interventions aimed at managing treatment-related symptoms, including sleep problems and reduced functional capacity ***(Sella et al., 2023).***

Thus, the self-care educational module on Progressive Muscle Relaxation (PMR) was structured to equip patients with an effective non-pharmacological technique based on the systematic alternation between muscle tension and relaxation, which promotes deep physical and psychological relaxation and enhances body awareness

PMR technique was performed through sequential tensing and relaxing of 16 major muscle groups, including fists, biceps, triceps, facial muscles, neck, shoulders, lower back, buttocks, thighs, calves, shins, and ankles. Each muscle group was deliberately tensed for roughly 5 seconds, before going on to the next muscle group, take ten to twenty seconds to fully relax and exhale. This structured sequence facilitates generalized relaxation and reduces sympathetic nervous system activity.

Significance of the Study and Research Gap

Hemodialysis patients have a higher risk of death and sleep disturbances help to make things worse ***(Alshammari et al., 2023)***. Using the self-care of hemodialysis patient to improve sleep quality is very important beside the nursing management and there are a few studies about this. However, identification of nursing management using progressive muscle relaxation technique effect on sleep quality, activity of daily living and quality of

life is paramount so this study was conducted.

Aim of the study:

This study aimed to evaluate the effect of educational module about self-care progressive muscle relaxation on hemodialysis patients' sleep quality, activity of daily living and quality of life.

Research hypothesis:

Hemodialysis adult patients who will receive self-care progressive muscle relaxation educational module will be expected to have improving sleep quality, activity of daily living and quality of life than control group who will receive routine hospital care.

Subjects and Methods:

Research design:

A quasi- experimental research design was utilized to conduct this study.

Setting:

This study was conducted at Tanta University hemodialysis unit with Students hospital 12 beds capacity and international educational hospital at Tanta university hospital 10 beds capacity.

Sample type and method: A purposive sample of adult hemodialysis patients was included in the study. The sample was split into two equal groups at random 30 patients in each as follow: **Group I:** study group, received progressive muscle relaxation technique. **Group II:** control group, received hospital routine of care for patients.

Sample size: The study included 60 adult patients undergoing hemodialysis.

Inclusion criteria:

- Adult conscious patient (21-60 years) undergoing hemodialysis.
- Both sexes.
- Participants at least 6-monthes history of hemodialysis with regular hemodialysis sessions.

Exclusion criteria:

- Presence of severe physical symptoms, such as bone pain, itchy skin, sleep apnea and restless legs, which are obviously causative of insomnia, respiratory disease or cardiovascular disease.

Tools of Data collection:

Four tools were utilized to this study:

-**Tool I: "Structured Patient Assessment Interview Questionnaire".** Consisted of two parts:

Part 1: Hemodialysis Patient's Bio-Socio-Demographic data: was developed by the researcher after reviewing relevant literature. It included patient name, age, sex, marital status, educational level, monthly income, occupation, the number of dialysis sessions per week and the number and duration of dialysis session per week.

Part 2: " Nottingham Extended Activities of Daily Living Scale ": Developed at 2007 by L. Ferrucci, and was adopted and translated into Arabic by the researchers. It consisted of 22 items that were grouped into 4

subscales including mobility (6 items), kitchen (5 items), domestic (5 items) and leisure activities (6 items). It was originally designed to function as a dichotomous scale with patient scored according to weather, they were dependent on others or independent.

All items were scored as following.

- Not at all and with help equal zero
- On my own with difficult and on my own equal 1

Total score

Maximum score is 22 with higher scores over 15 indicated greater independent and lower scores below 7 indicated very dependent.

Tool II: "Structured Sleep Assessment Questionnaire":

Consisted of two parts:

Part 1: Base line data of hemodialysis patients' sleep history: was developed by the researchers after reviewing relevant literature and it was included in five parts part one numbers of sleep hours and how patient sleep, part two using of sleeping aids, part three disrupting factors to sleep, part four usual habits before sleep, part five factors used to overcome disrupting factors.

Part 2: "Pittsburgh Sleep Quality Index":

Was developed at 1989 by Daniel J. Buysse to assess sleep quality and modified with translation into Arabic at 2020 and it was adopted and used by the researcher it was consisted of 19-item self-rated questionnaire for the evaluation of the overall sleep quality within the preceding month. Pittsburgh sleep quality index evaluates seven components of sleep quality, including (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of medication for sleep, and daytime dysfunction due to poor sleep).

Scoring system

- very good allocated score 0
- fairly good allocated score 1
- fairly bad allocated score 2
- very bad allocated score 3

Total score

Sum of seven component scores, range from 0 to 21, where scores of ≤5 indicated good sleep quality and scores of >5 indicated poor sleep quality.

Tool III: " Kidney Disease Quality of Life Short Form (KDQOL ^{SF} 36)

"It first developed in 1994 by Heys and developed into Arabic version in 2019 by Saudi center. It was adopted and used by the researcher. It was consisted of 36 items totally and subdivided into two main categories (12-items) as a generic core which included physical component summary (PCS) and mental component summary (MCS) and (24-items) as a kidney disease targeted questionnaire which included burden of kidney disease (4-items), symptoms and problems (12-items) and effects of kidney disease (8-items).

Scoring system

All items were scored on a 5-point Likert scale ranging from 1 (not at all bothered) to 5 (extremely bothered) except item 2,3 (3-point) and item (4,5,6,7) 2-points" yes or no ". Each of the targeted scales were scored by transformed all items linearly to a 0-100 possible range and averaged the items in the scale. Better health-related quality of life was indicated by higher scores.

Total score

- Scores of <40 indicated low quality of life.
- (40-60) indicated moderate quality.
- >60 indicated high quality of life.

Tool IV: Hemodialysis Patient 'self-care progressive muscle relaxation technique practices observational checklist:

It was developed by researcher after reviewing relevant literatures to assess the actual practice of hemodialysis patient of progressive muscle relaxation technique. It was comprised (3) main items such as site of muscle group, preparation before and after technique and steps of technique.

Scoring system

Each item in check list was scored as following:

Two scores for each step that was done correctly, score 1 for in completed done and zero for step that was not done, the total scoring system of patients 'practice were calculated.

Total score

- The total score of practice > 75 % indicated well.
- The total score of practice ≥60 % - 75 % indicated fair.
- The total score of practice <60 % indicated poor.

Validity:

The tools were submitted to a jury committee of three experts in the field of Medical-Surgical Nursing Department at the faculty of nursing - Tanta University; each of the expert panel was asked to examine the instruments for its content validity, coverage, clarity, wording, length, format, applicability, and overall appearance.

Reliability:

Cronbach` Alpha Coefficients of internal consistency were used to assess the internal reliability of the tools. The internal consistency coefficient showed high reliability

Table I: Reliability data of the study tools:

Items	Alpha Cronbach
Structured Patient Assessment Interview Questionnaire	0.87
Structured Sleep Assessment Questionnaire	0.81
Kidney Disease Quality of Life Short Form (KDQOL SF 36)	0.82
Hemodialysis Patient 'self-care progressive muscle relaxation technique practices observational checklist	0.79

Pilot study:

A pilot study was conducted on 10% of hemodialysis patients to test the applicability of the tools and to

determine any obstacles that may encountered during the period of data collection and needed modification was done.

Ethical approval:

Ethical aspects were considered before starting the study as the following:

- Approval from the Ethical Research Committee of Tanta University was obtained before conducting the study. **Code no**.116-11-2022.
- An official letter to carry out this study clarifying the purpose and setting of the study was acquired from the Faculty Dean of Nursing, Tanta University to the directors of the previously mentioned-setting as an approval to obtain permission and cooperation.
- An official permission was acquired from the responsible authorities of hemodialysis units before conducting the study through official letters from faculty of nursing Tanta university, explaining the purpose of the study.
- Written witnessed consent was obtained from every patient included in the study after explanation of the aim of the study and assuring them of confidentiality of collected data.
- Confidentiality and anonymity were maintained by the use of code number instead of name and the right of withdrawal is reserved.
- Privacy of the studied patients was maintained.
- An official permission from the selected study settings was obtained for the fulfillment of the study.
- The researcher explained the study's purpose and objectives to all patients before data collection began. Written informed consent was obtained from patents prior to participation in the study.
- All collected data were treated confidentially and used solely for research purposes. The researchers maintained strict anonymity and confidentiality of participants' data throughout the study.
- Patients were informed of right to withdraw from the study at any time without consequence.

Study phases:

Assessment phase:

The researchers used Tool I part 1 and tool II part 1 and 2 at the time of patient admission for collection of patient data and assessed who was met the inclusion criteria and were included in the study.

Planning phase:

- The researchers designed self –care educational module on progressive muscle relaxation technique for hemodialysis patients based on the patient assessment sheet and literature review which included definition of progressive muscle relaxation technique, site of muscle groups, preparation before the technique,

position of the patient and precautions after reviewing relevant literature.

- The educational intervention included five sessions and duration of each session was 20 minute /day for five days. The content of each session was divided as follows:

Session 1: Basic knowledge of hemodialysis that included:

- Hemodialysis definition, mechanism, complication and management
- Sleep definition, sleep disorders, healthy sleep habits.

Session 2: Basic knowledge of progressive muscle relaxation technique that included:

- Definition, benefits, site of muscle groups, position, preparations and precautions.

Session 3, 4, 5: clinical performance of progressive muscle relaxation technique.

It was performed by methodically tensing and relaxing 16 different muscle groups one by one (Fists, Biceps, Triceps, Forehead, Eyes, Jaw, Tongue, Lips, Neck, Shoulders, Lower back, Buttocks, Thighs, Calves, Shins and ankles). The key with this technique is to tense each muscle group and hold for 5 seconds. Then, exhale as let the muscles fully relax for 10 to 20 seconds before move on to the next muscle group.

- The theoretical part was presented through PowerPoint. It was taken in two sessions from the previous five sessions.
- The practical part was presented through demonstration and re-demonstration. It was taken in sessions 3, 4, 5 for 20 minutes /session.
- For control group: the patients were under routine care for hemodialysis and sleep.

Implementation phase:

For the studied group by the researcher:

a) Educational intervention for patients about progressive muscle relaxation technique for hemodialysis patients was developed and implemented by researcher based on the patient assessment sheet and literature review.

b) Educational strategies and aids used during the session covered three domains of education.

- Educational strategies include: PowerPoint, demonstration and re-demonstration were used as educational method.
- Teaching aids include: images, videos and booklets used as teaching aids.
- The images, videos and booklets were prepared by the researcher based on literature review. The images and booklets will be distributed to the patients participated in the study at the end of sessions and videos will be presented during the session.

c) The educational intervention was presented to all patients participated in the study in five sessions and duration of each session was 20 minute /day for five days. Session was given to three groups 10 patients in each group. the content of each session was divided as follows: -

Session 1: Basic knowledge of hemodialysis.

Objective of session 1 is to improve basic information about hemodialysis and sleep quality.

Session 2: Basic knowledge of progressive muscle relaxation technique.

Objective of session 2 is to improve basic knowledge about progressive muscle relaxation technique (definition, benefits, site of muscle groups, position, preparations and precautions).

Session 3, 4, 5: clinical performance of progressive muscle relaxation technique.

Objective of this session is to perform progressive muscle relaxation technique correctly. It was carried out by carefully tensing and relaxing sixteen distinct muscle groups one at a time. Tightening each muscle group and holding it for five seconds is the secret to this technique. Before moving on to the next muscle group, exhale and allow the muscles to totally relax for ten to twenty seconds.

- The theoretical part will be presented through PowerPoint using tap or laptop. It will be taken in two sessions from the previous three sessions.
- The practical part was presented through demonstration and re-demonstration. It was taken in sessions 3, 4, 5 for 20 minutes /session.

For control group: the patient received the routine care.

Evaluation phase:

Patients were evaluated as following:

- Patients who received educational intervention by the researcher were evaluated using tool IV to evaluate efficacy of self-care educational module at the end of the session three times at session3,4,5.
- Tool II part 2 was used to evaluate sleep quality of both control and study group and was used three times once at the beginning of the interview, one month after implementation of self-care educational module and the last one three months later.
- The researcher used tool III to evaluate quality of life of both control and study group at the beginning of the study and at the end.

Results:

Table (1) shows that there was no

statistically significant difference between the two groups' regarding their sociodemographic characteristics. The highest percentages of study participation were observed among individuals aged 31-40 were 33.3% and 36.7% of both study and control groups respectively, more than half of patients in both study and control groups were male 63.3% and 56.7% respectively, Over 50% of patients in both study and control groups were married 56.7% and 63.3% respectively, patient who have secondary school diploma were more than the quarter of both study and control groups 36.7% and 26.7% respectively, also more than third of both study and control groups 40.0% and 33.3% respectively.

Figure (1) With regard to total sleep quality among hemodialysis patients in both study and control groups through the study phases. The findings show that there is a statistically significant improvement in sleep quality for the study group following nursing intervention and at follow-up at (p=0.001). The proportion of patients in the study group demonstrating good sleep quality that increased markedly after intervention: 10% pre, 83.3% post, and 76.7% at follow-up, compared to those with poor outcomes (90%, 16.7%, and 23.3%, respectively). Conversely, in the control group, the majority consistently exhibited poor outcomes: 93.3% pre, 73.3% post, and 76.7% at follow-up, while only 6.7%, 26.7%, and 23.3% respectively.

Figure (2) illustrates that there is a statistically significant improvement in the proportion of independent activity in the study group after nursing intervention at (p=0.001). The majority of the study group patients became able to perform activities independently at post and follow-up phases: 86.7% pre, 86.7% post, and 83.3% at follow-up, compared to a minority who remained dependent (13.3%, 13.3%, and 16.7%, respectively). Respectively, in the control group, most patients continued to perform these activities dependently: 90% pre, 76.7% post, and 80% at follow-up, while only 10%, 23.3%, and 20% demonstrated independence at the three phases.

Table (2) illustrates that the study and control groups did not differ statistically significantly regrading total Quality of Life (QoL) scores using T-test at baseline (Pre: $t = 1.148$, $P = 0.256$), indicating comparability before the intervention. However, post-intervention, the study group demonstrated a substantial improvement in total QoL scores (Post mean ± SD = 91.70 ± 13.64) compared to the control group (62.20 ± 11.52), with a statistically significant difference (*$t = 9.051$, $P < 0.001$).

Table (3): Presents the distribution of hemodialysis patients in the study

group according to the total efficacy of the progressive muscle relaxation technique. The results reveal that the majority of patients showed good performance after the intervention, with a marked shift from poor to well levels across the different phases. Specifically, most patients demonstrated good efficacy in both post- and follow-up phases (86.7% and 80.0%, respectively), compared with only 6.7% at the pre-phase. A statistically significant improvement was observed in the post-phase ($p < 0.001$).

Table (4) displays correlation between the studied variables across different phases (Pre, Post, Follow-up). In the study group, significant positive correlations were found between sleep quality and activities of daily living in the three phases at $p < 0.001$, as well as between sleep quality and progressive muscle relaxation technique in the three phases at $p < 0.05$. Activities of daily living were positively correlated with progressive muscle relaxation technique in the study group across all phases at $p < 0.001$. Quality of life exhibited significant positive correlations with activities of daily living in both the study and control groups across pre and post phases at $p < 0.05$. Progressive muscle relaxation technique showed significant positive correlations with quality of life in the study group across pre and post phases at $p < 0.05$.

Table (1): Distribution of hemodialysis patient based on sociodemographic Characteristics of Study and control group (n=60)

Sociodemographic data	Study		Control		Chi-square	
	N.30	%	N.30	%	χ^2	P-value
Age						
21-30	5	16.7	6	20.0	0.282	0.963
31-40	10	33.3	11	36.7		
41-50	7	23.3	6	20.0		
51-60	8	26.7	7	23.3		
Sex						
Male	19	63.3	17	56.7	0.278	0.598
Female	11	36.7	13	43.3		

Marital status						
Single	7	23.3	4	13.3	1.072	0.784
Married	17	56.7	19	63.3		
Divorced	3	10.0	4	13.3		
Window	3	10.0	3	10.0		
Educational level						
Illiterate	2	6.7	3	10.0	3.393	0.640
Reads and writes	7	23.3	6	20.0		
Preparatory	2	6.7	6	20.0		
Secondary	3	10.0	4	13.3		
Technician	5	16.7	3	10.0		
Diploma	11	36.7	8	26.7		
Occupation						
Employee	5	16.7	8	26.7	1.395	0.845
Worker	1	3.3	2	6.7		
Housewife	12	40.0	10	33.3		
Free business	5	16.7	4	13.3		
Don't work	7	23.3	6	20.0		
monthly income						
lower than 2000	13	43.3	11	36.7	0.278	0.598
More than 2000	17	56.7	19	63.3		

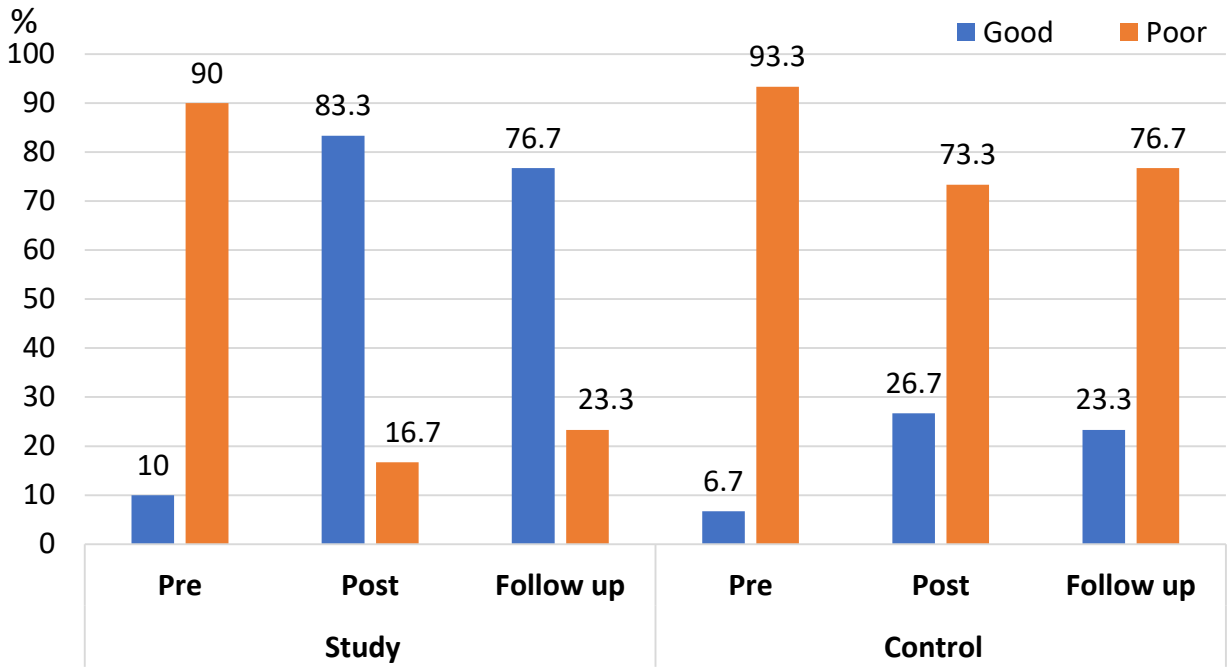

Figure (1): Distribution of hemodialysis of both groups study and control according to their total sleep quality through the study phases (n=60)

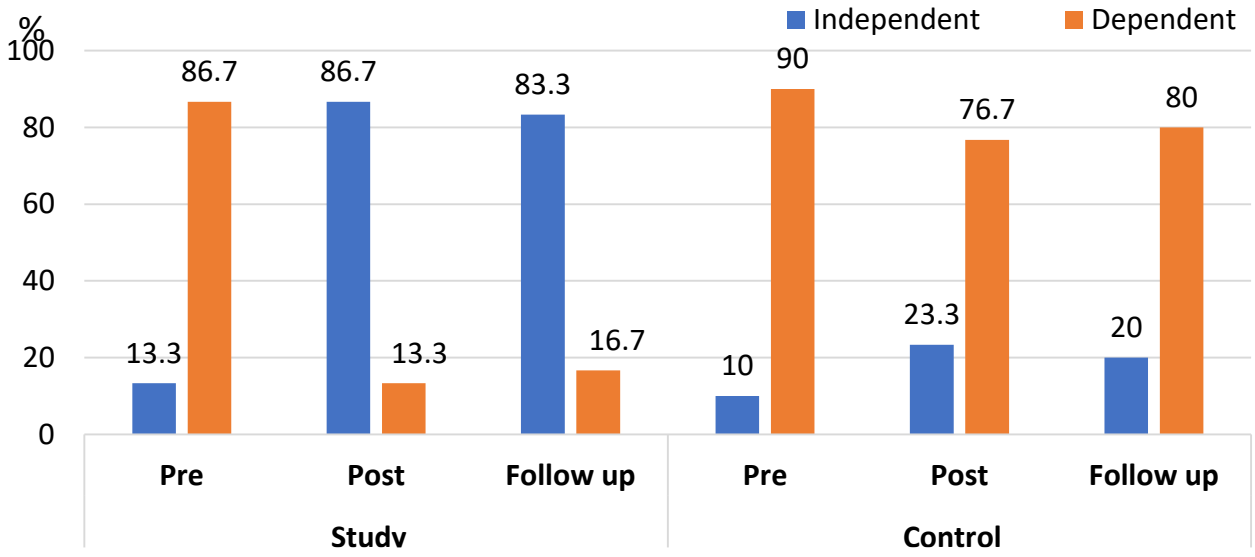

Figure (2): Distribution of hemodialysis of both groups study and control according to their total dependency in Activities of Daily Living Scores through the study phases (n=60)

Table (2): Distribution of hemodialysis patients of both groups study and control according to Total Quality of Life Scores Using T-Test (n=60)

Total Quality of Life	Control			Study			T-test	
	Mean	±	SD	Mean	±	SD	T	P-value
Pre	92.27	±	13.25	87.93	±	15.87	1.148	0.256
Post	62.20	±	11.52	91.70	±	13.64	9.051	<0.001*

Table (3): Distribution of hemodialysis patients of study group according to Total Progressive Muscle Relaxation Technique's Efficacy (n=30)

Total progressive muscle relaxation technique	study						Chi-square			
	Pre		Post		Follow up		P_1		P_2	
	N 30	%	N 30	%	N 30	%	χ^2	P-value	χ^2	P-value
Well	2	6.7	26	86.7	24	80.0	41.874	<0.001*	1.080	0.583
Fair	4	13.3	3	10.0	3	10.0				
Poor	24	80.0	1	3.3	3	10.0				

Table (4): Correlation between Sleep Quality, Activities of Daily Living, Progressive Muscle Relaxation Technique, and Quality of Life among the studied hemodialysis patients' groups (n=60)

	Study						Control			
	Sleep quality		Activities of Daily Living		Progressive muscle relaxation technique		Sleep quality		Activities of Daily Living	
	r	P-value	r	P-value	R	P-value	r	P-value	r	P-value
(Pre)										
Activities of Daily Living	0.427	<0.001*					0.198	0.035*		
Progressive muscle relaxation technique	0.384	<0.001*	0.425	<0.001*			-	-	-	-
Quality of Life	0.356	<0.001**	0.745	<0.001*	0.230	0.004*	0.129	0.201	0.239	0.046*
(Post)										
Activities of Daily Living	0.430	<0.001*					0.375	0.002*		
Progressive muscle relaxation technique	0.284	<0.001*	0.395	<0.001*			-	-	-	-
Quality of Life	0.356	<0.001*	0.234	0.003*	0.337	<0.001*	0.377	<0.001*	0.265	0.041*
(Follow up)										
Activities of Daily Living	0.298	<0.001*					0.401	<0.001*		
Progressive muscle relaxation technique	0.375	0.005*	0.806	<0.001*			-	-	-	-

Discussion

The incidence rate of hemodialysis patients elevated across the world. Although hemodialysis therapy is lifesaving, it is associated with a high treatment and symptom burden. Hemodialysis patients experience serious issues that have an impact on their life and compromise their emotional, mental, and physical well-being. Patients' everyday life may be disrupted by physiological factors that limit them ***(Hejazi et al., 2022; Hashem et al., 2022).***

Thus, the purpose of the current study was to assess the impact of educational modules. about self-care progressive muscle relaxation on hemodialysis patients' sleep quality, activity of daily living and quality of life.

Concerning the sociodemographic characteristics of the hemodialysis patients in both the study and control groups, the largest proportion of participants were middle-aged adults from thirty-one to forty years. Males accounted for more than half of participants in each group, and most

participants were married. With respect to educational attainment, over one quarter had completed secondary school, while more than one third had attained higher education. Importantly, there were no statistically significant differences between the study and control groups on these sociodemographic variables, indicating that the groups were comparable and reducing the likelihood of baseline sociodemographic bias.

These results can be attributed to age distribution (middle-aged predominance): CKD and progression to ESRD often manifest after years of comorbid disease (e.g., hypertension, diabetes), producing a concentration of patients in middle adulthood and older ages in many clinical samples. This pattern appears across regional cohort ***Togay & Akyüz, (2023).***

For male predominance: Several recent dialysis cohorts report higher proportions of male patients; sex differences in CKD incidence, access to care, exposure risks, and health-seeking behaviors contribute to this pattern ***Bamikefa et al., (2023).*** Regarding high marriage rates**,** the result reflects common sociodemographic structures for adults in the age ranges affected by ESRD in many countries and can also explained by sampling frames based in hospital/clinic populations ***EL-Hofy et al., (2023).***

For education profile (secondary/higher education): A meaningful portion of dialysis patients hold secondary or higher education, which makes educational interventions (an educational module teaching self-care PMR) feasible and likely to have reasonable uptake and adherence. Regional study shows a mix of education levels across HD populations ***Abdel Kareem et al., (2024).***

Similarly***, Tafese et al. (2024)*** found that patients on maintenance hemodialysis in Ethiopia were largely middle-aged with a clear male predominance, supporting the age-and-sex pattern reported here.

Moreover, ***Togay and Akyüz, (2023)*** pointed that middle-aged adults formed the bulk of hemodialysis cohorts in Turkey and highlighted comparable marital distributions, aligning with the high proportion of married participants in this study. In a nationwide analysis of gender differences on maintenance hemodialysis, ***Shankar et al. (2024)*** documented systemic male predominance and differences in socio-economic profiles between sexes—findings that are consistent with the male majority in the current study.

In Egypt, ***El-Hofy et al. (2023)*** reported that most ESRD patients receiving dialysis were in their forties and more often male, which corresponds with the age and sex distribution in the current study.

Khazaei Ghozhdi et al. (2023) and Boughdady et al. (2024) each described dialysis samples in which middle-aged adults predominated and a substantial share of patients had at least secondary-level education, corroborating the education profile observed (more than twenty-five percent are secondary school and more than thirty-three percent are higher education).

Concerning total sleep quality, the findings of the present study disclosed that patients in the study group experienced a marked improvement following the nursing intervention, with the majority reporting good sleep quality in the post-intervention and follow-up phases, while only a minority continued to experience poor outcomes. In contrast, the control group showed limited progress, as most patients consistently reported poor sleep quality across all phases, with only a small proportion achieving improvement. These results indicate that the nursing intervention was effective in enhancing sleep quality among hemodialysis patients, and that the positive impact was sustained over time.

Consistent with the current study findings, a 2024 quasi-experimental study of Jacobson's progressive muscle relaxation among adult hemodialysis patients demonstrated significant improvements in both fatigue levels and sleep quality after the intervention ***(Boughdady et al., 2024).***

Moreover, a 2022 clinical trial found that a twelve -week nursing intervention including education, relaxation, and counseling resulted in a significant reduction in global PSQI scores in middle-aged and elderly HD patients, indicating enhanced sleep quality ***Rothpletz-Puglia et al., (2022).*** Also, a meta-analysis and systematic review support these observations, acupressure was found to significantly improve quality of sleep among hemodialysis patients across multiple RCTs ***Wang et al., (2020).***

This improvement may be due to the nursing intervention's combination of elements such as direct guidance on sleep hygiene, relaxation techniques, and routine that address known sleep disruptors in hemodialysis patients (e.g., restless legs, pain, pruritus, anxiety, nocturnal shifts). The involvement of healthcare professionals in reinforcing these practices enhances patient adherence and fosters behavioral changes supporting sustained sleep improvement.

Concerning the activities of daily living of hemodialysis (ADL) outcomes between the hemodialysis study and control groups, the study results demonstrate that patients in the study group achieved markedly greater independence across mobility, kitchen tasks, domestic tasks, leisure activities and the total ADL score in

the post-implementation and follow-up phases than patients in the control group.

Consistent with the current study findings, a comprehensive review by ***Halle et al. (2024)*** confirmed that both intradialytic and home-based exercise regimens effectively enhance physical performance including walking capacity and strength which are key determinants of ADL independence. Additionally, a Japanese cohort study by ***Takahashi et al. (2025)*** demonstrated that hospitalized HD patients receiving intradialytic exercise showed significant gains in Barthel Index (BI) and walking speed, reflecting enhanced performance in daily living tasks.

Evidence from meta-analyses and narrative reviews also indicates broader physiological and systemic benefits of exercise (improved muscle mass/strength, better nutritional markers, improved anemia/albumin, reduced arterial stiffness) that plausibly increase daily energy and capacity to perform tasks such as feeding, preparing drinks, washing up, and leisure activities i.e., the kitchen/domestic ADL gains seen in your study ***Tabibi et al., (2023).***

Finally, several recent trials and consensus statements emphasize the importance of supervision, tailoring, and program duration (most benefit with supervised, multi-component programs sustained more than or equal eight to twelve weeks and better when continued long term). This explains why nurse-led intervention produced large, durable gains (post and follow-up) while usual-care controls remained dependent ***Halle et al., (2024).***

As regards total Quality of Life (QoL) scores of the studied groups, at pre-intervention, no significant difference was observed between the study& control groups, confirming that they were comparable prior to the intervention. Following the nursing intervention, however, a clear divergence emerged between the groups. The study group demonstrated a substantial improvement in overall QoL, while the control group showed a decline. Statistical analysis revealed that the difference in post-intervention total QoL scores between the study and control groups was highly significant. These results strongly suggest that the implemented nursing intervention had a positive and meaningful impact on enhancing the overall quality of life of patients undergoing hemodialysis.

This finding aligns with recent empirical evidence. For instance, a randomized controlled trial applying nursing interventions grounded in the health ecology model showed that intervention group participants had significantly higher QoL, health-promoting lifestyle behaviors, social support, and e-health literacy after six months, compared to controls ***Shu et***

al., (2025).

Further corroboration comes from a multidisciplinary nursing intervention study in 2025, which reported significant improvements in patient-reported QoL measured via the KDQOL-36 instrument in the experimental group versus controls ***Pradhan et al., (2025).*** These findings indicate that nursing-led interventions whether focusing on self-management, comprehensive patient-centered care models, or multidisciplinary approaches consistently yield improvements in QoL for hemodialysis patients.

Concerning the total progressive muscle relaxation technique's efficacy, the present study demonstrated that progressive muscle relaxation (PMR) was highly effective for patients undergoing hemodialysis, with the majority achieving good efficacy in both post- and follow-up phases compared with only a small proportion at baseline. This marked improvement indicates that PMR is a feasible and sustainable technique for enhancing patients' physical and psychological well-being during dialysis treatment.

These findings align with recent empirical studies. A randomized controlled trial combining mindfulness meditation and PMR for patients undergoing maintenance hemodialysis with sarcopenia demonstrated significant improvements in multiple domains of quality of life including physical function, energy, general health, sleep, and emotional well-being after 12 weeks, compared to controls ***Wu et al., (2024).***

Similarly, ***Hakverir and Gündoğdu (2024)*** demonstrated that PMR exercises resulted in notable improvements in almost every aspect of Turkish hemodialysis patients' sleep quality. Quasi-experimental study by ***Mohamed et al., (2023)*** has further corroborated these outcomes. Collectively, these findings emphasize that PMR is a reliable, non-pharmacological, and cost-effective intervention that supports both physical and psychological well-being in patients on long-term hemodialysis, thereby reinforcing the positive trends observed in the present study.

Regarding the correlation analysis between the studied variables in both study and control groups across pre-, post-, and follow-up phases, the analysis revealed significant interrelationships among sleep quality, activities of daily living (ADLs), progressive muscle relaxation (PMR) efficacy, and quality of life (QoL) in the study group. Sleep quality was positively associated with both ADL performance and PMR efficacy across pre-, post-, and follow-up phases, indicating that patients who experienced better sleep were more capable of performing daily activities and engaging effectively with

relaxation techniques.

Similarly, ADLs were positively correlated with PMR across all phases, with the strongest association observed at follow-up, suggesting that improvements in functional independence were closely linked to consistent participation in PMR. Quality of life also showed significant positive correlations with ADLs in both the study and control groups during pre- and post-intervention phases, and with PMR in the study group, demonstrating that higher engagement with relaxation and better functional performance contributed to enhanced overall well-being. Collectively, these findings suggest that improvements in sleep quality, functional ability, and PMR efficacy are mutually reinforcing and play a critical role in promoting quality of life among hemodialysis patients.

These associations between sleep quality, ADLs, PMR efficacy, and QoL allow for a reasonable attribution of observed gains in QoL to the combined effects of improved sleep and PMR practice, which in turn support functional independence. The stronger correlations in the study group, compared to the control group, indicate that the using educational module likely played a causal role in facilitating and guiding these improvements. While correlation alone does not prove causation, the study's design with a control group and pre and post intervention assessments strengthens the ability to attribute positive changes in QoL to the intervention. Therefore, the findings suggest that the PMR program not only directly enhances relaxation and sleep quality but also indirectly contributes to better daily functioning and well-being, emphasized the multifaceted impact of targeted nursing care for hemodialysis patients.

Concerning overall quality of life, total QoL scores were similar between groups at baseline, confirming comparability before the intervention. Following the intervention, the study group exhibited a significant and clinically meaningful improvement in total QoL compared to the control group, figured the effectiveness of patient-centered nursing educational module. This finding is consistent with recent evidence showing that self-management programs and nursing interventions based on holistic care models significantly improve physical function, symptom management, and social support in hemodialysis patients ***(Keivan et al., 2023; Shu et al., 2025).***

The efficacy of PMR was particularly pronounced, with most patients in the study group achieving good levels of performance in both post- and follow-up phases, compared with very low baseline levels. These findings support the role of PMR as a feasible, low-cost intervention for reducing stress, fatigue, and sleep disturbances

in hemodialysis patients ***(Wu et al., 2025; WU et al., 2024; Hakverir & Gündoğdu, 2024; Boughdady et al., 2024).***

Correlation analyses further revealed that improvements in sleep quality were positively associated with enhanced performance in activities of daily living and higher PMR efficacy, which in turn correlated with greater overall quality of life in the study group.

These findings suggest that improvements in QoL can reasonably be attributed to the combined effects of better sleep and active engagement with PMR. While correlation alone does not prove causation, the inclusion of a control group and repeated pre- and post-intervention assessments strengthens the inference that nursing interventions played a causal role in these outcomes. The weaker or inconsistent correlations observed in the control group emphasize the importance of targeted interventions in producing these benefits.

Conclusion:

Based on the findings of the present study, it is concluded that marked improvement in sleep quality, independence in daily activities, and overall quality of life following the nursing intervention using self-care educational module. In addition, most patients demonstrated high efficacy in performing the progressive muscle relaxation technique after the intervention. Finally, statistically significant positive correlations were observed between sleep quality, activities of daily living, progressive muscle relaxation performance, and quality of life, confirming the effectiveness of the of educational module about self-care progressive muscle relaxation on hemodialysis patients' sleep quality, activity of daily living and quality of life.

Recommendations:

Based on the findings of this study the following recommendations are derived and suggested:

- Integration of self-care practice module a mean to teach step by step PMR technique and encouraging improving chronic disease self-management
- Assessing sleep quality and functional ability & quality of life at regular intervals to enable early detection of deterioration and timely intervention for hemodialysis patients.
- Provide accessible relaxation therapy services at low or no cost to overcome financial barriers and ensure equitable care for all dialysis patients.

Recommendations for future research:

- Involve care givers as family members and nurses in education about progressive muscle relaxation technique to help in reinforcement of patient adherence and support patients in practicing progressive relaxation technique.

- Conduct follow-up studies to evaluate the long-term impact of PMR on sleep quality, daily functioning, and quality of life, aligning with global recommendations for continuous monitoring of chronic illness interventions.
- Investigate barriers to patients' adherence to PMR.
- Encourage further comparative studies using larger samples to validate the effectiveness of PMR.

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Effect of Picture-Based Program for Empowering Females with Down Syndrome regarding Self-Protection from Sexual Harassment

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Abstract

Background: Females with Down syndrome are at a significantly higher risk of sexual harassment due to cognitive limitations, limited self-protection skills and inability to distinguish between safe and unsafe behaviors. **Aim:** Evaluate the effect of picture-based program for empowering females with Down syndrome regarding self-protection from sexual harassment**. Design:** A quasi-experimental research design was utilized. **Setting:** This study was conducted at the Folk Foundation Down Syndrome Charity, Kafr Al Zayat, El-Gharbeya Governorate which affiliated to the Ministry of Social Solidarity. **Subjects**: All down's females in Al-folk Foundation Down Syndrome Charity were included in the study. **Tools:** One tool was used in this study consisted of two parts; Part (1): Socio-demographic data of the participants, Part (2): Assessment of the empowerment of down's females regarding self- protection from sexual harassment. **Results:** There was a significant improvement in total empowerment of studied females with Down syndrome regarding self-protection from sexual harassment post-intervention. Before the program, most participants (93.3%) had unsatisfactory empowerment levels, while after the program, the majority (98.3%) showed satisfactory levels. The mean total empowerment score increased from 21.83 ± 5.41 pre-intervention compared to 56.70 ± 3.33 post-intervention (P = 0.001). **Conclusion:** The pictorial-based educational program effectively improved self-protection awareness and behaviors among females with down syndrome. **Recommendations:** Implementing pictorial-based educational programs within schools, rehabilitation centers, and healthcare settings to enhance empowerment, awareness, and self-protection skills among females with Down syndrome.

Keywords: Picture-based program, Self-protection, Females with Down syndrome, and Sexual harassment.

Introduction

Down syndrome (DS) is a common chromosome condition linked to intellectual disability and developmental delays. Congenital defects, illnesses, and unique physical characteristics are common in people with Down syndrome **(Bull & the Committee on Genetics, 2022).**

Children with mental retardation have a higher risk of facing sexual harassment than normal children without mental retardation. The increased risk is related to deficits in judgment and social skills. Some additional factors are deficits in communication, inability to seek help or report what happened. Besides that, there is an attitude from the family to isolate children which is a tradition with the assumption that children with mental disabilities do not need sex. So, it is unthinkable to provide education about sex **(Brisma & Amir, 2020).**

Sexual harassment is frequently characterized as inappropriate sexual behavior or unwelcome sexual attention. It covers a broad spectrum of behaviors, including actual or attempted rape or sexual assault, unsolicited sexual favor requests, unwanted physical contact or touching, invasion of personal space, and inappropriate sexual gestures or glances. Additional kinds include verbal behaviors like unwanted jokes, remarks, teasing, or private inquiries about someone's social or sexual life, as well as unsolicited communications like sexually suggestive letters or phone calls. Sexual harassment also includes inappropriately used terms of endearment and sexual comments regarding one's appearance or style **(Fitzgerald, Drasgow& Magley, 2021; Svae, Hassel & Søndenaa, 2023).**

A global concern for children with intellectual limitations is sexual harassment. About 20% of females and at least 5% to 10% of boys in the general population have experienced sexual harassment. Among children with intellectual disabilities, sexual abuse occurs between 14 and 65 percent of the time. Additionally, a third party sees the harassment in 29% of cases involving children with intellectual disabilities who are sexually harassed. The victim's home was the scene of 53.6% of the events, and 92.7% of the abusers were someone the child knew **(Jojo, Nattala, Seshadri, Krishnakumar, & Thomas, 2023).**

There are numerous causes for this danger of harassment. On a personal level, for instance, certain disabled children could find it challenging to physically distance themselves from a harasser, or they might be singled out by a harasser who believes they will not be able to report the harassment. Children with special educational needs and disabilities (SEND) who have been harassed report that they either ignored or received insufficient

responses to disclosures of harassment. This is frequently because they were not given the chance to express their opinions or because it was assumed that they were incapable of understanding or communicating **(Eloufy, Youssef, Abdelmageed & Abdelaziz, 2024; Kelly, Farrelly, Batool, Kurdi& Stanley, 2023).**

Sexual harassment is known to have a profound effect on victims, who may experience feelings of guilt, abandonment, harm, fear, and helplessness; their trust in others may be severely damaged; these feelings may result in stress reactions and symptoms of trauma; individuals with intellectual disabilities may even find it more difficult to cope with such a traumatic event, as they are more vulnerable and at a higher risk of having their capacity for adaptation harmed; victims may also find it difficult to engage in sexual relationships; and victims may be more afraid of any aspect of sex. It becomes imperative to make sure that individuals with intellectual disabilities are safe in their own surroundings and safeguarded from harassment, especially considering the high prevalence rates and serious consequences of sexual harassment **(Amelink, Roozen, Leistikow, &Weenink, 2021; Svae, Blixt & Søndenaa, 2022).**

For people with ID, preventing sexual harassment is an essential lifelong ability. Emphasized the significance of teaching preventative techniques to children with ID at all levels, including those who have not experienced harassment, those who have experienced harassment and require immediate assistance, and those who have experienced abuse and require ongoing assistance. Children should be taught to first identify possible abuse situations, then to resist by saying "no" and leaving, and finally, to report abuse to a trusted adult. People with ID need to be educated in these three preventive areas **(Barton, 2020).**

When teaching sexual education to people with intellectual disabilities, visual materials are crucial, according to recent studies. Visual aids like images, movies, role-playing, and modeling make abstract ideas easier to understand and impart the learning process more substance and significance. Instructors have noted that these tactics increase engagement and memory of protective actions in addition to improving comprehension. Students with intellectual disabilities can learn to distinguish appropriate and inappropriate contact, comprehend personal boundaries, and acquire self-defense skills by using visual and participative methods (**Strnadová, Loblinzk & Danker, 2022).**

Parents and teachers play a crucial role in teaching sex education and making sure they have the information

and tools they need to live safe and healthy lives. Because parents are the primary source of knowledge about their children's bodies, boundaries, sexuality, and interpersonal interactions, they serve as the first teachers in their lives. Children with Down syndrome should therefore receive sexual education so they can learn how to defend themselves against those who would sexually harm them. Given the breadth of sexual education, it must be taught from an early age **(Fahriyah, 2024).**

Community health nurses are crucial in preventing sexual harassment of Down syndrome patients due to their cognitive deficits, communication issues, and limited social boundaries. Because of the increased vulnerability of this population, community health nurses play a vital role in avoiding sexual harassment among people with Down syndrome by using their distinctive position in the community to advocate, educate, and support them **(American Nurses Association, 2021).**

Community health nurses can provide specialized sexual education to help people with Down syndrome learn how to express their boundaries, understand their bodies, and identify improper behaviors. Given the potential ineffectiveness of standard teaching methods, nurses should employ visual aids, narrative, role-playing, and drama tactics to improve comprehension. In addition, empowering self-protection is essential, as nurses assist people in identifying and reacting to unwanted attention or harassment, as well as teaching protective practices. **(American Nurses Association, 2021; Wanasinghe& Dissanayake, 2024).**

Significance of the study

Sexual harassment is one of the most terrible things that can happen in any community, and it occurs everywhere, including in our Arab Nations in particular. That discussion of it remains a taboo subject. Although it is a problem that does not pose a threat to females, Sexual harassment has expanded throughout society. The girls with mental disabilities did not flee from them **(Abuzaid, 2021).**

Children with intellectual disabilities are at a greater risk of being sexually victimized, and the rate of sexual harassment among them is 2–8 times the rate in the general population **(Tomsa, et al., 2021).** They have no support or training to identify or protect themselves against such situations. So, the aim of the study was to evaluate the effect of picture-based program for empowering females with Down syndrome regarding self-protection from sexual harassment.

The aim of this study was to:

Evaluate the effect of picture-based program for empowering females with Down syndrome regarding self-protection from sexual harassment.

Research hypothesis:

Picture-based program was expected to have a positive effect on empowering females with Down syndrome regarding self-protection from sexual harassment.

Subjects and method

Study design:

For achieving the aim of the current study, a quasi-experimental research design was used.

Study settings:

The study was conducted in the Folk Foundation Down Syndrome Charity, Kafr Al Zayat, El-Gharbeya Governorate which affiliated to the Ministry of Social Solidarity.

Study subjects:

All down's females registered at Al-folk Foundation Down Syndrome Charity were included in the study those with IQs ranging between (40:70). Their total number was (60) females.

Tools of the study: An interview assessment sheet of the empowerment of Down's females regarding self-protection from sexual harassment was used in this study for data collection. It was adapted from **(Atia, Abu El Soud, Khalil, & Elsayed, 2023).** It contained two parts as follow:

Part I: Socio-demographic data of the participants.

This part was filled in by the girls' mothers and was used to assess the demographic characteristics and social class of the participants. It included data such as age, residence, and birth order of the child, as well as the parents' age, educational level, occupation, family income, family size, number of rooms, crowding index, and social class.

Part II: Assessment of the empowerment of down's females regarding self-protection from sexual harassment.

This part was a pictorial form, as it consisted of pictures to assess females with Down syndrome's awareness of self-protection from sexual harassment. It contained three domains, and each domain entailed several pictures. These domains were:

Recognition of privacy domain:

- This domain consisted of pictures to measure the Down's females' recognition of their body's privacy, including knowing that their bodies were very precious and belonged to them only, knowing private areas in their bodies, understanding that no one had the right to see or touch these private parts, and knowing who was permitted to perform private activities such as bathing and dressing.

Innocent and inappropriate touch domain:

- This domain consisted of pictures to assess females with Down syndrome's understanding of the difference between innocent and inappropriate touch, as well as their ability to say "no" when

someone touched them inappropriately or when a harasser offered candy or gifts as a request for any inappropriate physical contact.

Reactions to sexual harassment situations domain:

- It measured the Down's females' awareness of safety rules on how to confront sexual harassment situations that showed how they would behave to respond when encountering harassment behavior and dangerous situations, as when a relative or stranger tried to touch private body parts; when a stranger asked her to go somewhere with him without consulting parents; when someone, either relative or stranger, held and kissed her and asked not to tell parents; and reporting the situation to parents or a trusted person.

Scoring system:

The scoring system for down's females empowering level was measured as the correct response to pictures was given score (1) and wrong response and unknown were given a score of (zero). The scores were summed, and the total score was converted into a percentage and was classified as follow:

Unsatisfactory level (Poorly empowered) : - < 50% of the total score.

-Partially satisfactory level (Moderately empowered):- 50% - < 75% of the total score.

-Satisfactory level (Highly empowered):- ≥ 75% of the total score.

Method

1. Obtaining approval

An official permission was obtained from the Dean of the Faculty of Nursing; Tanta University directed to Ministry of Social Solidarity and the directors of The Folk Foundation Down Syndrome Charity to obtain their approval and cooperation for carrying out the study.

2. Ethical considerations

- Approval of the Scientific Research Ethical Committee of the Faculty of Nursing, Tanta University was obtained to conduct the study code no.، **(494-7-2024).**
- An informed consent was obtained from parents of the study subjects after providing appropriate explanation about the purpose of the study.
- The right to abstain or terminate participation at any time was respected.
- The nature of the study did not cause any harm or pain for the entire sample.
- Assuring the parents of participants about the privacy and confidentiality of the collected data, and that was used only for the study purpose.
- A code number was used by the researcher instead of names.

3. Developing the study tool

-The study tool was adapted from **(Atia et al., 2023).**

4. The study tool was tested for construct and content validity by a jury of five experts in the field of community health nursing. The percentage of relevance of study tool items ranging from (97%-100%).

5. A pilot study

After the development of the tool, a pilot study was conducted on 10% of the total sample. The purpose of the pilot study was to test the clarity and applicability of the developed tool. No necessary modifications were made so this sample was included in the study.

6. The study tool was tested for its reliability by using Cronbach's alpha test, it was computed, and it was found to be = (0.618) for the study tool.

7. Developing the educational program

The educational program was conducted through four phases: (Assessment, planning, implementation, and evaluation phases)

Assessment phase:

In this phase, the data were collected by the previously mentioned tool through interviewing each study subject individually and their parents mainly mothers in predetermined setting to collect the baseline data and to take their responses to each picture as a pre-intervention assessment. The data collected during this phase served as the basis for subsequent comparisons to assess the program's effectiveness).

Planning phase:

Based on the findings obtained from the data analysis conducted during the assessment phase and the relevant literature, the researcher developed the program session content according to the needs of girls with Down syndrome and the aim of the study. The program goals and objectives were formulated in the form of a booklet based on the identified needs, prerequisites, and areas of inadequacy.

Implementation phase:

The duration of data collection was 4 months from October 2024 to January 2025. The researcher met the study subjects two days per week (Sunday – Wednesday) in the Folk Foundation Down Syndrome Charity.

The program was conducted through four main interactive learning sessions. Subjects were interviewed individually to apply intervention program. The length of each session was variable according to their responses and active participation, as well as the time available, and the content of each session. It ranged from 30-45 minutes.

Evaluation phase:

The post-test was administered immediately after the implementation of the program to evaluate its effectiveness by comparing the change in the girls' awareness

regarding self-protection from sexual harassment with the pretest results.

Statistical analysis of the data

The statistical data were organized, tabulated and statistically analyzed using statistical package for social studies (SPSS) version 23. For categorical data, the number and percent were calculated and the differences between subcategories were tested by Wilcoxon test (z). For numerical data the range, Mean and standard deviation were calculated. For comparison of two related means the paired sample t test was used. For comparison of more than two independent means, one-way Anova test was used, and independent t test was used for two independent means. Correlation between variables was evaluated using Pearson's correlation coefficient (r). The level of significant 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): reveal the distribution of the studied down's females according to their socio-demographic characteristics. The table shows that, 45.0% of females with Down syndrome were aged 6–<11 years (mean 10.92 ± 3.044), with most living with both parents (91.7%) and in rural areas (68.3%). Middle birth order was most common (38.3%). Over half of fathers (55.0%) and mothers (51.7%) were in older age groups; 45.0% of fathers and 41.7% of mothers had secondary education. All fathers were employed, while 91.7% of mothers were housewives. More than half belonged to families of 3–5 members (55.0%), 51.7% lived in three-room houses, 61.7% had high crowding index, and 55.0% reported sufficient income.

Figure (1) represents the distribution of the studied down's females according to types of mass media available in their homes. The figure shows that**,** almost all (100%) of them had television in their homes while nearly half (48.3%) of them had access to social media and (46.7%) to radio and only 6.7% of them had computer.

Table (2) shows the distribution of the studied down's females according to levels of empowerment regarding to recognition of privacy domain pre and post program intervention. The table shows that, there was a statistically significant differences between the studied down's females in relation to the levels of empowerment regarding to recognition of privacy domain pre and post program intervention ($P = 0.001$). As the vast majority (95.0%) of studied down's females had unsatisfactory empowerment level preprogram intervention. While the vast majority (98.3%) of them become

having satisfactory level post program intervention.

Moreover, it was observed that there was a significant improvement in the mean score of the levels of empowerment regarding to recognition of privacy domain. Where the mean score improved from (12.850±3.035) preprogram intervention to (32.17±2.172) post program intervention. The mean differences between the studied down's females pre and post program intervention in relation to mean scores of the levels of empowerment was statistically significant (P = 0.001).

Table (3) displays the distribution of the studied down's females according to empowerment level regarding innocent and inappropriate touch domain pre and post program intervention. The table shows that, there was a significant improvement in levels of empowerment regarding innocent and inappropriate touch domain among studied down's females where the majority (90.0%) of studied down's females had unsatisfactory level preprogram intervention. While the majority (90.0%) of them became satisfactory level post program intervention. A statistically significant difference between pre and post program intervention was found (P = 0.001).

Moreover, it was observed that there was a significant improvement in the mean score of the levels of empowerment regarding innocent and inappropriate touch domain. Where the mean score improved from (3.833±1.860) preprogram intervention to (10.225±1.083) post program intervention. The differences between the studied down's females pre and post program intervention in relation to mean scores of the levels of empowerment was statistically significant (P = 0.001).

Table (4) illustrates the distribution of the studied down's females according to levels of reactions to sexual harassment situations domain and empowerment level pre and post program intervention. The table reveals most (86.7%) of studied down's females had unsatisfactory level (poorly empowered) preprogram intervention. While the vast majority (98.3%) of them had satisfactory level (highly empowered) post program intervention. There was a statistically significant difference between the levels of empowerment regarding to reactions to sexual harassment situations pre and post program intervention (P = 0.001).

Moreover, it was observed that there was a significant improvement in the mean score of the levels of empowerment regarding to reactions to sexual harassment situations where the mean score improved from (5.150±2.536) preprogram intervention to (14.283±1.083) post program intervention. With

statistically significant difference (P = 0.001).

Table (5) reveals the distribution of the studied down's females according to total levels of the empowerment regarding self-protection from sexual harassment during pre and post program intervention. The table shows that , there was a significant improvement in the levels of the empowerment regarding self-protection from sexual harassment among studied down's females post program intervention .That preprogram intervention it was found that, the majority (93.3%) of studied down's females had unsatisfactory level (poorly empowered) preprogram intervention .While the vast majority (98.3%) of them had satisfactory level (highly empowered) post program intervention .The differences between the levels of empowerment regarding to self-protection from sexual harassment pre and post program intervention was a statistically significant (P = 0.001).

Moreover, it was observed that there was a significant improvement in the mean score of the levels of empowerment regarding to self-protection from sexual harassment. Where the mean score improved from (21.833 ± 5.409) preprogram intervention to (56.70 ± 3.325) post program intervention. The mean difference was statistically significant (P = 0.001).

Table (6) illustrates the relation between total mean and standard deviation of empowerment among studied down's females regarding self-protection from sexual harassment and their socio-demographic characteristics pre and post program intervention. The table shows that, there was a statistically significant relation between total mean score of empowerment regarding self-protection from sexual harassment pre and post program intervention and down's female's residence, mothers' education and crowding index. On the other hand, there was no significant relation found with other items of socio-demographic characteristics including (age, birth order, living arrangement, father age, father education, mother age and family monthly income).

Table (7) displays the correlation between total scores of empowerments of down's females regarding self-protection from sexual harassment and its domains pre-program intervention. The table reveals that there was a significant positive correlation between the total score of recognition of privacy domain and the total score of empowerments preprogram intervention at (r = 0.739) and (p = 0.000).

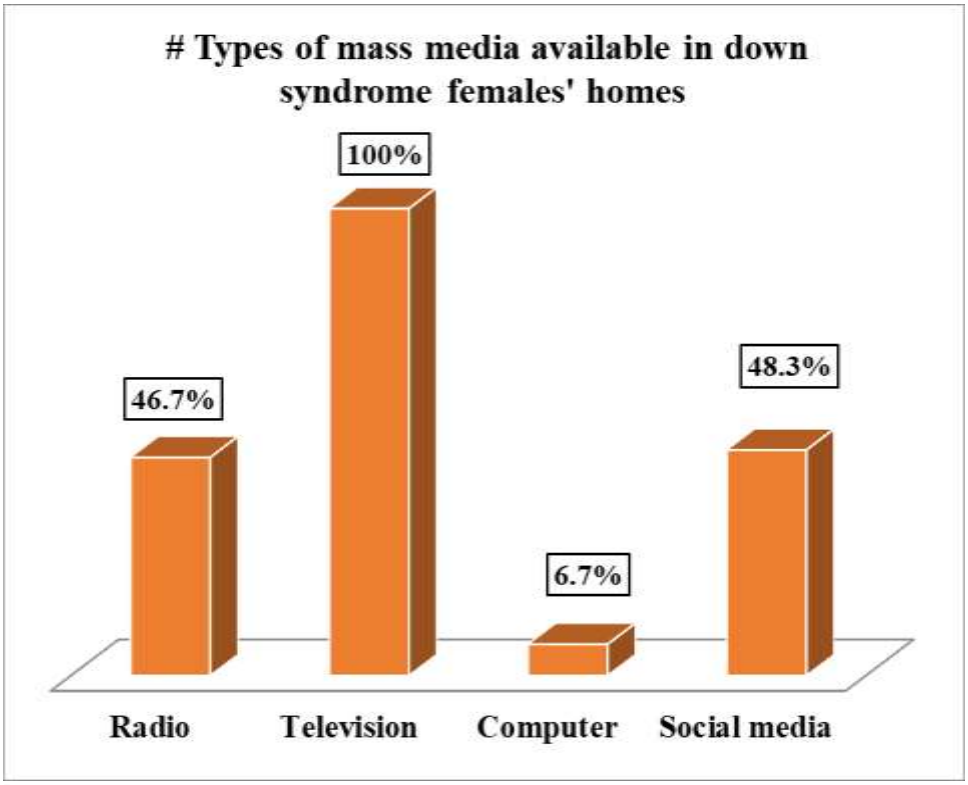
Also, there was a significant positive correlation between the total score of innocent and inappropriate touch

domain and the total score of reactions to sexual harassment situations domain and the total score of empowerments preprogram intervention at (r = 0.458, 0.661) and (p= 0.000, 0.000) respectively. In addition, there was a significant positive correlation between the total score of reactions to sexual harassment situations domain and the total score of empowerments preprogram intervention at (r =0.764) and (p = 0.000).

Table (1): Distribution of the studied down's females according to their socio-demographic characteristics

Down's females' socio-demographic characteristics	The studied down's females (n=60)	
	No	%
Age in years		
6 -	27	45.0
11 -	33	55.0
Range	6 – 17	
Mean ± SD	10.92 ± 3.044	
		Birth order
Alone	4	6.7
The First	12	20.0
Middle	23	38.3
The Last	21	35.0
Living arrangement		
Both parents	55	91.7
One of the parents	5	8.3
If the answer is one of parent, the reason for that	**(n=5)**	
Traveling	3	60.0
Separation or Divorce	2	40.0
Place of residence		
Rural	41	68.3
Urban	19	31.7
Father age		

30 -	27	45.0
46 -	33	55.0
Range	30 – 62	
Mean ± SD	45.85 ± 7.487	
Father education		
Illiterate	5	8.3
Read and write	12	20.0
Elementary education	9	15.0
Secondary general /Technical education	27	45.0
University and post university education	7	11.7
Father occupation		
Working	60	100.0
Mother age		
25 -	29	48.3
41 -	31	51.7
Range	25 – 57	
Mean ± SD	40.68 ± 8.052	
Mother education		
Illiterate	9	15.0
Read and write	19	31.7
Elementary education	5	8.3
Secondary general /Technical education	25	41.7
University and post university education	2	3.3
Mother job		
Working	5	8.3
Housewife	55	91.7
Family members		
From 3- 5	33	55.0
More than five	27	45.0
Range	3 – 7	
Mean ± SD	5.27 ± 1.056	
Rooms numbers		
Two rooms	25	41.7
Three rooms	31	51.7
Four rooms	4	6.7
Crowding index		
≤ 2	37	61.7
>2	23	38.3
Family monthly income		
Enough and save	33	55.0
Enough	27	45.0



(# more than one type)

Figure (1): Distribution of the studied Down's females according to types of mass media available in their homes

Table (2): Distribution of the studied down's females according to levels of empowerment regarding to recognition of privacy domain pre and post program intervention

Recognition of privacy levels	The studied down's females (n=60)				Z P
	Pre-program intervention		Post program intervention		
	No	%	No	%	
Unsatisfactory level (Poorly empowered	57	95.0	0	0.0	7.523 0.001**
Partially satisfactory level (Moderately empowered)	3	5.0	1	1.7	
Satisfactory level (Highly empowered)	0	0.0	59	98.3	
Range	6 – 22		25 - 36		
Mean± SD of total score	12.850±3.035		32.17±2.172		
t **p**	43.042 0.001**				

**** Highly statistically significant**

Table (3): Distribution of the studied down's females according to empowerment level regarding innocent and inappropriate touch domain pre and post program intervention

Innocent and inappropriate touch domain	The studied down's females (n=60)				Z P
	Pre-program intervention		Post program intervention		
	No	%	No	%	
Unsatisfactory level (Poorly empowered	54	90.0	0	0.0	7.201 0.001**
Partially satisfactory level (Moderately empowered)	5	8.3	6	10.0	
Satisfactory level (Highly empowered)	1	1.7	54	90.0	
Range	0 – 9		7 - 11		
Mean± SD of total score	3.833±1.860		10.225±1.083		
t **p**	23.209 0.0001**				

**** Highly statistically significant**

Table (4): Distribution of the studied down's females according to levels of reactions to sexual harassment situations domain and empowerment level pre and post program intervention

Reactions to sexual harassment situations domain	The studied down's females (n=60)				Z P
	Pre-program intervention		Post program intervention		
	No	%	No	%	
Unsatisfactory level (Poorly empowered	52	86.7	0	0.0	7.253 0.001**
Partially satisfactory level (Moderately empowered)	6	10.0	1	1.7	
Satisfactory level (Highly empowered)	2	3.3	59	98.3	
Range	1 – 13		8 - 15		
Mean± SD of total score	5.150±2.536		14.283±1.083		
t **p**	24.831 0.0001**				

**** Highly statistically significant**

Table (5): Distribution of the studied down's females according to total levels of the empowerment regarding self-protection from sexual harassment during pre and post program intervention.

Levels of the empowerment regarding self-protection from sexual harassment	The studied down's females (n=60)				Z P
	Pre-program intervention		Post program intervention		
	No	%	No	%	
Unsatisfactory level (Poorly empowered	56	93.3	0	0.0	7.475 0.001**
Partially satisfactory level (Moderately empowered)	4	6.7	1	1.7	
Satisfactory level (Highly empowered)	0	0.0	59	98.3	
Range	13 – 41		41 - 62		
Mean± SD of total score	21.833 ± 5.409		56.70 ± 3.325		
t **p**	42. 550 0.0001**				

**** Highly statistically significant**

Table (6): Relation between total mean and standard deviation of empowerment among studied down's females regarding self-protection from sexual harassment and their socio-demographic characteristics pre and post program intervention

Socio-demographic characteristics	Total empowerment of the studied down's females regarding self-protection from sexual harassment (n=60)			
	Preprogram		Post program	
	Mean ± SD	T test or F value P	Mean ± SD	T test or F value P
Age in years				
6 -	21.296±5.559	0.693	57.00±3.882	0.629
11 -	22.272±5.328	0.491	56.45±2.829	0.532
Place of residence				
Rural	20.902±4.392	2.008	56.487±3.661	0.723
Urban	23.842±6.841	0.049*	57.157±2.477	0.473
Father education				
Illiterate	22.200±2.774	0.232 0.919	58.600±1.140	0.689 0.603
Read and write	22.250±6.956		56.583±3.028	
Elementary education	20.666± 2.645		55.555±6.166	
Secondary general /Technical education	22.259±5.958		56.851±2.699	
University and post university education	20.714±5.089		56.428±1.902	
Mother education				
Illiterate	21.333±5.0497		57.444±3.126	

R and write	21.789±3.583	2.787 0.035*	56.210±4.528	0.290 0.884
Elementary education	22.200±4.919		56.200±3.114	
Secondary general /Technical education	21.040±5.740		56.960±.2.457	
University and post university education	33.500±10.606		56.000±2.828	
Crowding index				
≤ 2	23.054±6.159	2.641 0.011*	56.810±2.447	0.325 0.746
>2	19.869±3.137		56.521±4.450	
Family monthly income				
Enough and save	22.818±5.817	1.579 0.120	56.333±3.602	0.943 0.349
Enough	20.629±4.691		57.148±2.957	

*** Significant**

Table (7): Correlation between total scores of empowerments of down's females regarding self-protection from sexual harassment and its domains during pre-program intervention

Variables	Recognition of privacy domain total score	Innocent and inappropriate touch domain total score	Reactions to sexual harassment situations domain total score
	r p	r P	R P
Innocent and inappropriate touch domain total score	0.182 0.165		
Reactions to sexual harassment situations domain total score	0.245 0.059	0.458 0.000**	
Total scores of empowerments during preprogram	0.739 0.000**	0.661 0.000**	0.764 0.000**

****. Correlation is significant at the 0.01 level (2-tailed).**

Discussion

The current study created and implemented a sexual harassment self-defense program specifically for females with Down syndrome due to the lack of existing programs. This is because parents can't always keep a close eye on and provide round-the-clock care for their kids, and unfortunately, harassment can still happen since parents think their kids are with people they can trust.

Generally, the result of the current study showed that the studied Down's females had unsatisfactory levels of empowerment regarding self-protection from sexual harassment pre-program intervention. While there was a significant improvement in the levels of empowerment regarding self-protection from sexual harassment among them post-program intervention. This is corroborated by previous studies of **Amelink, et al., (2021),** who conducted a study to

assess "Sexual abuse of people with intellectual disabilities in residential settings" which examined cases of sexual abuse among individuals with intellectual disabilities in residential facilities in the Netherlands**.** Which emphasized that interactive, structured, and visual teaching methods are especially beneficial for people with intellectual disabilities because they improve understanding, memory retention, and the capacity to apply newly acquired skills in real-world contexts.

The findings of the present study demonstrated a significant improvement in the empowerment levels regarding the recognition of the privacy domain such as identify personal boundaries and private body parties (neck, breast, abdomen, vulva, feet and buttocks) among females with Down syndrome. Before the program intervention, the majority exhibited unsatisfactory empowerment levels, whereas post-intervention, most participants achieved satisfactory levels. Statistical analysis confirmed significant differences in privacy domain empowerment scores pre- and post-program (P = 0.001), indicating the effectiveness of the structured educational intervention **(Table 2).**

This is in agreement with **Lirola, Ruiz-Rico, Hernández-Rodríguez, and Prados-Megías , (2020)** who conducted a systematic review on body expression-based intervention programs for individuals with intellectual disabilities and found that such programs significantly enhanced body awareness, improving body recognition, and supporting personal autonomy, and the outcomes concerning private body areas (mouth, neck, chest, and vulva) are particularly important, as participants' awareness increased from minimal pre-intervention levels to large majorities post-intervention. This enhanced awareness of private areas is crucial for promoting self-protection

The results of the current study are consistent with **de Wit, Roeg and Embregts (2023)** who conducted a study ―Using concept mapping to explore the perspectives of people with mild to borderline intellectual disabilities toward sexual health in the Netherlands , mentioned that early social communication interventions can improve language skills and social interactions in children with down syndrome, which are crucial for understanding personal boundaries and the importance of education in enhancing personal boundaries and privacy awareness among individuals with intellectual disabilities. Similarly, **Gil-Llario, Fernández-García, Estruch-García, Ballester Arnal and Morell-Mengual (2024)** who conducted a study about: A quality of life and sexual health intervention for adults with mild intellectual disabilities in Spain, found that structured programs created to

teach individuals with neurodevelopmental disabilities about relationships and sexuality resulted in measurable improvements in their ability to recognize inappropriate touch and respond appropriately.

The present study revealed a significant improvement in the levels of empowerment regarding the domain of innocent and inappropriate touch among the studied females with Down syndrome. Before the program, the majority of participants demonstrated unsatisfactory levels of awareness, while after the intervention, the majority achieved a satisfactory level. Moreover, the mean score significantly increased from 3.833 ± 1.860 pre-intervention to 10.252 ± 1.083 post intervention ($p = 0.001$), confirming the effectiveness of the program in empowering participants to differentiate between innocent and inappropriate touch **(Table 3).** From the researcher's point of view, the significant improvement in distinguishing between innocent and inappropriate touch demonstrates the effectiveness of structured, picture-based education in addressing sensitive issues for females with Down syndrome.

These findings of the present study are consistent with **Wanasinghe and Dissanayake (2024)** who reported that drama-based interventions, including puppetry, storytelling, and role play, significantly enhanced the awareness of children with Down syndrome regarding good versus bad touch, appropriate and inappropriate secrets, and preventive strategies against child sexual abuse. Both studies emphasize that interactive and visually engaging teaching methods are more effective than traditional approaches in equipping children with intellectual disabilities with essential protective skills.

Turkish study supports the present findings was conducted by **Kemer and Dalgıç (2022)** who implemented the My Body is Special program using creative drama techniques with preschool children aged 5–6 years. The study reported substantial gains in children's use of protective strategies, including saying no, leaving unsafe situations, telling a trusted adult, and reporting abuse. These outcomes emphasize the effectiveness of drama-based interventions in enhancing body safety knowledge and self-protective skills among young children.

Furthermore, the results are consistent with recent program evaluations in different contexts **Xu, Fu, and Yang, (2024)** through the evaluation of the Chinese Doll Program in China, found that game-based educational toolkits, particularly when combined with active parental involvement, significantly improved children's ability to differentiate between appropriate and inappropriate touch and enhanced their awareness of protective behaviors.

Similarly, **Jojo et al., (2023)** in a study conducted in India among children with intellectual disabilities, reported that participants were able to distinguish between types of touch; however, their ability to resist inappropriate touch and report incidents was limited. This is inconsistent with the present study, where participants not only recognized different types of touch but also demonstrated significant improvements in self-protective behaviors, such as refusing inappropriate contact and informing a trusted adult. However, the study aligns with the current findings in emphasizing that structured, skills-based interventions are essential for enhancing protective abilities, highlighting the importance of interactive and practical training methods to translate knowledge into action.

The findings of the present study showed that most of the studied females with Down syndrome had unsatisfactory levels of empowerment in their reactions to sexual harassment situations before the intervention. After implementing the program, however, the majority reached satisfactory levels, with a significant improvement in the mean empowerment score from 5.150 ± 2.536 pre-program to 14.283 ± 1.083 post-program (P = 0.001) **(Table 4).** These results agree with the study of **Kim, (2016)** who evaluated a sexual abuse prevention program for children with intellectual disabilities in South Korea. Kim's study demonstrated that structured behavioral interventions significantly enhanced children's protective knowledge and refusal skills.

Similarly, the randomized controlled trial protocol by **Chodan, Häßler, and Reis (2017)** was designed to 10 evaluate the effectiveness of a sexual abuse prevention program specifically tailored for girls with intellectual disabilities in Germany.

Although it was a study protocol, its emphasis on the necessity of systematic and evidence-based interventions supports the findings of the present study, confirming the importance of empowerment-focused training in improving protective responses.

The present study revealed a significant improvement in the total levels of empowerment regarding self-protection from sexual harassment among females with Down syndrome following the illustrated empowerment program. Moreover, the differences between the pre- and post-program empowerment scores were statistically significant (P = 0.001), confirming the effectiveness of the intervention in enhancing participants' ability to protect themselves from potentially abusive situations **(Table 5).**

These findings are consistent with the results of **Paulauskaite, Rivas, Paris,**

and Totsika (2022) who conducted a systematic review of relationships and sex education outcomes for students with intellectual disabilities and reported that such educational interventions generally lead to improvements in knowledge, awareness, and protective behaviors. The agreement between the present study and **Paulauskaite et al., (2022)** review emphasizes the importance of tailored and accessible educational programs in promoting self-protection and reducing vulnerability to sexual harassment among individuals with intellectual disabilities.

The findings of the present study demonstrated a statistically significant relationship between the total score of empowerments regarding self-protection from sexual harassment before and after the pictorial-based educational program and certain socio-demographic variables, specifically the participants' residence, mothers' level of education, and the family crowding index **(Table 6).**

This indicates that the success of empowerment programs for females with Down syndrome is not only influenced by the intervention itself but also shaped by the social and familial context in which the participants live. Conversely, no significant associations were found with other socio-demographic characteristics such as age, birth order, living arrangement, father's age, father's education, mother's age, or family monthly income **(Table 6).**

These findings are supported by the meta-analysis conducted by **Mailhot Amborski, Bussières, Vaillancourt-Morel ،and Joyal, (2022)** which examined sexual violence against persons with disabilities. The study highlighted that vulnerability and protection outcomes are strongly influenced by demographic and contextual factors, such as living conditions and family resources. This supports the present study's results showing that contextual factors like residence and family crowding significantly influenced empowerment outcomes. Moreover, the grounded theory study by **Gokgoz, Deliktas Demirci ،and Kabukcuoglu، (2021)** which explored the experiences and opinions of mothers of adolescents and young adults with Down syndrome in Turkey, emphasized the critical role of family dynamics and parental education in shaping sexual behaviors, awareness, and protection practices.

In the present study, significant positive correlations were found between different empowerment domains among females with Down syndrome. During the preprogram phase, recognition of privacy was strongly correlated with the total empowerment score, while the domains of innocent and inappropriate touch were positively

associated with both reactions to sexual harassment situations and total empowerment. Reactions to sexual harassment situations also showed a strong correlation with total empowerment **(Table 7).**

These findings suggest that the different domains of empowerment are interrelated; improvement in one area, such as recognizing privacy or distinguishing between appropriate and inappropriate touch, may enhance the individual's ability to respond effectively to sexual harassment, highlighting the interrelated nature of knowledge, awareness, and behavioral response**.**

These findings agree with previous studies. For instance, **Kucuk, Platin ,and Erdem, (2017)** who conducted a study increasing awareness of protection from sexual abuse in children with mild intellectual disabilities: an education study conducted in Turkey, revealed that educational programs tailored with simplified and visual materials were effective in increasing awareness of protection from sexual abuse among children with mild intellectual disabilities.

This supports the idea that individuals with cognitive limitations benefit from visual-based and concrete teaching strategies similar to those applied in the current study. Moreover, **Gutiérrez-Bermejo, Flores, Amor ,and Jenaro, (2021)** in their study evidences of an implemented training program in consensual and responsible sexual relations for people with intellectual disabilities conducted in Spain, provided evidence of a structured training program that significantly improved responsible sexual relations, privacy, and safety awareness in individuals with intellectual disabilities, thereby reinforcing the relevance of empowerment-focused educational programs.

Overall, the findings point to the effectiveness of empowerment-based visual education programs in teaching girls with Down syndrome critical self-defense skills. They also draw attention to how these interventions can help close gaps in the literature about the shortage of accessible, specific training programs for this vulnerable population. While the findings of the current study are in line with previous findings, they also highlight the need for more research to broaden the application of these interventions, modify them for various cultural contexts, and evaluate their long-term viability in protecting people with intellectual disabilities from sexual harassment.

Conclusion

Based on the findings of the current study; It can be concluded that, the pictorial-based educational program was effective in significantly enhancing empowerment, awareness, and self-protective behaviors among

females with Down syndrome. Participants showed marked improvements in recognizing privacy, distinguishing between innocent and inappropriate touch, responding appropriately to sexual harassment, and implementing practical protective strategies. These findings highlight that structured, interactive, and visually-based interventions can successfully bridge knowledge and behavioral gaps in vulnerable populations.

Recommendations

Based on the findings of the current study, the following recommendations are derived and suggested:

- Integrate pictorial-based educational programs into the routine care and training of females with Down syndrome to strengthen empowerment and self-protection skills.
- Adopt a comprehensive approach that addresses multiple domains (privacy recognition, distinguishing touch types, and behavioral responses) simultaneously, as improvements in one domain reinforce others.
- Implement pictorial-based educational programs within schools, rehabilitation centers, and healthcare facilities to ensure wide accessibility.
- Promote community awareness campaigns to reduce stigma and raise sensitivity toward the risks of sexual harassment in individuals with intellectual disabilities.
- Conducting further researches by applying multimodal teaching strategies (e.g., role-play, storytelling, visual materials) to maximize engagement, understanding, and retention with disabled persons.

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Nursing Staff's Career Maturity in Relation to Career Expectations

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Abstract

Background: Career maturity facilitate the enhancement of competencies of nursing staff, which enhances them to develop realistic career expectations and find effective ways to achieve their career goals. **Aim:** To assess nursing staff's career maturity in relation to career expectations. **Research design:** A descriptive correlational study design was used. **Setting:** In all departments and intensive care units at El Menshawy General Hospital. **Subjects:** A stratified random sample of nursing staff (n=356)**. Tools:** Two tools were used to collect data, career maturity inventory and career expectations questionnaire. **Results:** More than half (58.9%) of the nursing staff had a moderate level of overall career maturity. The majority (85.4%) of nursing staff had a moderate level of overall career expectations. **Conclusion:** A significant positive correlation was observed between the overall career maturity of nursing personnel and their overall career expectations. **Recommendations:** Nurse managers establish a collaborative rather than hierarchical consultation relationships and create a forum where nurses feel genuinely heard and empowered to contribute ideas

Keywords: Career maturity, Career expectations. Nursing staff.

Introduction

Nursing is a profession that emphasizes the development of collaborative relationships in order to achieve the most favorable results for clients. The practice of nursing involves the assessment, promotion of health, provision of care, and treatment of health to ensure optimal function. The knowledge and competence of nursing staff must be consistently improved through ongoing learning, education, and acquiring the necessary experience to advance their profession **(Ejupi, Squires, & Skela-Savič,, 2025).**

A career is the progression of a nursing staff's professional life, which is achieved by selecting positions that align with their professional objectives. It is the accumulation of actions and progress that an individual undertakes over the course of their lifespan. A nursing profession should be rich, meaningful, autonomous, and provide access to the necessary conditions for growth, creativity, and maturity **(Mau and Krivanek, 2025)**.

Career maturity is the capacity to make appropriate decisions based on pertinent occupational knowledge, self-knowledge, and decision-making knowledge while engaging in planned exploration **(Tong et al., 2025)**. Career maturity is a persistent manner of improvement that reveals remarkably known traits essential for career development. Career maturity shows the degree to which one's intellect has matured concerning their technique of living their occupation and leisurely life **(Kato Nozue, & Yamashita, 2025)**.

The four dimensions that establish career maturity are inquiry, concern, confidence, and consultation. The extent to which nursing staff are engaged in and oriented to the process of making career decisions is referred to as the concern dimension. The inquiry dimension refers to the degree to which nursing staff are investigating the working world and acquiring knowledge about occupations and their prerequisites. The confidence dimension refers to the degree to which nursing staff have confidence in their capacity to make informed career decisions and practical occupation choices. The consultation dimension refers to the degree to which nursing staff seek advice or information from others in order to assist them in making career decisions **(Zhang, Shen, Xu, & Cui, 2025)**.

Career maturity is a critical component of the career

development, decision-making, and job and career satisfaction of nursing staff, **(Mau and Krivanek, 2025)**. Nursing staff who possess a high level of career maturity are better prepared to identify occupational preferences, make mature and realistic career decisions, and effectively plan and ruminate on their career aspirations **(Kato et al., 2025)**.

Nursing staff's career expectations encompass their expectations and aspirations regarding their professional development, such as the roles they anticipate assuming, the advancement they foresee, and the rewards they aspire to achieve. Understanding these expectations is essential for both nurses, who must align their objectives with realistic career trajectories, and for organizations that must customize their talent management strategies to attract, develop, and retain top talent **(Anselmann and Anselmann, 2025)**.

One of the eight dimensions that constitute career expectations is competition, freedom, management, life balance, organizational membership, expertise, learning, and entrepreneurship. Competition dimension is closely related to career growth and promotion opportunities, which is considered the most important aspiration factor. Freedom dimension is identified as "leisure time" or "me time," referring to the opportunity for free time, vacation, and social rewards in the workplace. Management dimension is linked to organizational hierarchy and supervisory support, involving aspects such as problem identification and information-seeking behavior. Life balance dimension is described as a constantly changing experience that requires flexibility to balance multiple roles regardless of career level **(Ha et al., 2024)**.

Organizational membership dimension involves a nurse's pro-activity and their relationship with supervisory support and creativity within a professional setting. Expertise dimension is framed as the desire for public recognition of nursing skills, which millennials value alongside affiliation and empowerment to increase motivation. Learning dimension encompasses expectations regarding work assignments, training opportunities, and career development, all of which remain high even during periods of recession. Finally, entrepreneurship dimension is defined as the opportunity to open a new business, driven by a nurse’s

ability to recognize business opportunities and utilize cognitive aspects for adaptive exploration **(Atalla, Mostafa, & Ali, 2025)**.

Significance of study

Preparing nursing staff with adequate career information and expertise and assisting their shift into clinical practice require a high level of career maturity. Which is essential for developing an attitude to understanding career performance and comprises an assessment of a person's level of career improvement relative to their career advancement activities. The nursing staff's increased competencies are suggested by their high level of career maturity, which may aid them in establishing realistic career expectations and identifying effective strategies for accomplishing their professional goals. Nursing staff are more likely to be enthusiastic about their work and have a greater sense of responsibility when they are contented with their job and career. This, in turn, enables them to provide better service to their patients **(Toson, Ahmed, & Ibrahim,, 2025)**. So, this study aims to assess nursing staff's career maturity in relation to career expectations.

Aim of the study

The study aims to: Assess nursing staff's career maturity in relation to career expectations.

Research Questions:

1- What are the levels of nursing staff career maturity?
2- What are the levels of nursing staff career expectations?
3- What is the relation between nursing staff career maturity and career expectation?

Research Design

A descriptive–correlation study design was used in the present study.

Setting

The study was conducted at El Menshawy General Hospital, which was affiliated to the Ministry of Health and Population and it was built in 1905. The total beds' capacity was 250 beds. It is divided into three main big buildings A, B, and C. It included all departments such as Internal Medicine, Pediatrics, Surgery, Pediatric Surgery, ENT, Urology, Maxillofacial, Orthopedics, Reception and Emergency, Insulation, Neurosurgery, Intermediate Care, Endoscopy, Sterilization, Toxicology, and Obstetrics & Gynecology. As well as, all intensive care units including the General Intensive Care Unit, Cardiac Care Unit, Hemodialysis

Unit, Neonatal Intensive Care Unit, and Pediatric Intensive Care Unit.

Subjects

The participants in the study were a stratified random sample of nursing staff (n=356) who were employed at the aforementioned hospital and were accessible at the time of data collection.

Tools of data collection:

To achieve the aim of the present study the following two tools were used:

Tool I: Career Maturity Inventory

It consisted of two parts as follows:

Part 1: **Nursing staff's personal data** included age, gender, marital status, unit/department, educational level, years of experience, position, previous training courses in the last year, type of shifts worked and any career vocation**.**

Part 2: Career Maturity Inventory

This part was developed by related literature **(Tarhan, Garousi, Turetken, Soylemez, & Garossi 2020,** the researcher based on **Abdul Rahim et al., (2021)** and **Nurani, 2022).** It aimed to assess the nursing staff career maturity level. It consisted of 38 items categorized into four subscales:

- **Concern** included 9 items
- **Curiosity** included 10 items
- **Confidence** included 10 items
- **Consultation** included 9 items

Scoring system

The responses of the nursing staff were evaluated using a 5-point Likert Scale, with the following categories: strongly disagree (1), disagree (2), neutral (3), concur (4), and strongly agree (5). The scale ranges from 1 to 5. The total scores were categorized into the following categories based on the statistical termination point (60%):

- High level of career maturity >75%
-Moderate level of career maturity 60-75%
-Low level of career maturity <60%

Tool II: Career Expectations Questionnaire

The tool was developed by the researcher based on **Wang, Guo, Song, Hao, Qiao, (2022)** and related literature **(Hong, Bergman, Walker, & Massa, 2022 and Wu, Pei, Li, & Jiang, 2020)**. It aimed to assess the nursing staff career expectations. It consisted of 69 items categorized into eight subscales:

- **Competition** included 8 items
- **Freedom** included 10 items
- **Management** included 9 items
- **Life Balance** included 8 items
- **Organization membership** included10 items
- **Expertise** included 10 items
- **Learning** included 9 items

- **Entrepreneurship** included 5 items

Scoring system

Nursing staff's responses were measured on a 5-points Likert Scale ranging (1-5) where, strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). Total scores were categorized according to statistical cut off point (60%) into:

-High level of career expectations >75%.

-Moderate level of career expectations 60-75%

-Low level of career expectations <60%.

Method

1. The dean of the Faculty of Nursing has granted official permission, and the submission will be made to the appropriate personnel of the aforementioned settings.

2. Ethical considerations:

a. Approval of the Scientific Research Ethical Committee of the Faculty of Nursing at Tanta University was obtained (code no. 403-3-2024).

b. The nurses were not experiencing any discomfort or damage as a result of the study's nature.

c. The nurses' consents to participate in the study were obtained after they were informed of the character of the study, the privacy of the information they provided, and their right to withdraw.

d. Privacy and confidentiality were prioritized during the data collection process. In lieu of names, a code number was implemented.

3. The researcher devised Tools I and II, which were subsequently translated into Arabic and presented to a jury of five experts in the field to verify their content validity.

- The Faculty of Nursing at Tanta University was represented by three professors, one assistant professor, and one professor of Nursing Administration. The expert's responses were reported on a four-point Likert Scale, with four indicating strongly relevant, three indicating relevant, two indicating little relevance, and one indicating not relevant. Clarification, the addition of certain items and the omission of others, and the simplification of work-related terms were among the necessary modifications. - Face validity for career maturity scales of staff nurses was 91.1 % and 89.0% for career expectations.

4. A pilot investigation was conducted on 10% of the

subjects (36). A pilot study was conducted in accordance with the experts' recommendations prior to the commencement of the actual data collection. The pilot study was conducted to assess the intelligibility, sequence of items, relevance of the query, applicability, and required time to complete the questionnaire. The researcher modified the instrument in accordance with the feedback from the jury and pilot study. The pilot was excluded from the study subjects.

5. The Cronbach's Alpha coefficient was employed to evaluate the reliability of the instruments. The Career Maturity Inventory demonstrated a value of 0.906, while the Career Expectations Questionnaire demonstrated a value of 0.965.
6. Data collection phase: Nurses were consulted by the researcher to acquire the data. The researcher met with the nurses in small groups of approximately five at their work locations and distributed the questionnaire to them during their morning and afternoon work schedules, according to their workload. The questionnaire was anticipated to require 20-30 minutes to complete. In order to verify and elucidate that all inquiries were satisfactorily addressed, the participants documented their responses in the presence of the researcher.
7. Data was collected within three months, from the beginning of July until the end of October 2024.

Statistical analysis of the data:

A version of IBM SPSS 20.0, which was published in 2011 by IBM Corp. in Armonk, NY, was used for the data analysis. The categorical data was summarized using percentages and numbers. To determine if the continuous data was normally distributed, the Kolmogorov-Smirnov test was employed. Statistical measures utilized to characterize the numerical data included range (both minimum and maximum), mean, and standard deviation.

The used tests were The chi-square test is used to compare various groups using category variables. ANOVA (F-test) More than two groups can be compared using normally distributed quantitative variables. The Pearson correlation coefficient is used to determine the degree of association between two quantitative variables that were regularly distributed.

Results:

Table (1): Shows personal and work-related data of the nursing staff. It was observed that the age of the nursing staff was ranged from 23 – 44 with mean age 30.0 ± 6.5 years and the majority (90%) of them were females. Additionally, more than two-thirds (73.3%) of them were married. As regard to the department, the highest proportion of nursing staff were worked at reception and emergency department (11.24%) followed by ICU (10.96%) and NICU (10.67%) while, the lowest proportion were worked at ENT (1.1%), and Endoscopy (1.1%) department. Also, as noticed nursing staff' years of experience was ranged from 3 – 27 with the mean 11.3 ± 10.9 years of experience.

The majority (93.54%) of nursing staff was staff nurses, while only 0.4% were head nurses. As for educational level, nearly half (48.9%) of the nursing staff had a Technical Nursing Diploma, while 28.0% of them had Bachelor in Nursing Science. As noticed, nearly two thirds (62.0%) of nursing staff had previous training on career maturity and career expectations. Regarding the shift type, nearly two fifths (39.6%) of nursing staff were at the morning shift (8 – 2). Additionally, nearly half (46%) of them had career vacations.

Table (2): Displays the mean scores and ranking of nursing staff' career maturity dimensions. As noticed, concern was ranked as the highest (88.75 ± 8.0) dimension of career maturity dimensions with mean scores 35.5 ± 3.2, followed by curiosity dimension with a mean score of 30.5 ± 4.5. While, consultation was ranked as the lowest (82.33 ± 9.7) dimension of career maturity dimensions with mean scores 24.7 ± 2.9.

Table (3) &Figure (1): clarifies levels of nursing staff' career maturity dimensions. It was obvious that, more than half (58.9%) of the nursing staff had a moderate level of overall career maturity. It demonstrates that around two third (65.7%, 62.6%) & of the nursing staff had a moderate level of consultation, and confidence dimension of career maturity. As well as, half and more (56.5%, &50%) of them had a moderate level of curiosity and concern dimension. of career maturity.

Table (4): Displays the mean scores and ranking of nursing staff' career expectations dimensions. As observed, entrepreneurship was ranked as the highest (88.75 ± 8.0,) dimension of career expectations dimensions with mean scores 4.3 ± 0.5, followed by learning dimension with mean scores 29.9 ± 2.3. While, expertise was ranked as the lowest (82.89 ± 8.9.) dimension of career expectations dimensions with mean scores 37.3 ± 4.0.

Table (5) &Figure (2): Clarifies levels of nursing staff' career expectations dimensions. It was obvious that, the majority (85.4%) of nursing staff had a moderate level of overall career expectations. It demonstrates the majority (89.6% 87.1%, 86.5%, 85.7%, 84.8%, 84.6%, 82.9% & 79.5%) of nursing staff had a moderate level of competition, freedom, management, life balance, organizational membership, expertise and learning and entrepreneurship dimensions of career expectations, respectively. While, none of them had a high level of career expectations dimensions.

Figure (3): Reveal correlation between overall nursing staff' career maturity and career expectations. It was evident that there was a significant positive correlation between overall nursing staff' career maturity and career expectations ($r= 0.64$, $P<0.001$).

Table (1): Personal and work related data of nursing staff (n=356)

Personal and work related data	No.	%
Age (years) Mean ± SD Range	30.0 ± 6.5 23 – 44	
Gender Female Male	321 35	90.0 10.0
Marital Status Married Single	261 95	73.3 26.7
Department		
Internal medicine	15	4.2
Pediatric	15	4.2
Surgery	22	6.2
Pediatric Surgery	5	1.4
ENT	4	1.1
Urology	5	1.4
Maxillofacial	5	1.4
Orthopedic	18	5.1
Reception and Emergency	40	11.24
Isolation	5	1.4
Neurosurgery	8	2.2
Intermediate Care	14	3.9
Endoscopy	4	1.1
Sterilization	13	3.7
Toxicology	12	3.4
Obstetrics and Gynecology	23	6.46
ICU	39	10.96
CCU	33	9.27
Hemodialysis	26	7.30
NICU	38	10.67
PICU	12	3.4
Years of Experience Mean ± SD Range	11.3 ± 10.9 3 – 27	

ICU: Intensive Care Unit, CCU: Cardiac Care Unit, NICU: Neonatal Intensive Care Unit, PICU: Pediatric Intensive Care Unit

Continue Table (1): Personal and work related data of nursing staff (n=356)

Personal and work related data	No.	%
Educational Level		
Technical Nursing Diploma	174	48.9
Bachelor in Nursing Science	100	28.0
Postgraduate Studies	82	23.1
Position		
Staff nurse	333	93.54
Nursing Supervisor	21	5.90
Head Nurse	2	0.4
Previous Training on career maturity or career expectations		
No	221	62.0
Yes	135	38.0
Shift Type	141	39.6
Morning 8 - 2	115	32.2
Evening 2 - 8	100	28.2
Night		
Any career vacation	192	54.0
No	164	46.0
Yes		

Table (2): Mean scores and ranking of nursing staff's career maturity dimensions(n=356)

Career maturity dimensions	Scores	Total Scores			% Scores	Rank
		Min. – Max.	Mean ± SD.	Median	Mean ± SD.	
- **Concern**	(30 – 40)	30 – 40	35.5 ± 3.2	36	88.75 ± 8.0	1
- **Curiosity**	(25 – 35)	25 – 35	30.5 ± 4.5	31	87.14 ± 12.8	2
- **Confidence**	(21 – 30)	21 – 30	25.2 ± 3.1	25	84.00 ± 10.3	3
- **Consultation**	(21 – 30)	21 – 30	24.7 ± 2.9	25	82.33 ± 9.7	4
Career maturity inventory total	(104 – 133)	104 – 133	115.9 ± 10.2	116	87.14 ± 7.7	

Table (3): Levels of nursing staff's career maturity dimensions (n=356)

Career maturity dimensions	High No	%	Moderate No.	%	Low No.	%
– **Concern**	142	39.9	178	50	36	10.1
– **Curiosity**	89	25	201	56.5	66	18.5
– **Confidence**	67	18.8	223	62.6	66	18.5
– **Consultation**	78	21.9	234	65.7	44	12.4
– **Total**	**376**	**26.5**	**836**	**58.9**	**212**	**14.9**

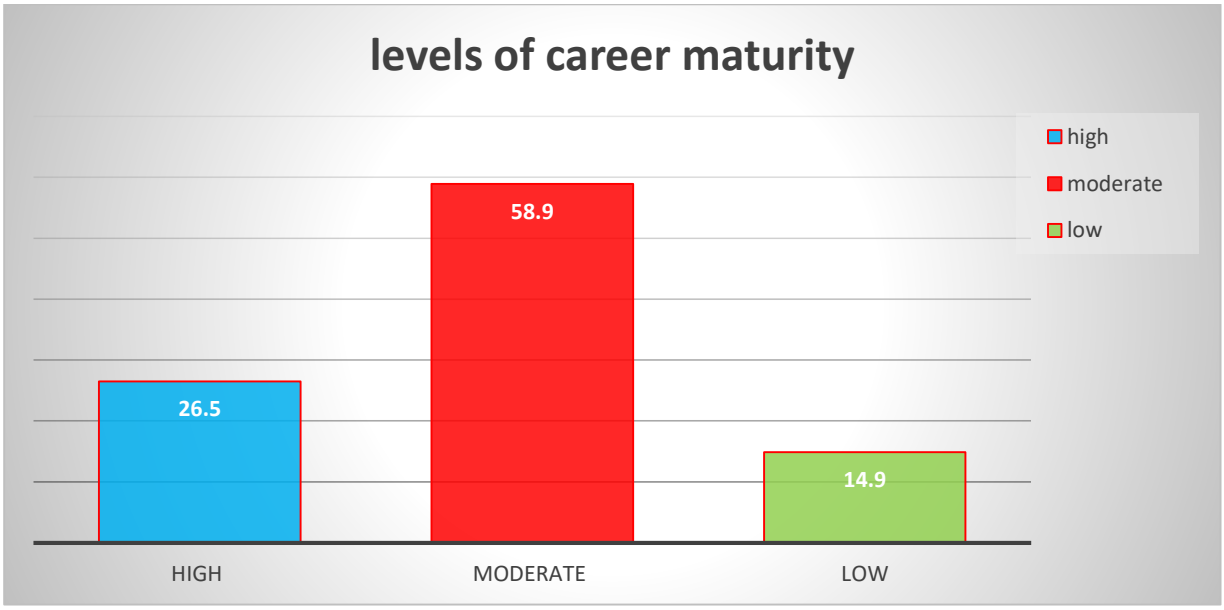

Figure (1): Levels of overall nursing staff' career maturity

Table (4): Mean scores and ranking of nursing staff's career expectations dimensions (n=356)

Career expectations dimensions	Scores	Total Scores			% Scores	Rank
		Min – Max	Mean ± SD	Median	Mean ± SD	
– **Competition**	(25 – 35)	25 – 35	31.0 ± 3.0	31	88.57 ± 8.6	**3**
– **Freedom**	(29 – 40)	29 – 40	34.9 ± 4.7	35	87.25 ± 11.8	**4**
– **Management**	(14 – 20)	14 – 20	16.9 ± 2.4	17	84.50 ± 12.0	**6**
– **Life Balance**	(20 – 25)	20 – 25	21.2 ± 1.6	21	84.80 ± 6.4	**5**
– **Organizational membership**	(21 – 30)	21 – 30	23.8 ± 2.8	24	79.33 ± 9.3	**7**
– **Expertise**	(33 – 45)	33 – 45	37.3 ± 4.0	37	82.89 ± 8.9	**8**
– **Learning**	(28 - 35)	28 – 35	29.9 ± 2.3	30	85.43 ± 6.6	**2**
– **Entrepreneurship**	(4 – 5)	4 – 5	4.3 ± 0.5	4	86.00 ± 10.0	**1**
Career expectations total	**185 – 229**	**185 – 229**	**199.3 ± 16.2**	**199**	**87.07 ± 7.1**	

Table (5): Levels of nursing staff's career expectations dimensions (n=356)

Career Expectations Item	Moderate		Low	
	No.	%	No.	%
Competition	319	89.6	37	10.4
Freedom	310	87.1	46	12.9
Management	301	84.6	55	15.4
Life Balance	302	84.8	54	15.2
Organizational Membership	283	79.5	73	20.5
Expertise	295	82.9	61	17.1
Learning	305	85.7	51	14.3
Entrepreneurship	308	86.5	48	13.5
Total	**2313**	**85.4**	**425**	**14.6**

Figure 2: Levels of overall nursing staff's career expectations (n=356)

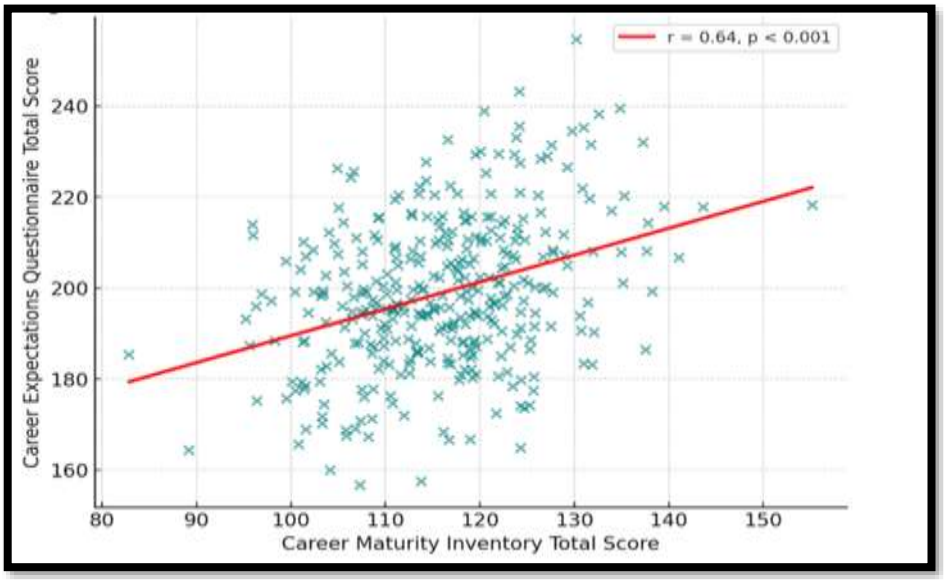

Figure 3: Correlation between overall nursing staff's career maturity and career expectations (n=356).

Discussion

Career Maturity Levels

The current study revealed that more than half of the nursing staff exhibited a moderate level of career maturity, with approximately one-quarter demonstrating high levels and a smaller group indicating low degrees of maturity. This moderate level suggests partial readiness for career decision-making that may be attributed to several organizational and contextual factors, including heavy workload demands, limited opportunities for systematic skill development, insufficient protected time for career planning activities, and organizational constraints that hinder access to mentorship programs and professional development resources.

Additionally, all the dimensions of career maturity also reported a moderate level and the ranking from highest to lowest was concern, curiosity, confidence, and consultation. Nursing staff demonstrated a strong awareness and motivation for career advancement but exhibited a notable lack of help-seeking behaviors and underutilization of available support resources such as supervisors and mentors. This reflection may be due to hierarchical workplace cultures that discourage open consultation, time pressures that prevent meaningful engagement with support systems, inadequate dissemination of information regarding available career resources, or insufficient training in self-advocacy and career navigation skills. These findings indicate that nursing staff possess foundational career awareness and interest, translating this potential into actionable career decisions requires targeted interventions, including structured mentorship programs, dedicated career counseling services, workload optimization strategies, and institutional support systems that actively facilitate and normalize help-seeking behaviors within the professional environment.

In agreement with the findings, **Chen et al.,(2024**) conducted their study revealed that nursing staff achieved a moderate level of overall professional growth, falling below the ideal threshold expected in the Chinese healthcare context. Also aligning with our moderate career maturity among nursing staff, **(Nasser Rayan, (2023))** found that most participants reached a moderate level of maturity and show that nurses score highest in the consultation dimension but lowest in curiosity.

In the same line, the current results, **Kato et al., (2025**) who revealed a moderate level of career maturity and also found that thinking about one's own thought processes directly shapes this maturity.

In contrast to observation that moderate career maturity predominates among nursing staff with potential for career progression,

Zhao, Zhang, Zheng, (2023). Also, **Nie et al., (2024**) found that organizational help directly drives career growth among Chinese nurses.

Career Expectations levels

The present study found that most of nursing staff had a moderate level of career expectations, with no participants showing high expectations, indicating a systemic ceiling effect due to inadequate organizational support. The findings revealed that nurses have adjusted their aspirations to fit perceived realities, with the highest priorities being entrepreneurship and learning, while organizational membership and recognition ranked lowest. This suggests a preference for autonomy and self-directed development over institutional loyalty, potentially reflecting weak organizational cultures.

The moderate expectations with absent high-level aspirations reflect systemic organizational constraints rather than individual pessimism. This aligns with **Kotp et al., (2025)** study whom documented significant career aspirations coexisting with recognized barriers among Egyptian nursing graduates. In their study, three-fifths identified financial constraints, half cited limited educational opportunities, and one-third faced job market competitiveness— forcing pragmatic expectation recalibration downward despite underlying ambitions.

Also, **Kallio, Liljeroos, Koivunen (2024**) stated that confirming organizational infrastructure fundamentally constrains expectation formation, with most institutions lacking adequate advancement pathways and developmental systems. Career expectations are shaped by perceived organizational capacity, creating systemic ceiling effects where insufficient resources directly limit aspiration levels—explaining why high expectations are absent despite moderate planning engagement.

In contrast to the present findings, **Callado, Teixeira, & Lucas, (2023**) found that most of their nurses were deeply invested in their organization's success. Most felt their personal values matched their employer's mission. Also, **Al-Hussami et al., (2025**) showed that high organizational commitment actually predicts better professional aspirations and indicates that organizational commitment does not limit ambition. Instead, strong institutional structures help nurses channel their high expectations into better performance and quality-focused goals.

Neves et al., (2022) found a high levels of organizational commitment among Portuguese nurses, and discovered that when nurses identify with organizational goals, their desire to quit drops significantly.

Correlation between Career Maturity and Career Expectations

The present study identifies a positive relationship between career maturity and career expectations, indicating that higher career maturity correlates with clearer and more ambitious expectations. Successful career decision-makers gain insights into their strengths and the job market. Notable positive associations include confidence and life balance, consultation and expertise recognition, and curiosity with both freedom and competition. Conversely, a reliance on supervisor guidance diminishes autonomy expectations, suggesting that frequent consultation can limit flexibility as nurses become aware of organizational constraints.

In agreement with the current findings, **Zhang et al., (2024**) who reported that higher levels of career expectations among nursing staff were significantly associated with increased career maturity and adaptability. Also, **Nie et al., (2024**) demonstrated a positive correlations between organizational career management practices and career growth outcomes.

Conclusion

Based on the findings of the present study, it was concluded that more than half of nursing staff demonstrated moderate career maturity. Similarly, the vast majority of nursing staff held moderate career expectations across eight dimensions, with notably absent high-expectation formation. A strong positive statistically significant correlation existed between nursing staff's overall career maturity and their overall career expectations.

Recommendations

The findings of the present study directed to recommend the following:

For Hospital Administrators

- Strengthen organizational membership and loyalty through enhanced recognition systems, transparent communication regarding advancement opportunities, transformational leadership development, and deliberate cultivation of professional belonging and institutional pride.
- Facilitate active career exploration through systematic exposure to diverse nursing specialty pathways, structured rotation programs, and accessible career information systems to convert passive curiosity into active systematic exploration.
- Flatten hierarchical organizational structures and implement psychological safety initiatives that normalize and reward help-seeking behaviors, recognizing that hierarchical cultures actively suppress consultation despite nurses' readiness to seek guidance.
- Develop formal systems for recognizing and validating specialized nursing expertise through career pathways,

certification support, salary differentiation, and public acknowledgment to address the disconnect between skill development efforts and institutional recognition mechanisms.

For Nurse Managers

- Provide active mentorship, coaching, and regular feedback to nursing staff, recognizing that intentional investments in guidance directly enhance nurses' confidence, competence, and career adaptability.
- Create structured opportunities for exposure to diverse nursing roles and specialty areas, facilitating informed career exploration and helping nurses develop realistic, grounded expectations about available pathways.
- Support nurses' engagement in continuing education, conference attendance, and specialty certifications by optimizing scheduling and providing financial or logistical support to elevate learning expectations into actionable professional growth.
- Establish collaborative rather than hierarchical consultation relationships, creating forums where nurses feel genuinely heard and empowered to contribute ideas, question existing practices, and participate in organizational decision-making.

For Nursing Staff

- Seek out and utilize available mentorship resources, supervision, and career counseling services, recognizing that help-seeking behaviors directly enhance career maturity and position nurses as valued professionals within their organizations.
- Participate in available career development training, continuing education, and professional development opportunities to continuously strengthen decision-making skills, clinical competencies, and career maturity.
- Communicate clearly with supervisors and managers regarding career aspirations, learning needs, and professional development interests to enable supportive organizational responses and identify aligned opportunities.
- Network within professional nursing communities, nursing associations, and specialty groups to expand awareness of career possibilities beyond immediate organizational constraints and build peer support systems for sustained professional growth.

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Influence of Faculty Members' Caring Behaviors on Nursing Students' Academic Burnout

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Abstract

Background: Faculty members' caring behaviors are a crucial key for enhancing nursing students' learning, confidence, professional identity, and success while reducing academic burnout, whereas uncaring behaviors increase stress and harm students' well-being. **Aim:** This study aimed to assess the influence of faculty members' caring behaviors on nursing students' academic burnout. **Design:** A descriptive-correlational study. **Setting:** The study was conducted at the Faculty of Nursing, Tanta University, Egypt. **Subjects:** This study included stratified proportional randomized sampling of undergraduate nursing students (1085 out of 3887). **Tools:** The data was collected using two tools: Faculty member's Caring Behaviors and Nursing Students' Academic Burnout Questionnaire. **Results:** The findings indicated that 44.6% of nursing students perceived a low level of faculty members' caring behaviors, while 31.2% demonstrated a moderate level, and 24.1% perceived a high level. In contrast, 45.3% of nursing students experienced a high level of academic burnout, 38.8% reported a moderate level, and only 15.9% had a low level. **Conclusions:** The study revealed the faculty members' caring behaviors have an important role in reducing nursing students' academic burnout, in which a statistically significant negative correlation was found between nursing faculty members' caring and nursing students' academic burnout. **Recommendations:** Building a supportive-caring learning environment, implementing mentoring programs for junior nursing faculty, promoting faculty well-being and anti-bullying policies, and engaging nursing students in stress management strategies including time management and relaxation techniques.

Keywords: Academic burnout, caring behaviors, Faculty members, Nursing students.

Introduction

Nursing education plays a crucial role in the acquisition of fundamental nursing competencies required for professional practice. It is the rapidly changing landscape, which is an exciting world of innovation, digital revolution, and accelerated knowledge creation that offers hopeful and infinite possibilities to improve patient care, safety, and outcomes **(Hwang and Kim, 2022)**. Faculty members are the cornerstone of outstanding nursing programs that make nursing education possible. Nursing faculties' attitudes and actions play a determinant role in students' learning experiences in nursing programs **(Negm et al., 2024)**. The faculty members' caring behaviors influence nursing students' self-image and drive them to become better caregivers and grow as caring people for others. Thus, nursing education should not just pass down scientific skills but also provide mentors as role models for caring. Caring is a fundamental value in nursing that is considered an aspiration for all nursing students **(Wei et al., 2021)**.

Faculty members' caring behaviors are actions concerned with the well-being of nursing students, involving sensitivity, confidence, attentive listening, honesty, and nonjudgmental acceptance. Caring behaviors reflect moral modeling, supportive interactions, and constructive challenges, which foster a positive learning environment, enhance professional socialization, and cultivate caring attitudes that influence future nursing practice **(Labrague and Obeidat, 2025; Tambunan and Kristiana, 2022).**

Faculty caring behaviors play a vital role in nursing education by shaping students' academic success and professional identity. When educators demonstrate empathy, respect, and supportive communication, they create a positive learning environment that enhances students' confidence, belonging, and intention to graduate **(Chipeta et al., 2022; Henderson, Sewell, & Wei, 2020).** Caring behaviors of faculty members have five dimensions, including confidence, respect, supportive learning, appreciation, professional anticipation, and control versus flexibility **(Moloney, Fieldes, & Jacobs, 2020)** .

Confidence through caring is the appropriate context to start a relationship where the student feels safe, protected, and motivated to learn **(Subke, Downing, & Kearns, 2020)**. Respect is a key element for building an instructor-student relationship, which is considered part of the expectations of both people **(Soroush, Andaieshgar, Vahdat, & Khatony, 2021)**. A supportive learning climate includes effective and fair use of appropriate discipline practices that promote positive student and faculty

member practice **(Inocian et al., 2022).**

Appreciation of life's meanings is a vital aspect of an appositive psychological state that has a significant influence on physical and mental health **(Cheng, Chen, & Zhang, 2021)**. Professional anticipation strongly influences the behavior, adaptation, and learning of nursing students, mediating their decision-making, action execution, and attention **(Al-Osaimi and Fawaz, 2022)**. Control versus flexibility provides guidance and encouragement without misusing authority, helping nursing students recognize their professional potential and remain committed to their studies **(Costan et al., 2022).**

In contrast, uncaring behaviors can harm nursing students' emotional well-being, increased stress, and consequently may contribute to academic burnout **(Shali, Nasrabadi, Manookian, & Rahimi, 2025).** Nursing students experience high levels of stress due to their significant workload, relatively inflexible curriculum, competitive atmosphere between peers, and preparation for the national nurse license exam, which inevitably leads to burnout **(Ghods et al., 2023; Oducado et al., 2022)**.

Academic burnout is a negative emotional, physical, and mental reaction to prolonged study that results in exhaustion, frustration, a lack of motivation, and reduced ability in school. It is a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment that can occur among nursing students. Academic burnout is classically described as a three-dimensional process: emotional exhaustion, cynicism, and a loss of professional efficacy **(Andargeery et al., 2025).**

Emotional exhaustion refers to a chronic state of physical and emotional fatigue resulting from excessive academic demands and sustained engagement in clinical practice. Cynicism refers a negative, hard-hearted, or excessively detached response to various aspects of the job. In this context, professional inefficacy reflects a feeling of self-incompetence, lack of reducibility, or lack of job achievement, which tend to negatively evaluate one's accomplishments with recipients **(Drăghici and Cazan, 2022; Ghods et al., 2023)**

Significance of the study:

Faculty members have continued to debate until now whether caring is an important behavior that must be taught and has a significant effect on nursing students' lives. To help nursing students continue to be a caring science profession, pre-licensure nursing education plays a vital role in preparing undergraduate nursing students' caring attributes, as well as building a sense of meaning in academic activities and affiliation in

class tasks, and increasing interest in academic issues. Academic burnout is a crucial factor that can be the main reason affecting nursing students' academic performance and their enthusiasm toward education **(Henderson et al., 2020; Wei et al., 2021)**. Therefore, the current study aims to investigate the nursing students' perceptions of faculty caring behaviors and their influence on academic burnout.

Aim of the study:

This study aimed to assess the influence of faculty members' caring behaviors on nursing students' academic burnout.

Research questions:

- What are the levels of faculty members' caring behaviors as perceived by nursing students?
- What are the levels of nursing students' academic burnout?
- What is the relation between the faculty members' caring behaviors and nursing students' academic burnout?

Subjects & methods

Design: Descriptive-correlational research design was used to carry out the current study.

Setting: The study was conducted at the Faculty of Nursing, Tanta University, under the Ministry of Higher Education and Scientific Research.

Subjects: The study's candidates were selected through stratified, proportional, randomized sampling of undergraduate nursing students enrolled in different years of the Bachelor of Science in Nursing during the academic year 2023\2024. The technique for selecting was proportional to the number of nursing students in each academic year, with the stratum being the academic year. The sample size and power analysis were performed using the EpiInfo statistical software package. The criteria used for sample size calculation were as follows: z=Confidence level at 95% (1.96) and d= error proportion (0.05). The sample size involves the following:

Academic year	Number of students	Sample
First	600	235
Second	1200	290
Third	1050	280
Fourth	1037	280
Total	**3887**	**1085**

Tools: The data was collected using the following two tools:

Tool I: Faculty Members' Caring Behaviors Questionnaire (FCBQ):

This tool was developed by **Romero-Martín et al. (2022)** and was adapted by the researcher based on relevant literature reviews **(Al-Husban, Shudifat, & Tarawneh, 2022; Arasteh, Rezapour-Nasrabad, Mousavizadeh, & Nasiri, 2023)**. It consisted of two parts as follows.

Part (1): Nursing students' personal and study- related data: It included nursing students' age, sex, academic year, marital status, current clinical

training area, department responsible for clinical training, and academic achievement/grade in the last year or semester.

Part (2): Nursing faculty members' caring behaviors questionnaire: It was used to assess the nursing students' perceptions about nursing faculty members' caring behaviors. It contained 31 items dividing into five dimensions: confidence through caring (12items), supportive learning climate (5 items), appreciation of life's meaning (5 items), professional anticipation (3 items), control versus flexibility (6 items). The nursing students' responses were measured on a 5-point Likert Scale ranging from 1=strongly disagree to 5=strongly agree.

Scoring system: The total score was categorized based on cut-off points as follows:

- High level of faculty members' caring behaviors >75% (score >116),
- Moderate level of faculty members' caring behaviors 60% - 75% (score 93-116), and
- Low level of faculty members' caring behaviors <60% (score <93).

Tool II: Nursing Students' Academic Burnout Questionnaire (NSABQ):

This tool was developed by the researcher based on relevant literature reviews **(Al Mutair et al., 2020; Williamson, Lank, Cheema, Hartman, & Lovell, 2018; Simancas-Pallares, Mesa, & Martínez, 2017)**. It was used to assess the nursing students' perceived academic burnout. It contained 17 items divided into three dimensions: emotional exhaustion (5 items), cynicism (6 items), professional inefficacy (6 items). The nursing students' responses were measured on a five-point Likert Scale ranging from 1=strongly disagree to 5=strongly agree. Items on the exhaustion and cynicism dimensions are scored normally, while those on the professional efficacy dimensions are reverse-scored.

Scoring system: The total score was categorized based on cut-off points as follows:

- High level of academic burnout (>75%; score >64),
- Moderate level of academic burnout (60% - 75%; score 51-64), and
- Low level of academic burnout (<60%; score <51).

Method:

1. Official permission to conduct the study was obtained from the Dean of the Faculty of Nursing at Tanta University, who submitted to all heads of the academic nursing departments to obtain their collaboration and approval.
2. **Ethical considerations:** Approval was obtained from the Scientific Research Ethical Committee (Code

No. 344/12/2023). The researcher introduced herself to participants, and a full explanation of the aim and method of study was given to obtain their acceptance and cooperation as well as their informed consents. Assuring nursing students about the privacy and confidentiality of collected data and explaining that it was used only for the study purpose only.

3. The questionnaire was translated into Arabic and presented to a jury of five experts in the nursing administration specialty to check their face and content validity. The experts were two professors and three assistant professors of nursing from nursing administration department, Tanta University
4. The face validity value of tool (I), which entitled the faculty member's caring behaviors questionnaire was 95.0% and tool (II), which called the nursing students' academic burnout questionnaire was 97.7%.
5. A pilot study was carried out on a 10% (n=109) of nursing students, who were excluded from the main study's sample during the actual collection of data. The pilot study was done to test tools' clarity, items sequence, applicability, and relevance to determine the needed time to complete the questionnaire items was around 10 to 15 minutes.
6. The reliability of tools was tested using the Cronbach Alpha Coefficient test. The value of reliability test for tool I was 0.958 and for tool II was 0.827.

Data collection phase: The data were collected from nursing students by the researcher, who met the respondents' nursing students in different areas during their teaching hours to distribute the questionnaire. The subjects provided their answers in the presence of the researcher to ensure that all questions were addressed. The data was collected for more than two months, from the middle of October 2024 until the end of December 2024.

Statistical analysis: Data was fed to the computer and analyzed using IBM SPSS Statistics version 20.0 (Armonk, NY: IBM Corp., 2020). Categorical data were summarized as numbers and percentages. Quantitative data were described using range, mean, and standard deviation. The Pearson correlation coefficient is used to assess the relationship between two normally distributed quantitative variables. The level of significance was adopted at $P<0.05$. The linear regression test is used to detect the influence of independent factor affecting the dependent variable.

Results

Table (1) illustrates the distribution and frequency of nursing students' personal data. The table reveals that 67.6% of nursing students were in the age group of more than or equal to 20 years with a mean score of 20.52 ± 1.71, in which 70.2% of them were

females. The vast majority of nursing students (94.9%) were unmarried, and 26.7% of them were in the second academic year. Moreover, 15.3% of nursing students trained in the current area of the medical department, in which 25.4% of them reported that the responsible academic department for training was a nursing administration department. Additionally, 36.6% of nursing students had an excellent grade in the last academic year or current semester.

Figure (1) represents the nursing students' overall perception levels of faculty members' caring behavior. The data indicates that 44.6% of nursing students perceived a low level, while 31.2% of them demonstrated a moderate level**,** and 24.1% perceived a high level of faculty members' caring behavior.

Table (2) defines the ranking of nursing students' mean scores of faculty members' caring behavior dimensions. The overall mean percent score of faculty members' caring behaviors was 61.34 ± 20.08**.** The highest mean percent score was recorded for the confidence through caring dimension (65.65 ± 21.95). This was followed by professional anticipation (63.44±26.12), and appreciation of life's meaning (62.82±24.80). While the supportive learning climate dimension ranked fourth with a mean percent score of 58.87±26.14, and lastly, the control versus flexibility dimension had the lowest score (52.50 ± 21.67).

Figure (2) describes the nursing students' overall levels of academic burnout. The results reveal that 45.3% of nursing students experienced a high level of academic burnout, while 38.8% reported a moderate level, and only 15.9% had a low level.

Table (3) presents the nursing students' percent mean scores of academic burnout dimensions. It reveals that the highest mean percent mean score was observed for emotional exhaustion (75.68 ± 14.72). This was followed by professional inefficacy (72.56±14.75). In contrast, the lowest mean percent score was noted for cynicism (65.52 ± 21.18). Overall, the total mean percent score of academic burnouts was 70.99 ± 12.80.

Figure (3) describes the correlation between nursing faculty members' caring behavior versus nursing students' academic burnout. The results reveal a statistically significant negative correlation ($r = -0.300$ & $p < 0.001$) between nursing faculty members' caring and nursing students' academic burnout.

Table (4) presents the results of the simple linear regression analysis illustrating the effect of faculty caring behavior on nursing students' academic burnout. This indicates that approximately 19.0% of the variation in nursing students' academic burnout

can be explained by the variation in faculty caring behavior.

Table (1): Distribution and frequency of nursing students' personal and studying related data (N= 1085)

Nursing students' personal data	No.	%
Age (years)		
<20	352	32.4
≥20	733	67.6
Min. – Max.	18.0 – 23.0	
Mean ± SD.	20.52 ± 1.71	
Sex		
Male	323	29.8
Female	762	70.2
Marital status		
Married	55	5.1
Unmarried	1030	94.9
Academic Year		
First	235	21.7
Second	290	26.7
Third	280	25.8
Fourth	280	25.8
Current training area		
Medical	166	15.3
Surgical	129	12.0
Neurology	105	9.7
Obstetric	160	14.7
Orthopedic	111	10.2
Pediatric	147	13.5
Psychiatric	152	14.0
Intensive Care Units	115	10.6
Responsible department for training		
Nursing medical – surgical	235	21.8
Critical care & emergency nursing	115	10.6
Obstetrics and gynecology	160	14.7
Pediatric nursing	147	13.5
Nursing administration	276	25.4
Community health nursing	152	14.0
Academic achievement in the past year or current semester		
Excellent	396	36.6
Very Good	271	25.0
Good	352	32.4
Satisfactory	66	6.0

SD: **Standard deviation**

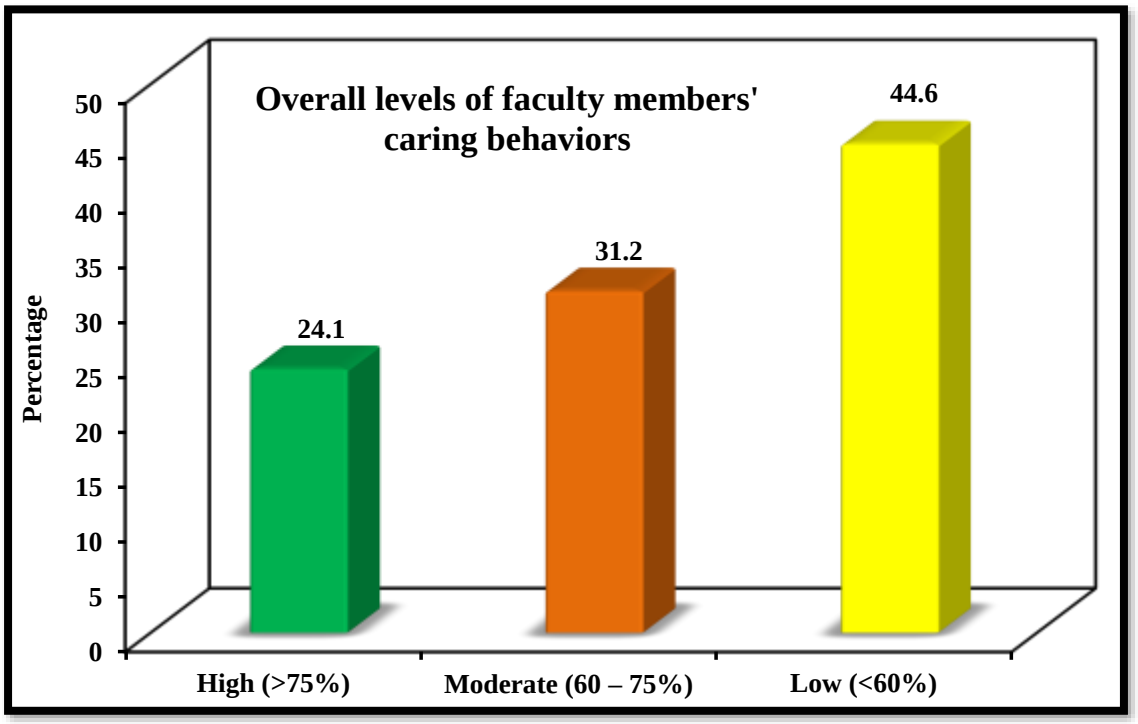

Figure (1): Nursing students' overall perception levels of faculty members' caring behavior

Table (2): Ranking of nursing students' mean scores of faculty members' caring behaviors dimensions (N= 1085)

Nursing faculty members' caring behaviors dimensions	Score Range	Total score		Percent Score	Rank
		Min. – Max.	Mean ± SD.	Mean ± SD.	
Confidence through caring	(12 - 60)	16.0 – 60.0	43.51 ± 10.54	65.65 ± 21.95	**1**
Supportive learning climate	(5 - 25)	5.0 – 25.0	16.77 ± 5.23	58.87 ± 26.14	**4**
Appreciation of life's meaning	(5 - 25)	5.0 – 25.0	17.56 ± 4.96	62.82 ± 24.80	**3**
Professional anticipation	(3 - 15)	3.0 – 15.0	10.61 ± 3.13	63.44 ± 26.12	**2**
Control versus flexibility	(6 - 30)	6.0 – 30.0	18.60 ± 5.20	52.50 ± 21.67	**5**
Overall	**(31 - 155)**	**35.0 – 151.0**	**107.1 ± 24.90**	**61.34 ± 20.08**	

SD: **Standard deviation**

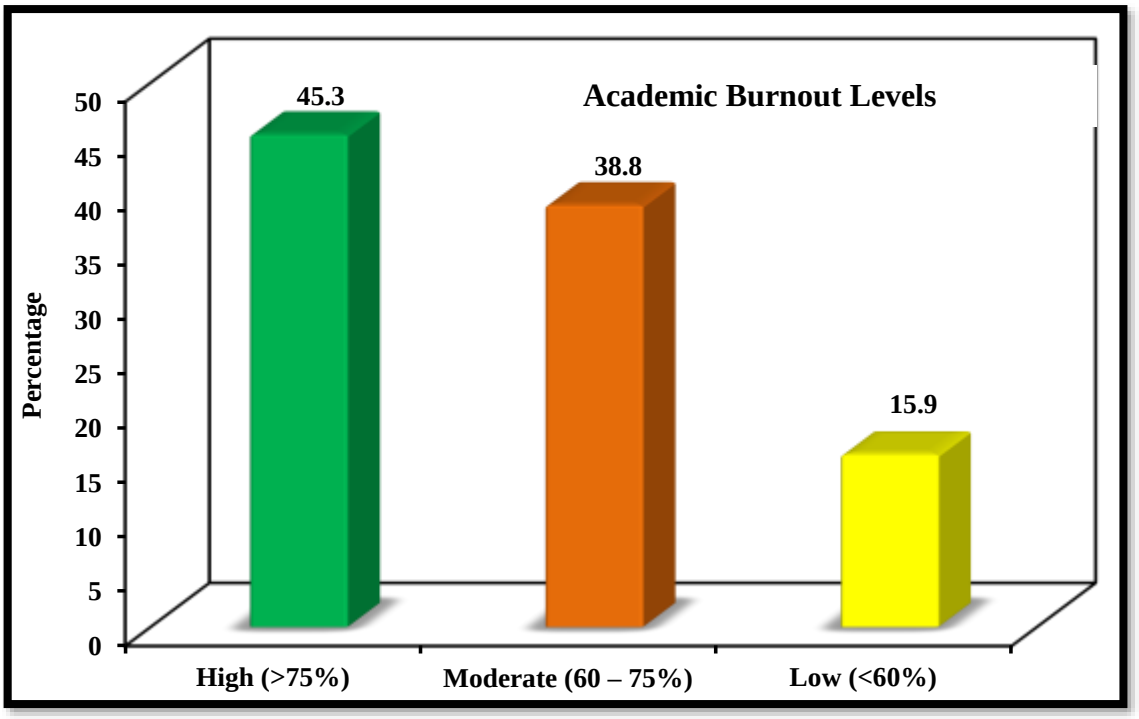

Figure (2): Nursing students' overall levels of academic burnout

Table (3): Nursing students' percent mean core of academic burnout dimensions (N= 1085)

Students' academic burnout dimensions	Score Range	Total score		Percent Score	Rank
		Min. – Max.	Mean ± SD.	Mean ± SD.	
Emotional exhaustion	**(5 - 25)**	14.0 – 25.0	20.14 ± 2.94	75.68 ± 14.72	**1**
Cynicism	**(6 - 30)**	6.0 – 30.0	21.73 ± 5.08	65.52 ± 21.18	**3**
Professional inefficacy	**(6 - 30)**	6.0 – 30.0	23.41 ± 3.54	72.56 ± 14.75	**2**
Overall	**(17 - 85)**	**26.0 – 85.0**	**65.28 ± 8.70**	**70.99 ± 12.80**	

SD: **Standard deviation**

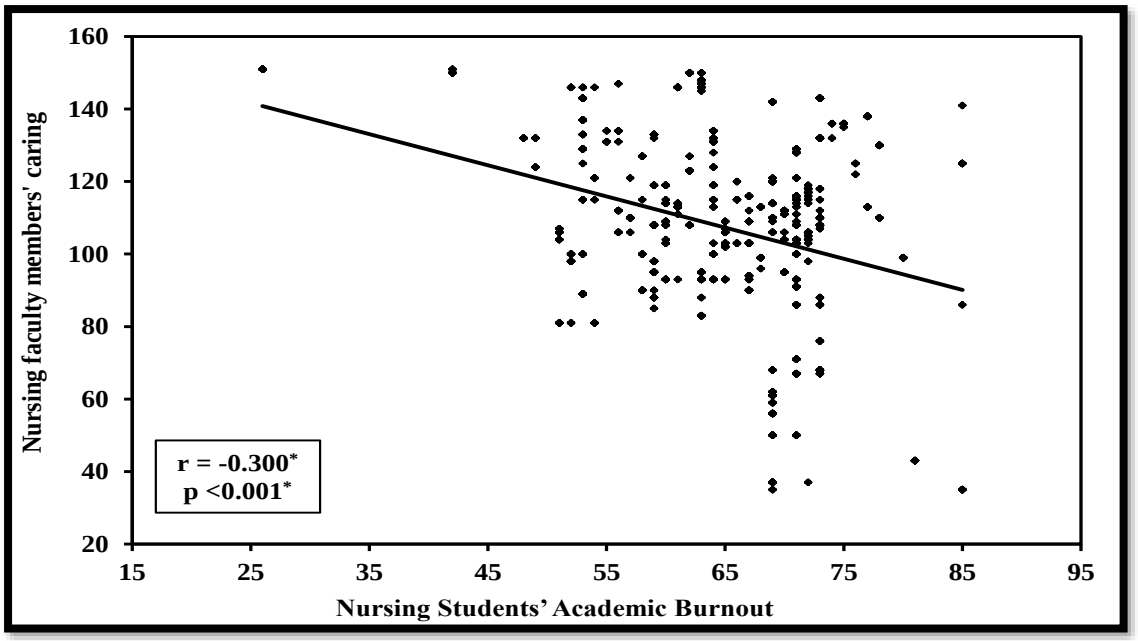

Figure (3): Correlation between nursing faculty members' caring behavior vs. nursing students' academic burnout

Table (4): Univariate Linear regression analysis showing the effect of faculty caring behavior on nursing students' academic burnout

Study's variables	B	Beta	T	p
(Constant)	82.733		69.379*	<0.001*
Academic burnout	-0.191	-0.300	10.357*	<0.001*
R^2 = **0.190**, adjusted R^2= **0.189**, F = **107.275***, p <0.001*				

F,p: f and p values for the model
R^2: Coefficient of determination
R: coefficient of regression
B: Unstandardized Coefficients (linear regression)
Beta: Standardized Coefficients
t: t-test of significance

Discussion

Understanding the relationship between faculty caring behaviors and academic burnout is crucial, as fostering caring attributes not only enhances nursing student well-being but also prepares them to deliver quality, patient-centered care **(Amin et al., 2025; Ayed et al., 2024)**. Thus, this study aims to assess the nursing students' perceptions of faculty caring behaviors and how these behaviors influence their experiences of academic burnout. Overall, nearly half of nursing students perceived low faculty caring, and about one-third moderate, while less than a quarter high. These results may be

attributed to the faculty members may focus more on checking off tasks, ensuring compliance, and assessing errors rather than providing emotional support for their nursing students, creating a task-oriented, stressful environment that limits attention to students' individual needs.

In this scene, **Chipeta et al. (2022)** found that perceptions of caring behaviors were low, particularly regarding themes of faculty members being available, respectful, recognizing students as individuals, being fair, and communicating effectively. Furthermore, **Fifer (2019)** indicated a significant gap, where nursing students perceived lower levels of caring compared to what faculty members believed they were demonstrating. **Haddad et al. (2025) and Karaman, Yerebakan, & Cakmak, (2022)** depicted the average mean score for clinical instructor caring behaviors as perceived by nursing students.

On the other hand, these findings are contradicted by the study of **Taghaee, Shabany, Afaghi, (2025)**, who displayed that the majority of nursing students had a high perception of faculty caring behaviors, including three themes of holistic care, respecting patient rights, and barriers to effective care. **Wu, Yang, Yan, & Cheng (2024)** depicted that the Chinese nursing students had positive perceptions of their clinical instructors' caring behaviors.

The study's data analysis discovered that confidence through caring was the strongest dimension of faculty caring behaviors from nursing students' perspective, followed by professional anticipation, then the appreciation of life's meaning, and after that the supportive learning climate dimension. The weakest dimension of caring behaviors was control versus flexibility**.** Based on nursing students' perspectives, the hierarchy of these behaviors can be explained by the nursing students are willing to learn from faculty who show confidence and respect, foster a sense of security, believe in their abilities, and prepare them for their future role as professional nurses.

This finding is strongly supported by **Domínguez-Martís et al. (2025),** who found that nursing students rated the dimension of instilling confidence through caring as having the highest mean score. Moreover, **Eshghi, Bahrami, & Jafari (2025)** and **Setyawan, Supratno, &**

Roesminingsih (2024) mentioned that the highest score of nursing students was assigned regarding the respectful involvement referring to confidence level of their faculty.

In disagreement, **Romero-Martín et al. (2022)** revealed that the most appreciated dimension of caring behaviors as perceived by nursing students was control versus flexibility, and the least was appreciation of life's meanings. Moreover, **Eshghi et al. (2022)** showed that the highest mean dimensions of instructors' caring behavior from nursing students' perception were related to the respectful sharing. **Osborne, Judge, Lullo, & Jones (2025)** highlighted that academic burnout was remarkably present by showing disengagement and exhaustion, both exceeding clinically established thresholds.

The present study provides strong evidence that academic burnout is highly prevalent among nursing students, ranging from moderate to high levels. These findings reflected a sense of physical and mental exhaustion in response to the stressors of academic learning, including extensive study plans, long hours of training, excessive assignments, poor time management, challenging clinical experiences, and exposure to workplace hazards, as well as managing complex relationships to fulfill academic responsibilities.

These findings are consistent with **Arian, Jamshidbeigi, Kamali, Dalir, & Ali-Abadi (2023)** confirmed that academic burnout is a significant, widespread issue among nursing students, with prevalence rates frequently reported between 25% and 60% globally, ranging from moderate to high levels. Similarly, **Osborne et al. (2025)** highlighted that academic burnout was remarkably present by showing disengagement and exhaustion, both exceeding clinically established thresholds.

The Chinese study of **Hwang and Kim (2022)** found that the overall score of academic burnouts among nursing students was higher in first- and second-year without experience for clinical practice environment. In another scene, **Andargeery et al. (2025)** found that nursing students had a moderate level of overall academic burnout. Additionally, the study of **Elhadidy, Osman, & Mahmoud (2024)** revealed that more than two-thirds of the nursing students have a moderate level of academic.

These findings indicate that emotional exhaustion was the strongest predictor of academic burnout among nursing students, followed by the dimensions of professional inefficacy, and cynicism, respectively. These findings revealed that nursing students feel drained, fatigued, and emotionally burned out. They struggle with their study challenges or doubted their contributions, reflecting the significant impact of heavy academic demands on student well-being.

In the same line, the findings of a longitudinal study by **Lee, Lee, Lee, & Cho (2020)**, who identified the dimension of emotional exhaustion as a primary driver that leads to academic burnout. These results also strongly agreed with **Prakash, Sheilini, & Nayak (2023)**, who reported a high level of emotional exhaustion among nursing students, which was widespread regardless of demographic variables. Similarly, **Gómez-Urquiza et al. (2023)** and **Tating et al. (2023)** confirmed that emotional exhaustion consistently increases as students' progress through nursing education, particularly during clinical training.

The current study findings present a complex picture of professional inefficacy, in which the nursing students felt ineffective in class contributions and did not believe in their contributions. This indicates a coexistence of motivation and perceived inefficacy, suggesting that nursing students remain committed but psychologically strained.

Correspondingly, the study's findings of **Elhadidy et al. (2024)** noted that nursing students experiencing academic burnout are less prepared for the actual profession due to professional inefficacy, which exaggerates the likelihood of leaving the field shortly after graduation. **Kong et al. (2021)** concluded that academic burnout was prevalent among Chinese undergraduate nursing students, leading to a reduced belief in their capabilities to perform essential nursing duties, which negatively impacts their professional efficacy in providing patient care.

Although cynicism was the lowest among the three dimensions of academic burnout, it remained substantially important. Based on the longitudinal study of **Söderholm et al. (2025)**, the student burnout, cynicism is often

detected as having a lower initial level compared to exhaustion and inadequacy at the beginning of academic programs, which increase overtime, particularly in demanding of academic environments, as the students use it as a coping mechanism for exhaustion and feelings of inadequacy.

In this aspect, **Bang and Reio (2017)** focused that cynicism was a significant partial mediator of the emotional exhaustion and professional inefficacy relations with three outcome variables, linking to increased individual task performance, contextual performance, and prosocial behavior.

The present study reveals a significant negative correlation between nursing students' perceptions of faculty caring and their academic burnout. This means that when nursing students perceive their faculty as more caring, empathetic, and supportive, their levels of academic burnout—including emotional exhaustion, cynicism, and low professional efficacy significantly decrease.

Similarly, the findings echo those of **Alsararatee, Ahmed, & Elachola (2025) and Wei et al. (2021),** who reported that supportive faculty engagement significantly reduced students' burnout and enhances overall well-being. Further support is provided by **Wang, Chu, M., & Xu (2024),** who found that social support and positive role models core components of faculty caring serve as major facilitators in reducing stress, self-doubt, and fatigue, which are central dimensions of academic burnout.

The current findings demonstrate that faculty caring is a significant predictor of academic burnout among nursing students, as evidenced by the univariate regression analysis where faculty caring acts as a crucial protective factor against the emotional exhaustion, cynicism, and reduced efficacy that constitute student burnout.

Similarly, the findings of **Gómez-Urquiza et al. (2023) and Tating et al. (2023)** provide strong support for the present results by emphasizing the protective role of supportive faculty behaviors in reducing student burnout. Moreover, intervention studies by these authors showed that **Zangaro, Rosseter, Trautman, & Leave (2023)** further extend this understanding by demonstrating that faculty burnout is inversely related to job

satisfaction and that effective stress management improves faculty members' capacity to care for students.

Conclusions

The study concluded that faculty caring behaviors play a key role in reducing nursing students' academic burnout, with a significant negative correlation between the two. Nearly half of the students perceived low faculty caring, about one-third moderate, and less than a quarter high. In contrast, less than half experienced high academic burnout, over one-third moderate, and around one-sixth low.

Recommendations

For Dean of Nursing Faculty:

- Implement mentoring programs for junior nursing faculty to improve their teaching, professionalism, supportive relationships, communication skills, and recognize signs of students' stress.
- Establish policies against faculty bullying or incivility, which are primary causes of nursing students' burnout and decreased self-confidence.
- Encourage faculty to be mindful of nursing students' learning needs, offering personalized support rather than treating students as a uniform group.
- Launch counseling and support services for nursing students to reduce burnout and enhance psychological well-being.

For Nursing Faculty Members:

- Use the strategy of balancing "Control vs. Flexibility" to move away from rigid, authoritarian, or overly controlling methods to more flexible, supportive, and empowering methods.
- Adopt teaching strategies that "instill confidence through caring," to mitigate nursing students' burnout.
- Provide constructive feedback and guidance to enhance nursing students' retention, confidence, and academic motivation.
- Align nursing students' workloads with their capabilities to avoid excessive pressure and unrealistic deadlines.
- Announce the scheduling plan of office hours that organizes frequent contact meetings with their nursing students.
- Tailor teaching methods to meet the unique needs and learning styles of individual nursing students, rather than a one-size-fits-all approach.
- Maintain a non-judgmental, respectful, and fair atmosphere

in both classroom and clinical settings.

For nursing students:

- Engage in stress management strategies such as time management, relaxation techniques, and seeking support when needed.
- Communicate openly with faculty members regarding academic challenges to obtain guidance and emotional support.

For nursing researchers:

- Replicate the study in different nursing faculties in private and national universities to compare findings and generalize results.
- Conduct further research studies to explore the effect of faculty caring behaviors on nursing students' academic performance, satisfaction, retention, and mental well-being.
- Conduct longitudinal studies to track how changes in faculty behaviors impact nursing students' academic burnout over time, as well as experimental studies testing the efficacy of faculty training programs in caring behaviors.

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Effectiveness of Instructional Guidelines on Nurses' Knowledge and Attitudes regarding Application of Nanotechnology in Obstetrics and Gynecology

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Abstract

Background: Nanotechnology has become an emerging approach in obstetrics and gynecology with expanding applications in diagnosis, treatment, and reproductive health care. However, nurses' knowledge and attitudes toward its application remain limited. **Aim**: To evaluate the effectiveness of instructional guidelines on nurses' knowledge and attitudes regarding application of nanotechnology in obstetrics and gynecology. **Subjects and Method:** Design: A quasi-experimental research design was adopted. Setting: Kafrelsheikh University Hospital and General Kafrelsheikh Hospital located at Kafrelsheikh Governorate, Egypt. Subjects: A convenience sample of all nurses (72) working at the previously mentioned study settings during the time of data collection. Tools: Three tools were used for data collection**:** (1) Structured interviewing questionnaire; (2) Obstetrics Nurses' knowledge Sheet and (3) Obstetrics Nurses' attitudes Sheet. **Results:** After implementation of the instructional guidelines regarding application of Nanotechnology in Obstetrics and Gynecology, there was a highly statistically significant improvement in levels of nurses' knowledge and attitudes ($p<0.001$ & $p<0.001$ respectively), as well as there was a positive correlation between knowledge and attitudes ($p<0.001$). Additionally, educational levels and years of experience were significantly associated with knowledge ($p<0.001$, & $p<0.038$ respectively), as well as with attitudes ($p<0.002$, & $p<0.001$ respectively). **Conclusion:** Instructional guidelines were effective in improving nurses' knowledge and attitudes toward nanotechnology applications in obstetrics and gynecology. **Recommendation:** Integrate nanotechnology concepts and applications into undergraduate and postgraduate nursing curricula, particularly within obstetrics and gynecological nursing courses.

Keywords: Guidelines, Knowledge, Attitudes, Nanotechnology, Obstetrics and Gynecology

Introduction

The specialty of obstetrics and gynecology is regarded as having the most responsibility in the medical world because it involves caring for both the life of the expectant mother and the newborn. The production of new life is its main objective. However, a variety of illnesses affect obstetrics and gynecological health, creating a global dilemma. Infections include HIV-related diseases, vaginitis, pelvic inflammatory disease; uterine-related conditions include pregnancy disorders, endometriosis, uterine fibroids, cervical cancer; and ovarian-related conditions include polycystic ovary syndrome (PCOS) and ovarian cancer (**Tang et al., 2025**).

Advances in health care such as nanotechnology can help. Nanotechnology is a new technology that represents a realm that scrutinizes the characteristics and applications of materials at the nanometer scale (0.1–100 nm) (Anselmo & Mitragotri, 2019).

Nanotechnology is utilized in Numerous fields such as diagnosis, early detection, management, prevention of tissue injuries, drug development, production of patient tracking devices, pain control and drug delivery systems, water decontamination, protection and improvement of health, information, communication technologies, and the creation of lightweight and durable materials. The significance of nanotechnology, which addresses numerous issues in healthcare, keeps growing in tandem with the expansion of its applications (Barani et al., 2020).

Many studies have documented the use of nanotechnology in the diagnosis of women's reproductive diseases, including the use of fluorescence imaging to aid in the early detection and treatment of ovarian and cervical cancer, as well as the use of nano-imaging technology to diagnose polycystic ovary syndrome and endometriosis **(Wang et al., 2024; Yi et al., 2023; and Choi et al., 2021).**

Magnetic nanoparticles have shown positive development and potential applications in the setting of disorders of the female reproductive system. The selective disintegration of uterine fibroids is achieved using magnetic nanoparticles. Furthermore, there are possible uses for nanotechnology to alter the production, release, and reaction of ovarian hormone regulation (Abdelgader et al., 2023; Cui et al., 2021 and Ahn et al., 2020).

Nanoparticles can transport contraceptive medications, enabling more effective birth control. Nano-spermicides can be useful in preventing sperm movement, which promotes contraception. They also offer a great deal of potential for local contraception, which includes controlling the vaginal environment

and acidifying the local contraceptive (Iftikhar et al., 2021).

According to **Rad et al., (2020)**, nanotechnology is becoming more widely acknowledged as a successful strategy for raising assisted reproductive technology success rates. Obstetrics and gynecological nurses play a vital role in integrating nanotechnology into women's health care to ensure safe, ethical, and effective female reproductive health outcomes. One of their key responsibilities is to stay informed about advancements in nanotechnology and its potential benefits and associated risks. These nurses must also ensure that ethical considerations are upheld by safeguarding informed consent and prioritizing maternal safety during nanotechnology-based treatments (**Dikmen et al., 2022**). Therefore, the Obstetrics and gynecological nurses' knowledge and attitudes should be improved to avoid misconceptions that can affect patients' care and to fulfill their roles and responsibilities as healthcare professional. Studies on this area are insufficient (**Zhu et al., 2024)**. Thus, it was urgent to evaluate the effectiveness of instructional guidelines on nurses' knowledge and attitudes regarding the application of nanotechnology in obstetrics and gynecology.

Significance of the study

Nanotechnology has numerous applications worldwide, particularly in the healthcare sector, where its growing use in medicine is improving nursing practices. Nanotechnology-based point-of-care tests can be especially valuable in low-resource settings by enhancing the management of high-risk pregnancies and supporting the WHO Sustainable Development Goals **(Bertozzi et al., 2022).**

However, a major challenge in implementing nanotechnology in clinical practice is the limited preparedness of healthcare providers, particularly obstetric nurses. As key providers of patient care, education, and monitoring, many nurses report insufficient knowledge and uncertain attitudes regarding the applications, safety, and ethical aspects of nanotechnology. Female reproductive system disorders remain a significant global health concern, affecting women's fertility, health, and quality of life (**Tang et al., 2025**).

Recent advances in nanotechnology offer promising opportunities for more accurate diagnosis, targeted therapies, improved drug delivery systems, and enhanced assisted reproductive technologies. Despite these advancements, integrating nanotechnology into obstetric and gynecological care is still evolving (Luo et al., 2024).

Addressing this knowledge gap is essential to ensure safe and effective adoption of nanotechnology in maternal and reproductive healthcare.

Therefore, the present study aims to the effectiveness of instructional guidelines on nurses' knowledge and attitudes regarding application of nanotechnology in obstetrics and gynecology. The findings may support curriculum development, continuing education, and policy initiatives to strengthen nurses' competencies and enhance the quality of patient care (Dikmen et al., 2022; Malik et al., 2023; Wang et al., 2024).

Aim of the study

This study aimed to evaluate the effectiveness of instructional guidelines on nurses' knowledge and attitudes regarding application of nanotechnology in obstetrics and gynecology.

Research hypothesis:

H1. Knowledge of obstetrics and gynecological nurses is expected to be enhanced after implementation of the instructional guidelines regarding application of nanotechnology in obstetrics and gynecology.

H2. Attitudes of the obstetrics and gynecological nurses are expected to be enhanced after implementation of the instructional guidelines regarding application of nanotechnology in obstetrics and gynecology.

Subjects and Method

Study Design

A quasi-experimental research design utilizing a one-group pre-test/post-test approach was adopted in the present study. When randomization or a control group was not practical, a one-group pre-test/post-test quasi-experimental design was employed to measure participant outcomes prior to and following program implementation to evaluate the effect of the intervention (Capili., & Anastasi, 2025).

This design was selected to evaluate the effect of instructional guidelines on nurses' knowledge and attitudes regarding the application of nanotechnology in obstetrics and gynecological fields. Baseline measurements of the dependent variables (knowledge and attitudes) were assessed prior to implementation of the instructional guidelines. Following implementation of the instructional guidelines, the same variables were reassessed to determine the magnitude of change attributable to the instructional guidelines.

Research Setting:

The study was conducted at the Obstetrics and Gynecology Departments of Kafrelsheikh University Hospital and General Kafrelsheikh Hospital**,** located at Kafrelsheikh Governorate, Egypt. The Obstetrics and Gynecology Department at Kafrelsheikh University Hospital includes one outpatient and family planning clinic, one inpatient unit (6 beds), and two operating rooms; While the department at General Kafrelsheikh Hospital includes three outpatient clinics, one family planning clinic,

one inpatient unit (24 beds) and three operating rooms**.** These settings were selected due to their high patient flow rate and the presence of a sufficient number of obstetrics and gynecological nurses working across antenatal, intranatal, postnatal, and family planning units.

Subjects and methods

Research Subjects

Subjects:

A convenience sample of all nurses (72) working at the obstetrics and gynecological departments (antenatal, intranatal, postnatal units, and family planning clinics) of Kafrelshiekh University hospital (45 nurses) and General Kafrelshiekh Hospital (27 nurses) during the time of data collection.

Tools of data collection:

Three tools were used for data collection:

Tool I: A structured Interviewing questionnaire Schedule: This schedule was developed by the researchers after reviewing the related literature **(Zheng et al., 2023 and Dikmen et al. 2022).** It included personal characteristics of the studied obstetrics nurses: age, residence, graduation degree, years of experience in obstetrics and gynecological department, work position, if they heard about nanotechnology in obstetrics and gynecology (yes, no question), and if yes, what were the sources of their knowledge about nanotechnology?

Tool II: Obstetrics and Gynecological Nurses' knowledge Sheet (pre and post-test): It was adopted from **Zheng et al., (2023).** It included 7 questions to assess obstetrics and gynecological nurses' knowledge regarding application of nanotechnology in obstetrics and gynecology, such as Are you familiar with the definition of nanotechnology?; Is it safe to apply nanotechnology in the obstetrics and gynecology?; Are there risks involved in applying nanotechnology in the obstetrics and gynecology?; Is nanotechnology being applied successfully in the obstetrics and gynecology at the moment?; How much do you think the following statement is true or false: Nanotechnology can offer straightforward and safe ways to diagnose illnesses?; Do you know that medications based on nanotechnology have been used to treat a wide range of cancer conditions?; Does the use of nanotechnology improve therapeutic results?

Scoring system: Responses were measured Correct answer = 1, Incorrect answer = 0, and the total score ranged from 0–7. Total scoring system: Knowledge levels were categorized as: Poor: <50%, Moderate: 50%–<75%, and Good: ≥75%.

Tool III: Obstetrics and Gynecological Nurses' Attitudes Sheet (pre and post-test): It was adopted from **Dikmen et al., (2022).**

It included 34 questions to assess obstetrics and gynecological nurses' attitudes regarding the application of nanotechnonology in obstetrics and gynecology, such as (treatment, diagnosis, production of medical materials and other); special healthcare fields for management of (pain, gestational diabetes during pregnancy, and osteoporosis), regulation of ovarian hormones, the support for assisted reproductive technology, the contraceptive monitoring, stop bleeding, wound healing, infection prevention, sterilization, medical imaging, the diagnosis of cancer, prevention of genetic illnesses, and the management of viral illness…….etc.

Scoring system: Responses were measured using a Five-point Likert scale. Each item is scored on a Likert scale ranging from 1 to 5 (1= Strongly disagree, 2=Disagree, 3=Unsure, 4=Agree, 5=Strongly agree), with higher scores indicating more positive attitudes, and the total score ranged from 34 to 170 Total scoring system: Attitudes levels were demonstrated as: Negative attitudes scores between 34 –101 (<60%) and Positive attitudes scores between 102 – 170 (60% or higher)

Method

The study was conducted according to the following steps:

1. An official letter clarifying the aim of the study was obtained from the Faculty of Nursing, Kafrelshiekh University, Egypt, and subsequently submitted to the responsible authorities at the Kafrelsheikh University Hospital and General Kafrelsheikh Hospital to take out their formal approval and facilitate cooperation for conducting the study

2. **Ethical and legal Considerations:**

Ethical approval to conduct the study was attained from the Research Ethics Committee at the Kafrelshiekh University (November 2024) with Ref. No. KFSIRB200-667). Official permission to carry out the study was attained by the director of Kafrelshiekh University hospital and General Kafrelshiekh Hospital for Obstetrics and Gynecology Department. The researchers explained the aim of the study to the obstetrics and gynecological nurses. They told them that their participation is completely voluntary, they can withdraw from the study at any time, and there are no health risks or dangers from this study. The researchers also assured the nurses that the data will only be utilized for the purposes of this study, and precautions were taken to ensure anonymity in data coding. Then, each nurse was asked to give written consent to participate in the study.

3. **Validity and reliability:**

Validity: The tools were assessed for clarity, relevance, comprehensiveness, and applicability by five nursing experts specializing in

obstetrics and gynecological nursing and nanotechnology, and the required modifications were incorporated accordingly.

Reliability: The internal consistency of the tools was evaluated using Cronbach's alpha. The results showed that the Cronbach's alpha value of the nurses' knowledge regarding the application of nanotechnology is 0.903, and of the nurses' attitudes regarding the application of nanotechnology is 0.899.

4. Pilot study:

A pilot study was conducted on 10% of the sample (7 nurses) to assess clarity, feasibility, and time required for data collection. The pilot participants were included in the final study sample as no major modifications were required to the tools.

4. Procedure:

This study was carried out through four phases: Assessment, planning and preparation, implementation, and evaluation. Data of the study were collected within Seven months from April 2025 to October 2025. The researchers attended the predetermined setting two days a week from 10:00 am to 12:00 pm.

Phases of the study

2. Assessment phase: The researcher conducted a one-on-one interview at the clinical setting with each obstetrics and gynecological nurse to collect her personal data and sources of knowledge regarding nanotechnology using tool (I). To get a baseline assessment of the nurses' knowledge and attitudes regarding application of nanotechnology in obstetrics and gynecology tools (II and III) were used by the researchers. They recorded the answers after asking the questions. The time needed to complete the study tools ranged from 15 to 25 minutes for each nurse.

2. Planning and preparation phase: Tools for data collection and the instructional guidelines were developed by the researchers based on thorough assessment of the related literature and on a baseline assessment for the entire sample (pre-test). Teaching and learning content, methods and tools were prepared. They included: PowerPoint presentations, instructional videos, interactive and recorded lectures, as well as online materials to be shared via WhatsApp and Telegram, through application form.

3. Implementation phase: The obstetrics and gynecological nurses were divided into 7 groups. Each group included 10 nurses. Every obstetrics and gynecological nurse attended 2 online sessions. Each session lasted nearly 45 to 60 minutes. The researchers sent recording lectures for the studied nurses after doing post-tests to enhance chances for obstetrics nurses to hear these lectures at any time through a sent media on google drive. **The 1st session:** The aim of this session was

to improve the studied nurses' knowledge regarding application of nanotechnology in obstetrics and gynecology. It included definition of nanotechnology, why all researchers work with nanomaterials, shapes and types of nanomaterials, nanotechnology application and sustainable development in nursing, nanotechnology and pregnancy such as management of gestational diabetes, assisted reproductive technology and diagnosis of cancer in pregnancy, Does the use of nanotechnology improve therapeutic results? The following is the link of the 1st session that was given by the researchers to the studied nurses: https://drive.google.com/file/d/ 1H1Yfi3PeEIdGtbCVL RmVf3V1mbr_ gdE/view ?usp=sharing.

The 2nd session: The aim of this session was to discuss the application of nanotechnology in obstetrics and gynecological fields such as (smart wearables, sterilization, surgical robots and artificial erythrocytes, medical dressings, wound care, diagnostic tools and drug delivery systems). The nurses studied were encouraged to ask questions during the two sessions of the instructional guidelines and to engage in discussions. The following is the link of the 2nd session that was given by the researchers to the studied nurses: https://drive.google.com /file/d/1IgQnnBZ xwzQJLJjVAL IXjaGhs99b6o NV/view?usp=sharing.

4. Evaluation phase: An evaluation of the two main outcomes: knowledge and attitudes were achieved four weeks after completion of the instructional guidelines' sessions using google form questioner. the two main outcomes were assessed using the same data collection instruments that were used to examine the baseline data.

Statistical Analysis

All statistical analyses were performed using SPSS for windows version 20.0 (SPSS, Chicago, IL). Continuous data were normally distributed and were expressed in mean ±standard deviation (SD). Categorical data were expressed in number and percentage. Chi-square test (or fisher's exact test when applicable) was used for comparison of variables with categorical data. Correlation co-efficient test was used to test correlations between two variables with continuous data. The reliability (internal consistency) of the study' tools was evaluated using Cronbach's alpha test. Statistical significance was set at $p<0.05$.

Results

Table 1: Represents socio-demographic characteristics of the studied nurses. It revealed that slightly more than one half of the studied nurses (59.7% and 58.3% respectively) aged between 21–30 years (mean 29.5 ± 6.2), and held a

Master's degree, and (61.1%) lived in rural areas. It also shows that nearly one half (48.6% and 40.3% respectively) worked in birth and postpartum units, and slightly more than two-thirds (66.7%) of them had 1–5 years of experience (mean 5.0 ±2.5). However, nearly three quarters (73.6%) of the studied nurses were unaware of nanotechnology applications in obstetrics and gynecology.

Figure (1): Illustrates sources of information of the studied nurses regarding application of nanotechnology in obstetrics and gynecology pre implementation of the instructional guidelines. It elucidates that among the studied nurses (19) who had prior knowledge of nanotechnology, the internet was the main source of their information accounting for (57.9%).

Demonstrates knowledge' level of the studied nurses regarding application of nanotechnology in obstetrics and gynecology pre and post implementation of the instructional guidelines. It shows that pre implementation of the instructional guidelines, slightly more than one half (52.8%) of the studied nurses had poor level of knowledge and only (9.7%) had good level of knowledge. On the other hand, post- implementation of the instructional guidelines, the studied nurses' level of good knowledge increased significantly to (84.7%), and only (6.9%) had poor level of knowledge, with a highly statistically significant difference (x^2= 81.572 & p< 0.001).

Figure (2): Demonstrates knowledge' level of the studied nurses regarding application of nanotechnology in obstetrics and gynecology pre and post implementation of the instructional guidelines. It shows that pre implementation of the instructional guidelines, slightly more than one half (52.8%) of the studied nurses had poor level of knowledge and only (9.7%) had good level of knowledge. On the other hand, post-implementation of the instructional guidelines, the studied nurses' level of good knowledge increased significantly to (84.7%), and only (6.9%) had poor level of knowledge, with a highly statistically significant difference (x2= 81.572 & p< 0.001).

Figure 3: Proves attitudes' level of the studied nurses regarding application of nanotechnology in obstetrics and gynecology pre and post implementation of the instructional guidelines. It shows that pre implementation of the instructional guidelines, slightly more than two thirds (70.8%) of the studied nurses had negative attitudes regarding application of nanotechnology in obstetrics and gynecology. However, post-implementation of the instructional guidelines, slightly more than three quarters (77.8%) of the studied nurses demonstrated positive attitudes with a

highly statistically significant difference (x2= 34.193 & p< 0.001).

Figure 4: Determines correlation between knowledge of the studied nurses and their attitudes regarding application of nanotechnology in obstetrics and gynecology. It reveals that there was a highly statistically significant correlation (r= 0.374 & p< 0.001) between knowledge of the studied nurses and their attitudes.

Table 2: Establishes the association between socio- demographic characteristics of the studied nurses and their knowledge. It reveals that there were significant associations between socio- demographic characteristics and both educational level and years of experience of the studied nurses (x^2= 32.883 & p< 0.001, and x^2= 6.492 & p=0.038 respectively).

Table 3: Presents the association between socio-demographic characteristics of the studied nurses and their attitudes' level. It reveals that there were significant associations between socio-characteristics and both educational level and years of experience of the studied nurses (x^2= 12.139 & p=0.002, and x^2= 10.286 & p<0.001 respectively).

Table (1). Socio-demographic characteristics of the studied' nurses (n= 72)

Socio-demographic characteristics	N	%
Age (Years)		
21 – 30	43	59.7
31 – 40	29	40.3
Mean ±SD	29.5 ±6.2	
Educational level		
Diploma in Nursing	11	15.3
Masters in nursing	42	58.3
Bachelor's degree in nursing	19	26.4
Residence		
Village	44	61.1
City	28	38.9
Specialization Department		
Family Planning & Outpatient clinic	8	11.1
Postpartum	29	40.3
Birth	35	48.6
Experience years		
1 – 5	48	66.7
6 – 10	24	33.3
Mean ±SD	5.0 ±2.5	
Knowledge regarding nanotechnology		
Yes	19	26.4
No	53	73.6

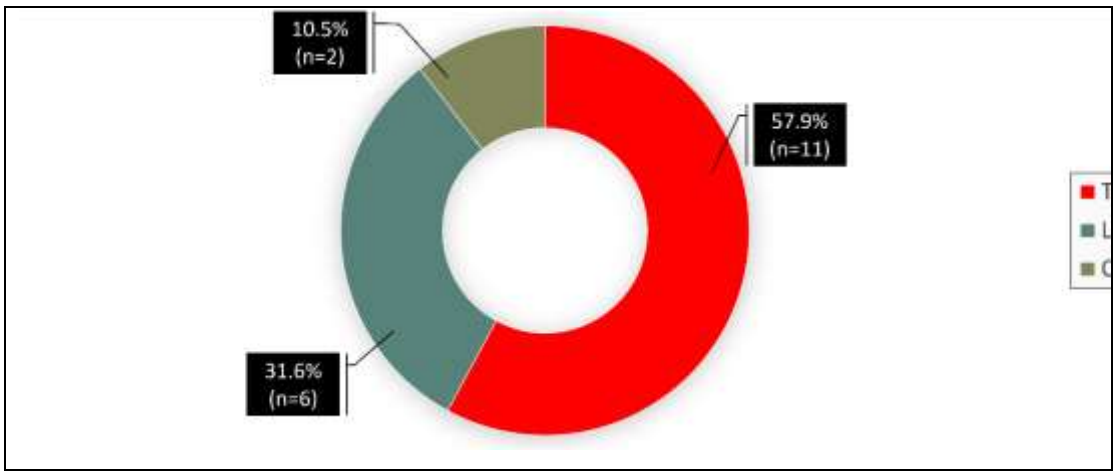

Figure (1): Source of information of the studied nurses regarding application of nanotechnology in obstetrics and gynecology pre implementation of the instructional guidelines (n= 19).

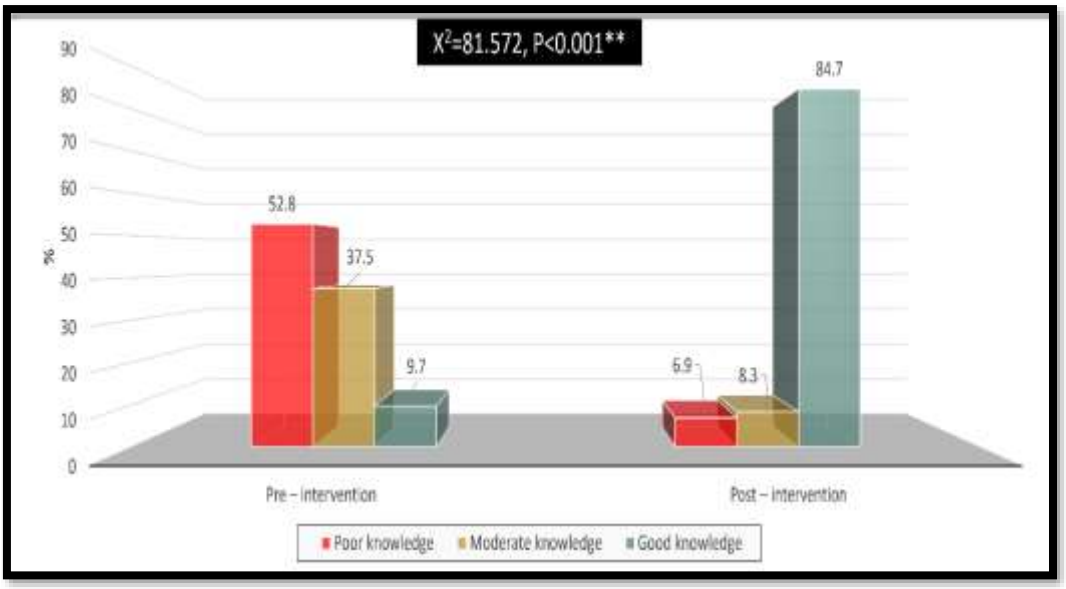

Figure (2): Knowledge' level of the studied' nurses regarding application of nanotechnology in obstetrics and gynecology pre and post implementation of the instructional guidelines (n= 72).

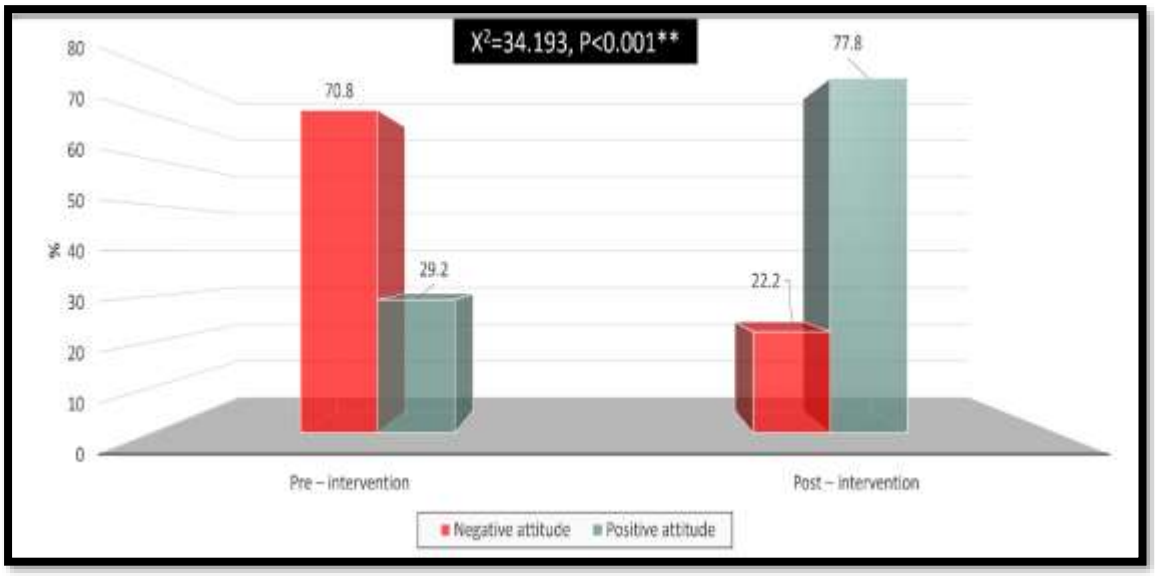

Figure (3): Attitudes' level of the studied nurses regarding application of nanotechnology in obstetrics and gynecology pre and post implementation of the instructional guidelines (n= 72).

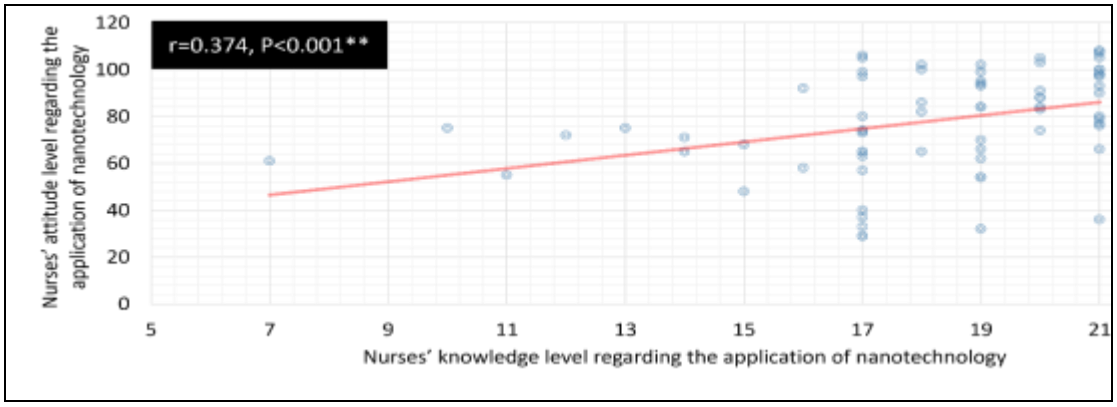

Figure (4): Correlation between knowledge of the studied' nurses and their attitudes regarding application of nanotechnology in obstetrics and gynecology (n= 72).

Table (2): Association between socio- demographic characteristics of the studied nurses and their knowledge (n= 72).

Socio-demographic characteristics	Poor knowledge (n=5)		Moderate knowledge (n=6)		Good knowledge (n=61)		Chi – square / Fisher's test	
	n	%	N	%	N	%	X^2	P
Age (Years)								
21 – 30	2	40.0	5	83.3	36	59.0		
31 – 40	3	60.0	1	16.7	25	41.0	2.212#	0.331
Educational level								
Diploma in Nursing	5	100.0	2	33.3	4	6.6		
Masters in Nursing	0	0.0	3	50.0	39	63.9		
Bachelor's degree in nursing	0	0.0	1	16.7	18	29.5	32.883$	<0.001**
Residence								
Village	4	80.0	4	66.7	36	59.0		
City	1	20.0	2	33.3	25	41.0	0.941#	0.625
Specialization Department								
Family Planning & Outpatient clinic	1	20.0	1	16.7	6	9.8		
Postpartum	2	40.0	3	50.0	24	39.3		
Birth	2	40.0	2	33.3	31	50.8	1.191$	0.880
Experience years								
1 – 5	5	100.0	6	100.0	37	60.7		
6 – 10	0	0.0	0	0.0	24	39.3	6.492#	0.038*
knowledge regarding nanotechnology								
Yes	0	0.0	0	0.0	19	31.1		
No	5	100.0	6	100.0	42	68.9	4.655#	0.097

#: Fisher's exact test, $: Chi-square test

Table (3): Association between socio- demographic characteristics of the studied nurses' and their attitudes (n=72).

Socio-demographic characteristics	Negative attitude (n=16)		Positive attitude (n=56)		Chi – square / Fisher's test	
	N	%	N	%	X^2	P
Age (Years)						
21 – 30	9	56.3	34	60.7		0.748
31 – 40	7	43.8	22	39.3	0.103$^{\$}$	
Educational level						
Diploma in Nursing	6	37.5	5	8.9		
Masters in Nursing	10	62.5	32	57.1		0.002*
Bachelor's degree in nursing	0	0.0	19	33.9	12.139$^{\#}$	
Residence						
Village	10	62.5	34	60.7		0.897
City	6	37.5	22	39.3	0.017$^{\$}$	
Specialization Department						
Family Planning & Outpatient clinic	3	18.8	5	8.9		0.435
Postpartum	7	43.8	22	39.3		
Birth	6	37.5	29	51.8	1.664$^{\$}$	
Experience years						
1 – 5	16	100.0	32	57.1		<0.001**
6 – 10	0	0.0	24	42.9	10.286$^{\#}$	
Knowledge regarding nanotechnology						
Yes	0	0.0	19	33.9		<0.001*
No	16	100.0	37	66.1	7.375$^{\#}$	

#: Fisher's exact test, $: Chi-square test

Discussion

Nanotechnology has emerged as a transformative approach in obstetrics and gynecology, offering novel diagnostic, therapeutic, and monitoring capabilities that enhance the quality and safety of women's healthcare. Nanotechnology enables early detection of pregnancy-related complications, such as pre-eclampsia and gestational diabetes, supports targeted drug delivery systems that improve effectiveness, while reducing side effects and contributes to the development of safer, long-acting contraceptive methods (**Bertozzi et al., 2022 and Andonotopo et al., 2025).**

Nanoparticle-based therapies are also applied in the management of gynecological conditions such as endometriosis, and cancers. Besides, the use of antimicrobial nanomaterials to reduce the risk of infections during obstetrics and gynecological procedures (**Ke et al., 2026**). Therefore, by integrating these technologies, nurses can provide more

precise, evidence-based, technology driven care, enhance patient education, and support improved maternal and fetal health outcomes.

However, this requires specialized knowledge and supportive attitudes to ensure safe administration, continuous monitoring, and effective patient care. So, the aim of this study was to evaluate the effect of instructional guidelines on nurses' knowledge and attitudes regarding the application of nanotechnology in obstetrics and gynecology. Three tools were used by the researchers to fulfill the aim and the hypotheses of the current study.

The results of the present study demonstrate that regarding socio-demographic of the studied nurses, two thirds of them were young with limited professional experience, ranging from one to five years. This may influence their exposure to emerging technologies in clinical practice. This finding is consistent with the study by **Ragucci et al., (2023)** which reported that the average age of nurses participating in their research was about 28 years and that around two thirds of them had one to five years of professional experience. The study also indicated that nurses' knowledge regarding nanotechnology was generally insufficient, which may be related to limited clinical exposure and the relatively recent emergence of nanotechnology applications in healthcare.

Similarly, another study examining nurses' interaction with modern healthcare technologies have reported that a large proportion of nurses are young professionals with limited years of experience. These nurses may still be developing their professional competencies and may not yet have received sufficient training on advanced technological applications in healthcare settings **(Elhalafawy et al., 2025).**

From the researchers' point of view, younger nurses often demonstrate greater adaptability and willingness to learn innovative technologies due to their recent exposure to digital learning environments during their education. At the same time, nurses with fewer years of professional experience may have limited opportunities to encounter advanced technologies in clinical practice because of reduced exposure to specialized training programs and complex clinical procedures. Nevertheless, these nurses may benefit significantly from educational interventions and training programs, which can enhance their knowledge and attitudes toward emerging healthcare technologies such as nanotechnology.

Regarding the studied nurses' awareness about nanotechnology applications in obstetrics and gynecology and their source of

information. The current study shows that despite relatively high academic qualifications of the studied nurses where slightly more than one half of them holding a master's degree, the findings revealed that less than one third of the studied nurses were aware of nanotechnology applications in obstetrics and gynecology and the main source of information was the internet. Similarly, **Dikmen, et al., (2022)** who studied nursing students' knowledge and awareness of nanotechnology usage in healthcare, found that the majority relying on the internet as their primary information source. The observed limited awareness of nanotechnology among the studied nurses could be attributed to the inadequate integration of this topic into nursing curricula even at the postgraduate level, as well as its limited inclusion into the in-service training programs, conferences and workshops. This finding highlights a gap between academic preparation and current technological advancements, underscoring the need for curriculum development and continuous professional education to enhance nurses' readiness for modern healthcare innovations.

In this regard, **Díaz-López et al., (2025)** evaluated the barriers to nanotechnology education in medical specialty programs among postgraduate students and emphasized the importance of structured training programs, promoting interdisciplinary collaboration, and bridging resource and knowledge gaps to equip future healthcare professionals for the global advancement of medical technologies.

Concerning the studied nurses' overall knowledge regarding application of nanotechnology in obstetrics and gynecology. The present study demonstrated that pre-intervention, slightly more than one half of them had poor knowledge. This is supported by **Dikmen et al., (2022)**, who determined that a small part of the participating students received information about nanotechnology. Consistently, a descriptive study conducted by **Ragucci et al (2023)** revealed that nurses' knowledge regarding nanotechnology in healthcare was insufficient, and many nurses lacked knowledge about the risks, applications, and responsibilities associated with nanotechnological products in clinical practice.

From the researcher's point of view, the concept of nanotechnology is largely unfamiliar in Egypt, as nanotechnology is a very new area. It is mostly known to scientists and specialists, while healthcare professionals, including nurses, still have limited knowledge and understanding of its applications in obstetrics and gynecology.

On the other hand, post implementation of the instructional guidelines, the results of the present study revealed that the studied nurses'

knowledge increased significantly among more than four-fifths who acquired good level of knowledge. This finding is consistent with **Goyette., (2016)** who conducted an educational program on nanotechnology for nurses and reported a significant improvement in post-intervention knowledge scores. This supports effectiveness of the educational guidelines which provided clear, structured, and evidence-based information about nanotechnology and its clinical applications in enhancing nurses' knowledge regarding nanotechnology. Correspondingly **Zhong et al., (2024)**, highlighted that while nanotechnology can significantly improve patient monitoring and treatment outcomes, its successful integration into nursing practice requires adequate training and educational preparation for nurses.

Regarding nurses' attitudes toward nanotechnology, the current study demonstrated that slightly more than two-thirds of the studied nurses had negative attitudes toward application of nanotechnology in obstetrics and gynecology. In the same line, a cross-sectional study conducted by **Baybek, et al., (2017)** investigating nursing students' attitudes toward nanotechnology reported moderate attitude scores, indicating that many students perceiving both benefits and risks of nanotechnology applications. Agrees with **Alruwaili et al., (2024)**, who conducted a study to explore nurses' awareness and attitudes toward artificial intelligence. They found that nurses often held cautious or conservative attitudes toward adopting advanced healthcare technologies, indicating concerns and hesitancy. This align with the negative attitudes toward nanotechnology observed in the present study. From the researcher's point of view, these negative attitudes prior to the intervention may reflect fear of unfamiliar technology and lack of practical exposure.

However, post implementation of the instructional guidelines, slightly more than three-quarters of the studied nurses demonstrated positive attitudes. This improvement suggests that increased knowledge and clarification of misconceptions can positively influence the acceptance of emerging technologies. Likewise, **Ragucci et al., (2023)** found that structured educational programs addressing nanotechnology led to measurable improvements in nurses' attitudes. This finding supports the idea that improving nurses' knowledge about nanotechnology applications in obstetrics and gynecology through instructional guidelines can reduce concerns, increase confidence in using emerging technologies and foster more positive attitudes.

In the same regard, the finding of the current study confirmed that there is a positive correlation between nurses' knowledge and attitudes. This indicates that increased knowledge contributes to more favorable attitudes, highlighting the critical role of education in reducing resistance to technological innovations. Similarly, a recent research on nurses' knowledge and attitudes toward artificial intelligence found that higher levels of AI knowledge were associated with more favorable attitudes toward AI integration, suggesting that understanding the technology's usefulness reduces uncertainty and supports acceptance (**Alrashedi et al., 2026).**

Concerning the relationship between socio-demographic characteristics and nurses' knowledge level, the observed significant association with educational level and years of experience suggests that advanced academic preparation and professional exposure facilitate understanding of complex and new concepts. Agrees with **Huertas et al., (2024)**, who reported that while nursing students generally had limited awareness of nanotechnology in healthcare, those who had access to information and followed scientific developments demonstrated better knowledge. This indicates that educational exposure improves understanding of nanotechnology concepts.

Moreover, the relationship between socio-demographic characteristics and nurses' attitudes, the results of this study displayed that the studied nurses with higher education, longer experience, and prior knowledge demonstrated more positive attitudes. From the researchers' point of view, advanced educational preparation enhances nurses' critical thinking and competence in evaluating and accepting complex concepts, all of which contribute to increased confidence and favorable attitudes toward new technologies. **Huertas et al., (2024),** emphasized the current need for academic programs that integrate nanotechnology into healthcare curricula to reduce resistance and increase professional confidence in technological adoption

Conclusion

In conclusion, the findings of the current study highlight that nurses' knowledge and attitudes toward nanotechnology in obstetrics and gynecology were generally limited before implementation of the educational guidelines. This may be largely due to gaps in formal education and training.

Furthermore, the associations between educational level, professional experience, and positive attitudes underscore the importance of integrating emerging healthcare technologies into nursing education to prepare nurses for evidence-based, technology-driven practice. These

results support the need for ongoing efforts to enhance nurses' readiness to adopt and apply innovative technologies, ultimately improving obstetrics / maternal and fetal health outcomes and gynecological conditions.

The study demonstrates that targeted educational interventions can significantly improve both knowledge and attitudes, emphasizing the critical role of structured curricula, continuous professional development, and practical exposure.

All in all, the results of the current study proved that implementation of the instructional guidelines significantly improved knowledge and attitudes of obstetrics and gynecological nurses regarding application of nanotechnology in obstetrics and gynecology. Thus, the aim and the hypotheses of the study are achieved.

Recommendation

Based on the findings of the present study, the following recommendations are proposed:

- Integrating nanotechnology into undergraduate and postgraduate nursing curricula and continuous training is essential to enhance nurses' readiness for applications of advanced obstetrics and gynecological care.
- Conducting regular in-service training programs for obstetrics and gynecological nurses to update and enhance their knowledge and attitudes regarding applications of nanotechnology in obstetrics and gynecology.
- Encouraging further research studies regarding the impact of nanotechnology education on clinical nursing practice and maternal health outcomes.

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Impact of Nursing Managers' Despotic Leadership Protective Program on Staff Nurses' Group Cohesiveness and Emotional Dissonance.

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Abstract

Background: Nurses are experiencing various negative consequences as a result of a toxic environment caused by despotic leadership. Nursing managers need to do away such leadership in order to enhance nurses' well-being and workplace that strengthen group cohesiveness and create a psychologically secure free from emotional dissonance. **Aim:** To investigate impact of nursing managers' despotic leadership protective program on staff nurses' group cohesiveness and emotional dissonance. **Method:** A quasi-experimental pre-test and post-test design was utilized at Menoufia University hospital. A convenience sample of 70 nursing managers and a systematic random sample of 350 staff nurses constituted the study sample. Data was collected using despotic leadership questionnaire, group cohesiveness scale, and emotional dissonance scale. **Results:** Post-program, nursing managers' satisfactory despotic leadership knowledge rose from 5.7% to 54.3%, also mean staff nurses' group cohesiveness scores also increased from 47.39 to 73.64, reflecting a significant improvement ($p < 0.001$). Regarding emotional dissonance of staff nurses, mean decreased from14.08 to 7.91 reflecting a significant decreasing ($p < 0.001$). **Conclusion:** Based on the study findings, nursing managers' despotic leadership protective program was significantly effective in promoting group cohesiveness and reducing emotional dissonance among staff nurses. So, enrich nursing manager with continuous, competency based programs focused on identifying and mitigating despotic leadership behaviors; incorporate modules on ethical leadership, psychological safety, and group cohesiveness **is recommended**.

Keywords: Despotic leadership, Emotional Dissonance, Group Cohesiveness, Nursing Managers, Program, Staff nurses.

Introduction

Nursing is a vital profession indispensable for the effective delivery of healthcare services. However, it is a demanding job characterized by numerous challenges and stressors, including long hours, heavy workloads, patient interactions, and despotic leadership (**Akdoğan et al., 2025)**. Despotic leadership is considered one of the most destructive leadership styles, where a leader seeks total control over their subordinates and demands unwavering allegiance from them. Despotic leadership is defined as a leadership style that characterized by a leader's pursuit of absolute control over their subordinates and their demand for complete loyalty (**Cheng &Wang 2015, Zhou et al., 2021)**. This leadership style has severe consequences for the work environment and the health of nurses as increases the influence of organizational deviance, which primarily consists of stealing and putting in less effort to complete daily responsibilities at work (**Erkutlu & Chafra, 2018**) Furthermore, it has Multiple negative consequence including revanchist actions, organizational silence, and emotional weariness. Nurses' well-being and behaviors are also affected (**Akdoğan et al., 2025**). Additionally, it has a detrimental impact on staff job performance, job happiness, and emotional well-being at work (**Raja et al., 2020**). Staff under this leadership are more likely to tolerate bullying, retreat from work, feel emotionally spent, and embrace organizational conspiracy theories (**De Clercq et al.,2020 and Nauman et al.,2020)**. This harmful atmosphere fostered by this leadership results in staff isolation and the formation of defense mechanisms and leading to phenomena such as emotional dissonance and reduced team cohesion (**Wang et al., 2020**).

Obviously, the importance of cohesiveness and teamwork in the medical field has grown significantly. As work becomes simpler and more effective when nurses work as a team and as a unit. Group cohesion can be greatly enhanced by workload reduction, worker satisfaction and retention, patient satisfaction, and improved job performance (**Monroe, 2021**).

Similar, group cohesion is a strategy used for assisting nurses in becoming more cooperative team members and courteous rivals. When nurses have a clear purpose and successfully follow protocols and procedures, nursing cohesion functions better (**Secunda et al. 2020)**.

Creating an effective work team involves developing a plan for how nurses will behave and collaborate, including the efficient use of communication technology to help nurses make better use of face-to-face time. Additionally, nurses maintain a

supportive group that has a positive effect on the environment, guarantee ongoing supervision and evaluations, improve a good understanding of group boundaries and the differences among nurses to enhance their group strengths and treat nurses' weaknesses (**Naylor D 2023, Monroe, 2021, Secunda et al. 2020**).

Based on various studies nurses often manage their emotions as part of their profession, which makes them particularly vulnerable to emotional dissonance. Emotional dissonance is defined as the ensuing discrepancy between felt emotions and the emotions presented to satisfy social norms, professional standards, and organizational requirements. Emotional dissonance arises from the need to hide or explicitly express specific emotions during work-related social encounters (**Hoekx et al., 2022, Johannessen et al., 2025**). This discrepancy impacts nurses in various ways, as it can threaten their psychological and mental health, while also challenging and influencing their objectives and overall psychological well-being (**Shawky, 2025**). Emotional dissonance is tied to high levels of psychological strain and negative effects on the organization and its members (**Hoekx et al., 2022**).

Clearly, programs for positive leadership growth that protect from toxic styles such despotic should be concentrated as this result in improving the psychological capital and adaptive behaviors of nurse leaders. In the same line hospital administrations should incorporate psychological capital building initiatives into staff development strategies to enhance work environments (**Abdel-Azeem et al., 2025 and Govender, 2025**).

Significance of the Study

Despotic leaders are examples of dark side of leadership and obviously, work success is significantly impacted negatively by despotic leadership (**Schilling et al., 2023 and Shahzad et al.2023**). Various studies reveal how despotic leadership negatively impacts nurses' mental health and professional conduct resulting in emotional weariness and revanchist actions. Improving nurses' well-being and preserving a positive healthcare environment require doing away with destructive leadership styles and encouraging candid communication (**Akdoğan et al., 2025 and Shawky, 2025**). Moreover, psychologically safe environment enables members to exchange innovative ideas; cohesion is a crucial requirement for team innovation, as a (**Marmarosh and Sproul 2021**).

Similar, research in a number of fields has focused on role of leadership growth programs in enhancing group cohesion, psychological capital, and adaptive behaviors, and psychologically safe environment away from despotic leadership (**Van**

der Voet & Steijn, 2021 and Govender, 2025),

Therefore, given these considerations, the purpose of this research was to investigate impact of nursing managers' despotic leadership protective program on staff nurses' group cohesiveness and emotional dissonance. This purpose should be fulfilled through the following objectives:

1- Assess level of despotic leadership knowledge among nursing managers pre and post program.
2- Assess level of group cohesiveness and emotional dissonance among their staff nurses pre and post program.
3- Investigate impact of nursing managers' despotic leadership protective program on staff nurses group cohesiveness and emotional dissonance

Research hypothesis

H1- Nursing Managers who receive the despotic leadership protective program has increased satisfactory despotic leadership knowledge post program than before it.

H2- Despotic leadership protective program for nursing managers improve group cohesiveness among staff nurses post program than before it.

H3- Despotic leadership protective program for nursing managers reduce emotional dissonance among staff nurses post program than before it.

Method:

Research Design:

Quasi-experimental research design (a pre- and post-program study) was used in the present study.

Setting

This study was conducted at Menoufia University Hospital, in the specialty units and general departments at Shebin El-kom, Menoufia governorate, Egypt.

Sample:

Group I: Nursing Managers' group:

A convenience sampling technique of nursing managers was used to select participants in the current study. The sample included in the study was 70 nurse managers who agreed to participate in the study.

Sample size: It was determined by using Yamane formula (1976) to assess the sample size of nursing managers; "n=N/ (1+N (e) 2." The sample size of nurse mangers was 71 / (1+71 × (0.05^2)) = 61 nursing managers, they were increased to 70 nursing mangers (1 % possible attrition)

Group II: Staff Nurses' group:

A systematic random sampling technique was used to select 350 staff nurses from a total population of 1,150 staff nurses working in the designated study setting at the time of data collection.

Sample size: It was determined by using Yamane formula (1976) to assess the sample size of staff nurses; "n=N/ (1+N (e) 2)". The sample size of staff nurses was 1150 / (1+1150 ×

$(0.05^2))$ = 297 staff nurses, they were increased to 350 staff nurses (1 % possible attrition).

Instruments

Instrument one; Despotic leadership knowledge Questionnaire:

It was developed by the researchers after reading relevant literature review (**Bhandarker & Rai.,2019, Debbie et al., 2021, Mukarram & Khan.,2021, Samad et al., 2021, and Jeon et al., 2022; etc.…**). It consisted of two sections, the first section concerned with personal characteristics of nursing managers, including; (age, sex, years of experience and the units of work). The second section consisted of 40 questions to assess nursing managers' despotic leadership theoretical and practical knowledge.

Scoring system: The nurse managers' responses scored as the following, one score for the correct answer and zero for the incorrect answer. The total score ranges 0- 40 points. The scoring levels were arranged as follow: (24-40 points) for satisfactory knowledge and (0 < 24 points) is for unsatisfactory knowledge.

Instrument two:

Instrument II: Group Cohesion Scale

Group Cohesion Scale was developed by Treadwell et al. (2001) and modified by Elden et al. (2024) to determine group cohesiveness from staff nurses' perspective. It consisted of two sections, the first section concerned with personal characteristics of staff nurses, including; (age, sex, years of experience and the units of work). The second section consists 25 items with five-point Likert-type scales ranging from 1 (strongly disagree) to 5 (strongly agree) were used for measure.

Scoring system: Scores range from 25 to 125. The perception level of nurses was considered low: if score (25 - 74), moderate if score (75 - 93) and high if score (94 -125) (Elden et al. 2024).

Instrument three:

Emotional dissonance Scale was adopted by **Jeon et al. (2022**) to assess level of emotional dissonance that first proposed by **Cheung and Cheung (2013), and Rutner et al. (2008**). It composed of four items with five-point Likert-type scales ranging from 1 (strongly disagree) to 5 (strongly agree) were used for measure.

Scoring system:

Scores range from 4 to 20. The perception level of nurses was considered low: if score (4 - 11), moderate if score (12 - 14) and high if score (15 -20) (Jeon et al., 2022).

Validity of instruments:

The validity of the three instruments and despotic leadership protective program was done by three experts in Administration Nursing Department who interviewed the questionnaires for content accuracy and internal validity. Also, professors were asked to judge the items for completeness

and clarity (content validity). Suggestions were no modification into instruments and program so they are valid.

Reliability of instruments:

Study instruments were tested for reliability. Regarding Despotic leadership knowledge questionnaire, **cronbach** alpha (α = 0.897). Group cohesion scale, cronbach alpha (α) = (0.95). Furthermore, cronbach alpha for emotional dissonance Scale and it was 0.80. The results of Cronbach alpha reliability test for instruments indicate that they are reliable to detect the objectives of the study.

Ethical Consideration

After receiving the approval of the Faculty of Nursing Ethical and research committee from the selected hospital, the study was conducted. Ethical and Research Committee Decision (No. 970). The respondent's rights were protected by ensuring voluntary participation, so that informed oral consents were obtained after explaining the purpose, nature, time of conducting the study, the potential benefits of the study and how data was collected. The respondents were assured that data was treated as strictly confidential. Furthermore, the respondents' anonymity was maintained as they were not required to mention their name.

Pilot study

10% of the study sample (7 nursing manager and 35 staff nurses) who participated in the study, which aimed to investigate the feasibility of the study instruments and evaluate their clarity, application, and time requirements for completing them all. No modification taken so they were included in the study.

Data Collection procedure

A letter outlining the goal and procedures for gathering data was sent from the dean of the Faculty of Nursing to the director of the Menoufia University Hospital. Official approval was acquired from the Menoufia University Hospital Administration. An inventory was created prior to gathering data. Then, using a number drawn at random from a pool, the researcher issued code numbers to each participant. From the first of July 2024 to the last day of December 2025, a six-month timeframe was used for the research.

Despotic leadership protective program for nursing managers was divided into four phases: assessment, planning, implementation, and evaluation phase.

I. Assessment phase:

Assessment level of Despotic leadership knowledge among nursing managers was done afterwards, assessment level of group cohesiveness and emotional dissonance among their staff nurses was conducted.

II. Planning phase:

Based on the findings of the nursing managers' despotic leadership questionnaire and staff nurses' group

cohesiveness and emotional dissonance before despotic leadership protective program, the program was planned and included six sessions.

III. Implementation phase:

The study sample who receives program was 70 nurse managers divided into two groups; each group contained 35 nurse managers. Each nurse manager received 12 hours. The Despotic leadership protective program lasted for six weeks for each group with 2hours weekly. Each group received 6 sessions. **The program contents conducted in 6 sessions for each group as the following:**

- **The first session:** Theoretical and practical information about leadership related concepts, theories, styles, and dimensions.
- **The second session:** Theoretical and practical information about despotic leadership related concepts, characteristics and despotic leader.
- **The third session:** Theoretical and practical information about different attitudinal, behavioral outcomes, negative consequences of despotic leadership style on nurses and work environment.
- **The fourth session:** Theoretical and practical information about how to protection from despotic leadership, positive leadership style, leadership competencies its application in healthcare organizations.
- **The fifth session:** Theoretical and practical information the role of leadership in group cohesion among nurses
- **The sixth session:** Theoretical and practical information about the role of leadership in emotional dissonance among nurses.

IV. Evaluation phase:

Evaluate the despotic leadership protective program post program through assess levels of despotic leadership knowledge among nursing managers. Also, level of group cohesiveness and emotional dissonance among their staff nurses was conducted.

Data Analysis

Data was coded and transformed into specially designed form to be suitable for computer entry process. Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 2. Graphics were done using Excel program. Quantitative data were presented by mean (X) and standard deviation (SD). Qualitative data were presented in the form of frequency distribution tables, number and percentage. Wilcoxon Signed-Rank test was used to compare two related measurements on the same subjects of the variables. Level of significance was set as p value <0.05 was considered statistically significant and p value <0.01 was considered highly statistically significant.

Results

Table (1) demonstrated the majority of staff nurses were female, aged between 20 and 30 years, posed 1 to 10 years of professional experience, and were employed in critical care units. Conversely, nurse managers are predominantly female, aged between 41 and 50 years, with 21 to 30 years of experience, and also worked within critical care settings.

Figure (1) illustrates that post to the pre-program phase; most nursing managers (94.3%) demonstrated an unsatisfactory level of knowledge regarding despotic leadership at the pre-program phase. In contrast, post program improvement was observed; with 45.7% of nurse managers were achieving an unsatisfactory level.

Table (2) highlights a high statistically significant improvement in nursing managers' knowledge across the program phases. Specifically, the mean knowledge score of nursing managers showed a marked increase following the program when compared to their pre- program scores ($p < 0.001$).

Figure (2) reveals a notable transformation in staff nurses' group cohesiveness across the study phases. Initially, during the pre-program phase, a substantial proportion (64.3%) of nurses reported low group cohesiveness, with only 0.3% indicating high levels. However, following the posttest phase, the percentage of staff nurses experiencing high group cohesiveness rose sharply to 52.3%, while reports of low level fell to zero.

Figure (3) reveals a marked positive change in the level of staff nurses' emotional dissonance from before program to after program phases of the study. Before the program all (100%) of staff nurses experienced moderate to high emotional dissonance. While, following the program, the levels of emotional dissonance dramatically decreased as the overwhelming majority, 75.7%, reported low dissonance while the percentage of nurses with moderate dissonance dropped significantly to 24.3%, and no one reported high dissonance.

Table (3) revealed that, a highly statistically significant difference between the pre and post program scores regarding group cohesiveness and emotional dissonance among staff nurses. A significant improvement in group cohesiveness among staff nurses following the program. The mean score increased from 47.39 ± 13.61 in the pre-program to 73.64 ± 11.49 in the post-program, indicating a marked enhancement in group cohesiveness. In another line, a significant reduction in emotional dissonance among staff nurses following the program. The mean score dropped from 14.08 ± 2.95 in the pre-phase to 7.91 ± 2.73 in the post-program, indicating a notable reduction in emotional dissonance.

Table (1): Distribution of the studied sample according to their personal characteristics (Staff nurses N=350, Nursing Managers N=70).

Personal characteristics	Staff nurses		Nurse Managers	
Age	N	%	N	%
20≤30	138	39.4	0	00.0
31≤40	124	35.4	1	1.4
41≤50	77	22.0	46	65.7
≥51	11	3.1	23	32.9
Mean ± SD	34.23± 8.073		48.67±4.84	
Experience				
1≤10	175	38.0	0	00.0
11≤20	110	32.3	4	5.7
21≤30	58	16.3	47	67.1
≥31	7	13.4	19	27.1
Mean ± SD years of experience	11.86± 8.18		26.99±4.756	
Sex				
Male	131	37.4	0	00.0
Female	219	62.6	70	100.0
The unit in which you work				
Critical care units	219	62.6	39	55.7
Departments	131	37.4	31	44.3

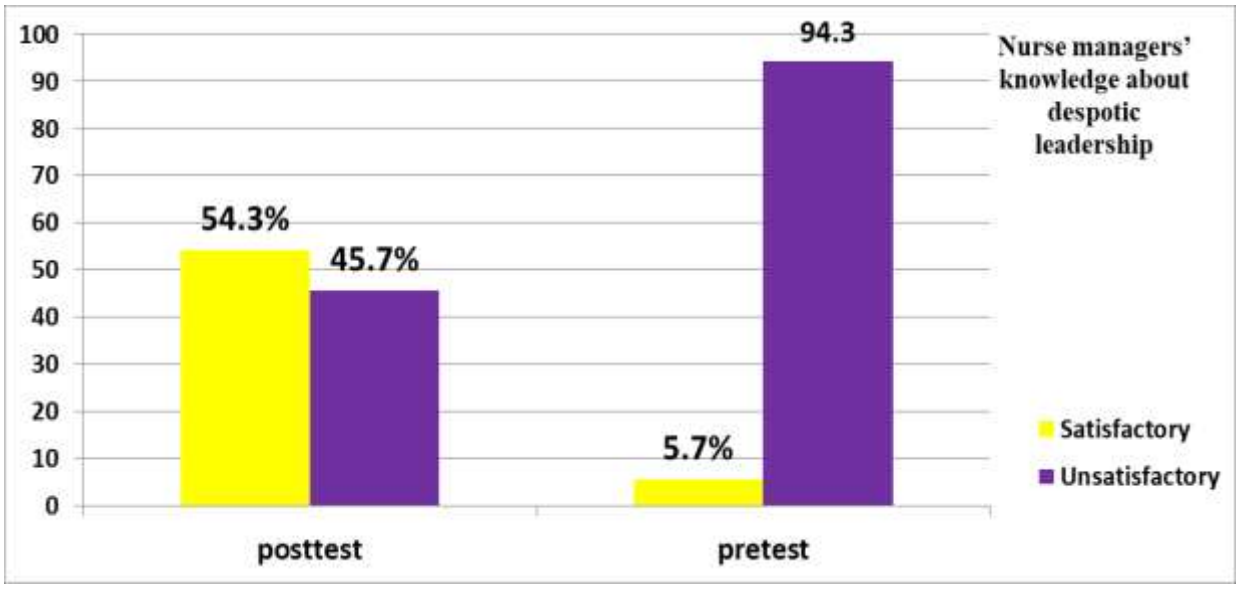

Figure (1) levels of nursing managers' despotic leadership knowledge pre and post despotic leadership protective program. (Nursing Managers N=70).

Table (2): Mean scores of nursing managers' despotic leadership knowledge pre and post despotic leadership protective program. (Nursing Managers N=70).

Despotic leadership knowledge	Pre (M ± SD)	Post (M ± SD)	t-test	P value
	7.47±2.85	13.20±3.30	11.761	0.000**

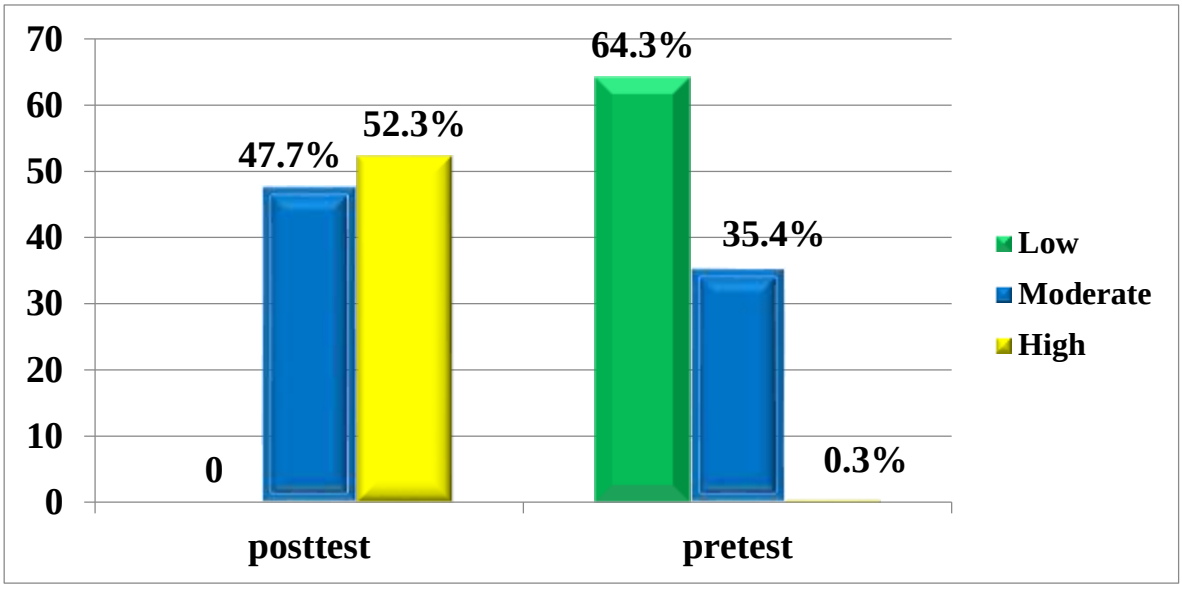

Figure (2): The levels of Staff Nurses' Group Cohesiveness pre and post despotic leadership protective program. (N=350).

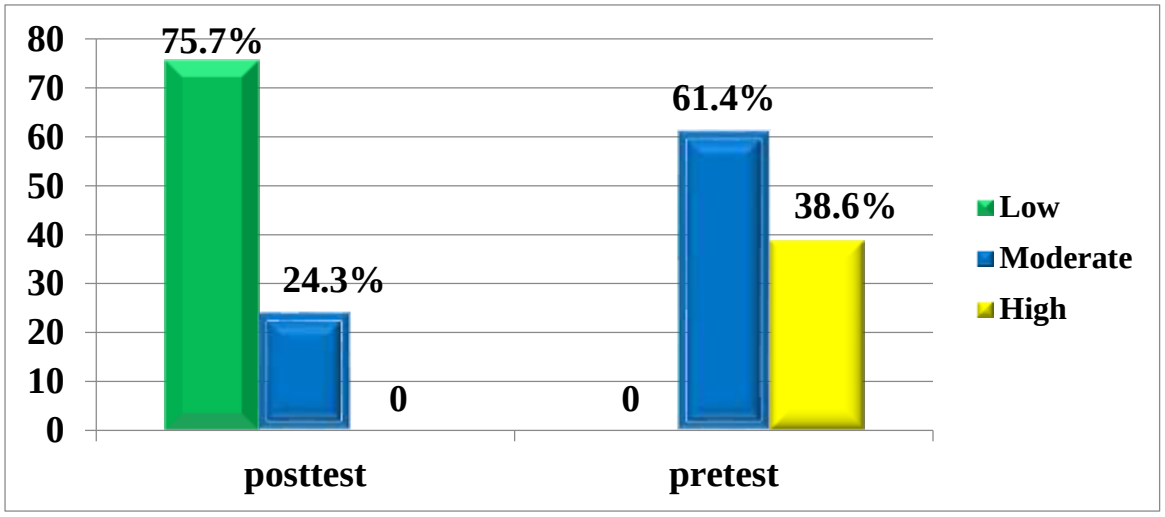

Figure (3): The Level of Staff Nurses' Emotional Dissonance pre and post despotic leadership protective program. (N=350)

Table (3): Mean scores of Staff Nurses' Group Cohesiveness and Emotional Dissonance pre and post despotic leadership protective program. (N=350)

Variables	Pre (M ± SD)	Post (M ± SD)	t-test	P value
Group Cohesiveness	47.39±13.61	73.64±11.49	24.322	0.000**
Emotional Dissonance	14.08±2.95	7.91±2.73	24.950	0.000**

Discussion

Despotic leadership by nursing managers considerably influences the work environment, leading to strengthened emotional dissonance among nurses. This authoritarian style, characterized by absolute control and ignore the subordinates' input, impacts the feelings of emotional exhaustion and job dissatisfaction. Consequently, such leadership erodes group cohesiveness, weakening the connections within the nursing team and delaying their capacity to function efficiently as a unified unit. Focusing despotic leadership via protective programs is crucial for encouraging a healthy and supportive work environment (Mrayyan & Abu-Hantash, 2025 and Akdoğan et al., 2025)

The present study sought to investigate impact of nursing managers' despotic leadership protective program on staff nurses' group cohesiveness and emotional dissonance. When focusing the attention on the socio-demographic data of the studied sample it is revealed that the majority of staff nurses were female, aged between 20 and 30 years, posed 1 to 10 years of professional experience, and were employed in critical care units. Also, the majority of nursing managers are predominantly female, aged between 41 and 50 years, with 21 to 30 years of experience, and also worked within critical care settings.

According to the research investigators, the largest proportion of the studded nurses was females could be due to the high numbers of students who enter the faculty or school of nursing are females and feminists make up the majority of nurses.

This study results were in the same line of the study conducted by Hassan et al. (2024) who carried a study in El-Mabara hospital for Health Insurance in Zagazig city titled despotic leadership, work withdrawal behavior, and acquiescent silence in the current study, the studied participants lied between 21 and 58 years old, with a mean age of 33.85, SD ±5.89 and more than half of them had age more than 35 years old. Prominent gender was females among most of them. The most reported duration of experience was more than 10 years among more than half of studied nurses.

Regarding to the first hypotheses that revealed "Nursing Managers who receive the despotic leadership protective program has a satisfactory knowledge level of despotic leadership post program than before it". Table (1) and figure (1) represented that, this hypothesis was achieved. As the significant post program improvement in nursing managers' knowledge highlights the effectiveness of organized programs in refining awareness of destructive leadership behaviors.

According to researchers, this improvement of nursing managers' knowledge was due to the comprehensiveness of the provided training program. This outcome is consistent with existing scholarship emphasizing the detrimental effects of toxic or authoritarian leadership practices on healthcare personnel and the consequent need for leadership development interventions. For instance, Alsadaan and Alqahtani (2024) reported that authoritarian and manipulative leadership styles contribute to emotional exhaustion and diminish organizational commitment, revealed the need for context-specific training that addresses harmful supervisory behaviors. Similarly, Mehmood et al. (2024) study concentrated on the adverse effects of despotic leadership psychological safety healthcare employees and reinforcing the value of leadership training within hospitals that aimed at mitigating these adverse outcomes.

On the side the second hypothesis proposes that, despotic leadership protective program for nursing managers improve group cohesiveness among staff nurses. This hypothesis also become real and was supported by table 3 and figure 2.

As post-program results showed a **significant increase in group cohesiveness among staff nurses**, indicating that improving nursing managers' awareness and behaviors positively influences team dynamics. This finding reinforces the idea that leadership style directly shapes team cohesion and collaboration.

Supporting literature similarly reports destructive or authoritarian leadership as a key contributor to dysfunctional team relationships. Alsadaan & Alqahtani (2024) demonstrated that toxic leadership negatively influences teamwork and increases conflict, contributing to lower levels of organizational commitment and cohesion. Additionally, Ghanem et al. (2024) found that despotic leadership is significantly related to organizational deviance, emphasizing how leaders' negative actions disrupt group harmony.

On contradiction, a study conducted by Elden et al. (2024). in a study titled "Green Human Resources Management and Group Cohesiveness as Perceived by Nurses

at Menoufia University Hospitals They attributed the cause of decreasing group cohesion among the studied nurses was related to a highly statistically significant positive strong correlation between dimensions of green human resource management anddimensions of group cohesion among the studied

Regarding to the third hypotheses "Despotic leadership protective program for nursing managers reduce emotional dissonance among their staff nurses post program than before it", it has already been proven. As the results of the current study revealed that, a substantial reduction in emotional dissonance was observed post-intervention, suggesting that improved managerial practices may have bolstered nurses' emotional well-being. This aligns with an established body of research documenting the emotional harm associated with despotic and authoritarian leadership styles. For example, Akdoğan et al. (2025) observed that despotic leadership heightened emotional negative effects and organizational silence among nurses. Likewise, Shamshad et al. (2025) demonstrated that emotional problems mediate the relationship between despotic leadership and deviant workplace behaviors in healthcare employees. Furthermore, Badar et al. (2023) found that emotional effects like exhaustion served as a significant mediator between despotic leadership and turnover intentions among nurses.

From the researchers' point of view, the alignment between these studies and the present findings suggests that reducing despotic tendencies through targeted managerial training can effectively diminish emotional strain.

On contradiction to the current study the results of a study title "Emotional Dissonance, Job Stress, and Intrinsic Motivation of Married Women Working in Call Centers: The Roles of Work Overload and Work-Family Conflict which conducted by Jeon et al. (2022) clarified that Both work overload and work–family conflict were found to be significant moderators that aggravate the positive relationships between emotional dissonance and job stress, and the negative relationships between emotional dissonance and intrinsic motivation.

Conclusion

It is clear from the study's findings that the nursing managers' despotic leadership protective program was significantly successful in raising satisfactory level of nursing managers' despotic leadership knowledge at $P<0.001$. As the high percentage of nursing managers achieved significantly improvement with high percentage achieving a satisfactory level.

Furthermore, the study revealed that, a highly statistically significant

difference between mean scores before and after the program concerning group cohesion and emotional dissonance among staff nurses at P<0.001. As after the program, staff nurses were reporting high group cohesiveness increased significantly to 52.3%, whereas instances of low cohesiveness dropped to zero. In contrast, prior to the program, all staff nurses faced moderate to high levels of emotional dissonance. Post program, most participants indicated low emotional dissonance. Therefore, based on these findings, the nurse managers' despotic leadership protective program was successful in achieving its objectives. Certainly, all hypotheses of the research are acknowledged

Recommendations:

- Implement a continuous, competency based program for nurse managers focused on identifying and mitigating despotic leadership behaviors; incorporate modules on ethical leadership, psychological safety, emotional intelligence, conflict resolution, and communication.
- Establish unit level forums and digital channels for upward voice that will help decrease dissonance behaviors and strengthening group cohesiveness
- Incorporate a clear definition of despotic leadership into the code of conduct and managerial competency frameworks
- Create a just-culture process for decrease despotic behaviors as combining fact-finding, coaching plans, and, where needed, corrective action.
- Integrate despotic leadership protective and ethical frameworks in hospitals policies and strategies to avoid toxic workplace
- Enrich nursing curriculum with new trends regarding leadership, group cohesion and emotional dissonance.

Author contributions

All authors contributed to the study design and in writing, revising, and checked the manuscript. All authors read and approved of the final manuscript.

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Conflict of Interest

The authors declare no conflict of interest.

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Effect of Mothers' Health Education on Care Provided For their Children under Five Years Suffering from Iron Deficiency Anemia

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Abstract

Background: Iron deficiency anemia (IDA) is one of the most prevalent public health problems. Iron deficiency anemia is a condition in which low levels of iron are linked with anemia and it characterized by existence of microcytic hypochromic red cells. **Aim:** The current study was aimed to evaluate **t**he effect of mothers' health education on care provided for their children under five years suffering from iron deficiency anemia. **Research design:** A quasi-experimental research design was utilized. **Setting:** The study was conducted at pediatric outpatient clinic and hematology unit of Tanta University hospitals. **Subjects:** A purposive sampling of sixty mothers and their children with iron deficiency anemia were included in the study. **Tools:** three tools were used to collect the required data: Mothers knowledge Interview Schedule, mothers reported practices and children's clinical outcomes. **Result:** The results of the present study represented that about two thirds of mothers had low level of knowledge before educational program, while immediate and one month after educational program the total scores of mothers 'knowledge were improved. The majority of the mothers had unsatesfactory level of practice pre educational program, while immediate and one month after educational program the total scores of mothers ' reported practice was satesfactory. **Conclusion:** there was a significant improvement of mothers 'knowledge regarding care of their children with iron deficiency anemia. **Recommendation:** Continuous educational program should be applied to the mothers of children with iron deficiency anemia.

Keywords: Children, Health Education**,** Iron deficiency anemia, Mothers.

Introduction

Iron deficiency anemia (IDA) is one of the most widespread public health problems, especially in developing countries. Iron deficiency anemia is characterised by presence of microcytic hypochromic red cells. **(Elalfy et al 2025)**

It affects over 25% of people worldwide, according to the WHO, including nearly half of infants and toddlers while affecting over 40% of Egyptian infants from low-income families. Therefore, iron supplementation is essential for this high-risk group. **(Elalfy et al 2025)**

The high prevalence of IDA among under five-year-old children arises from the combination of increased iron needs due to accelerated growth and development, and is mainly due to early consumption of unmodified cow's milk, delayed introduction of iron rich solid foods beyond 6 months, high order of birth within the family and poor maternal educational level. (**Gallagher, 2022).**

Signs and symptoms of iron deficiency depend on the degree of anemia, as extreme fatigue, weakness, pale skin, chest pain, fast heartbeat or shortness of breath, headache, dizziness, cold hands and feet, Inflammation or soreness of the tongue, brittle nails, poor appetitestrange desires for non-nutritive foods like starch, ice, or dirt. **(Lee, 2020).**

Detailed history from the parents is very important in diagnosing iron deficiency anemia, especially about prenatal period and dietary habits including time of introducing solid foods. **(Chang, 2023)**

Also, diagnosis of iron deficiency anemia is made by a combination of risk assessment and laboratory testing of complete blood count, peripheral blood smear, hematocrit test, hemoglobin test, serum iron test, ferritin test, transferrin, and total iron-binding capacity, **(Özdemir & Powers ,2022). (Stoffel et al, 2020)**

Daily iron requirement varies according to age groups. The recommended amount of iron per day for infant whose age below 7 months equal to 0.27 mg/day that increased to 10 mg/day for child whose age 4 years to meet body demands. Therefore, prevention of iron deficiency anemia is essential. **(Ghosh et al, 2019)** (**Stoffel et al, 2024).**

It can be prevented by eating a diet containing adequate iron amounts or by iron supplementation and choosing iron-rich foods such as red meat, beans, dark green leafy vegetables, such as spinach, dried fruit, such as raisins and apricots, iron-fortified cereals, bread and pasta, peas, choose foods containing vitamin C to enhance iron absorption which present in broccoli, grapefruit, kiwi, melons, oranges, peppers, strawberries, tangerines, and tomatoes **(Abrams et al, 2021).**

Highly qualified paediatric nurses play a vital role in the management of children with iron deficiency anemia by assessing their dietary history and perform physical exam, give medications as ordered, administer intermuscular iron Perform sensitivity testing of intermuscular iron injection to avoid the risk of anaphylaxis. Advice mothers to provide iron supplements for their children. Inform mothers that salts of iron will change the stool color to dark green or black. Advise mothers to take liquid forms of iron via a straw and rinse child's mouth with water **(Abdullah et al, 2025).**

Mothers are the first caregiver of their children to avoid IDA in children and achieve optimal growth. Maternal knowledge, and practices affect the change of the children's diet. Mothers with sufficient knowledge will implement a good nutrition practice; hence, their children will be healthy and free from IDA. **(Soliman et al, 2025)**

Mothers should be encouraged to continue iron supplementation therapy for their children according to doctor order. Also, nurses should explain for mothers the diagnostic procedures importance and a possible referral to a haematologist. Explore the significant of iron replacement /supplementation, educate mothers rich foods with iron. **(Ummah, 2024).**

Significance of the study

Despite progress in medicine and science development, more than 50% of children under 5 years of age suffer from iron deficiency anemia. Insufficient iron is considered one of the nutritional disorders all over the world that affects many children especially in developing countries with an increase in the flow rate of children with iron deficiency anemia. **(Gedfie, S., Getawa, S., & Melku, M. (2022)**

All these facts emphasize the importance of constant surveillance and early detection, prevention, and intervention of iron deficiency among childhood, particularly in high-risk groups. Special attention should be paid to discover and treat iron deficiency at the earliest periods of life, because severe iron deficiency can have a great impact on child's growth, development, and learning skills. Mothers play an importance role in their children's life as they are responsible for caring of their children at home. **(Bathla et al, 2021)**

Aim of the Study

The study was aimed to evaluate the effect of mothers' health education on care provided for their children under five years suffering from iron deficiency anemia.

Research Hypotheses

1- Implementing health education for mothers are expected to improve their care provided for their children suffering from iron deficiency anemia.

2- Children suffering from iron deficiency anemia are expected to enhance their hemoglobin level and serum iron after implementation of health education for mothers

Subjects

Research Design:

A quasi-experimental research design was utilized in the current study.

Study Setting:

The study was conducted at pediatric outpatient clinic and hematology unit of Tanta University hospitals. which is affiliated to Ministry of higher education and scientific research.

Subjects:

A purposive sampling of sixty mothers and their children with Iron deficiency anemia were included in the study.

Inclusion Criteria for Children:

- Age from 6 months to less than five years.
- Both gender with iron deficiency anemia

Tools of data collection

Three tools were used to collect the required data; they included the following:

Tool I: Mothers' knowledge about iron deficiency anemia structured interview schedule:

It was developed by the researcher after reviewing the related literatures **(Refat et al, 2025 &, Abdelfatth E & Ismaiel S & Mahmoud E, 2022)**. It was composed of two parts:

Part (1): Socio demographic characteristics which includes:

a) Mothers characteristics such as age, educational level, occupation, residence, participating in any instructional course regarding iron deficient anemia.

b) Children characteristics such as age, gender and birth order.

c) Medical history of children as gestational age, birth weight, hemoglobin level and serum iron at admission.

Part (2): Mothers' knowledge about iron deficiency anemia

It was developed by the researcher after reviewing the recent literatures to assess mothers' knowledge regarding iron deficiency anemia and their sources of information. It was contained items about meaning, risk factors, causes, signs and symptoms, feeding habits and unhealthy habits that prevent iron absorption, dietary intake, foods that increase iron absorption, prevention of iron deficiency anemia. management and therapy of iron deficiency anemia. **Cappellini, Musallam, & Taher, 2020)**

Scoring system for mothers' knowledge was as the following: -

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

Total scoring system for mothers' knowledge

- From 75- 100 % was considered high level of knowledge,
- From 60 to less than 75 % was considered moderate level of knowledge.
- Less than 60% was considered low level of knowledge.

Tool II: Mothers reported practices

It was developed by the researcher after review literature to assess mother's practices regarding iron deficiency anemia. It was included: Mouth care, brush teeth and dental care, administration of iron supplement and observe change of stool and urine colours. (**Ibrahim et al., 2022; Abdel-Mohsen, 2025, Harb et al., 2025)**

Total score was calculated as follow:

- Less than 70% was considered unsatisfactory practice.
- From 70%- 100% was considered satisfactory practice.

Tool III: Children clinical outcomes: It was developed by the researcher to evaluate outcome of the children and consisted of three parts as follow: - Observation for tooth decay, laboratory investigation to measure hemoglobin level, hematocrit and serum iron level and change color of stool and urine.

Method

An official permission to conduct this study was obtained from Faculty of Nursing Tanta University directed to administrators of outpatient pediatric clinics at Tanta University hospitals to obtain their approval and cooperation for carrying out this study.

2-Ethical and legal considerations: Ethical approval to conduct the study was taken from scientific research ethics committee of the Faculty of Nursing, Tanta University before conducting the study; code No. 250/5/2023. Appendix (III). Mothers were informed about the confidentiality of the information obtained from them. The nature of the study didn't cause any harm or pain to the entire sample. Mothers' oral consents to participate in this study were obtained after explanation of the aim and benefits of the current study. The mothers had the right to withdraw from the study at any time without providing a reason.

3-Tools development:

The Study tools (tool I, II, III) were developed and modified based on the review of the related literatures.

4-Content validity:

The tools of the study were presented to a jury of five experts in the field of Pediatric Nursing to check content validity and clarity of the questionnaire. Modifications were carried out accordingly. Content validity index was >95 %

Appendix (III)

5- Reliability of tools:

The test of reliability was indicated high reliability of tools used for data collection. in the present study the

developed tools were tested through the internal consistency and the value of **Cronbach's Alpha was** 0.888 for **"**Mothers' knowledge. 0.798 for "Mothers reported practices"**,** 0.902 for**"** children clinical outcome**"**

6-Apilot study:

A pilot study was conducted on 10 % of the sample (6 mothers with their children) to test clarity; visibility and applicability of the study tools and the necessary modification were done. The Pilot study was excluded from the study sample.

7-Phases of the study: The present study was conducted on five phases:

I-Assessment Phase:

The researcher carried out meeting with mothers, who participated in the study in order to explain the aim of the study, collect data about mothers and their children to assess mothers' knowledge about iron deficiency anemia by using (**tool I, II)**

2-Planning phase: Educational program was planned according to mother's educational needs assessment and based on literature review which was included the following:

- Setting specific objectives of the educational program.
- Preparation of the content which was covered the reason behind the implementation of the sessions, researcher planned questionnaires sheet.
- The educational program was translated into Arabic.
-A booklet was designed and included a teaching module. It contained meaning, risk factors, causes, clinical manifestations, diagnosis, management, complication, prevention of iron deficiency anemia.
- Different teaching methods and materials were used including interactive lectures, group discussion, pictures, demonstration and redemonstration.

3-Implementation phase:

An educational program was carried out through conduction of successive sessions with every mother and child, they were divided into 10 subgroups, and each subgroup was attended five sessions and scheduled in the morning. The time for each session was about 30 – 45 minutes that was based on the response of the mother and the child condition.

The content of the five sessions covered the following topics:

The first session:

It focused on meaning, causes and predisposing factors of iron deficiency anemia.

The second session:

This session focused on theoretical knowledge regarding signs and symptoms of iron deficiency anemia, possible complications and feeding habits and unhealthy habits that prevent iron absorption and dietary intake.

The third session:

It focused on how to prevent iron deficiency anemia, ways of

management and behavior modification of dietary intake.

The fourth session:

It focused on types of foods that increase iron absorption, different types of iron supplementation and eating foods rich of iron.

The fifth session:

It aimed to enhance practices of mothers such as mouth care, brush teeth, administration of iron medication and observe change of urine and stool colors.

- Data was collected within one year. (From June 2024 to July 2025)

4- Evaluation phase:

Evaluation of the effects of educational program on mothers' knowledge and practices about iron deficiency anemia was carried out using the same assessment tools (Tool I, II, III). Each mother was evaluated immediately and one month after implementing educational program (through the follow up visits) and these were compared to pre-test levels to evaluate effectiveness of the educational program.

Statistical analysis:

The collected data were coded, entered, tabulated and analyzed using SPSS (Statistical Package for Social Science) version 23. Reliability is measured by using Cronbach's Alpha. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, which describe a categorical set of data by frequency, percentage or proportion of each category? The Friedman test is used for one-way repeated measures analysis of variance by ranks (χ^2). Fisher's exact test is used to analyze the relationship between two categorical variables. For comparison between means of two groups of parametric data of independent samples, T test was used. For comparison between more than two means of parametric data, Anova test (F) was calculated. Correlation between variables was evaluated using Pearson's correlation coefficient.

Results

Table (1): Presents socio-demographic characteristics of the studied mothers. Regarding age, it was revealed that, more than one third of the studied mothers (41.7 %) were between 20 to less than 30 years old, with mean ± SD of age 31.75±10.89. and, more than one third of the studied mothers (43.3%) had Secondary\ Diploma education. Concerning mothers' occupation, it was observed that more than half of the studied mothers (56.7 %) were working, and more than two thirds of them (70.0%) were from rural area.

Table (2) Represents socio-demographic characteristic of the studied children. It was observed that, nearly half of the studied children (43.3%) aged from 3 to less than 5 years. The study

revealed that, nearly two thirds of them (63.3%) were males, 40% were at the second birth order in the family.

Figure (1): Demonstrate percentage distribution of the studied mothers regarding their total level of knowledge about iron deficiency anemia. It was observed that, 71.7% of the studied mothers had low level of knowledge before the educational program while 90%, 80% of them had high knowledge immediately and after one month of educational program respectively. there was statistically highly significant difference between before and immediately after educational program at (X2=-21.20), (P1=0.0001**).

Table (3) Illustrates total mean scores of mothers' reported practice concerning care of their children with iron deficiency anemia. It was observed that there were highly statistically significant differences between all total mothers practice before, immediately & one month after educational program with **mean & SD (**19.50±5.92, 40.18±3.98, 37.15±4.42**)** respectively.

Table (4) Illustrates Percentage distribution of the studied children according to their clinical outcomes It was clear that, all studied children their haemoglobin level was from 6 to less than 10 g /dl before educational program, while 31.7% 0f them their haemoglobin level is more than 10 one month after the educational program. Regarding serum iron, all studied children their serum iron was less than 20 µg/L before educational program, while 85% of them had serum iron from 20 to less than 30 one month after educational program.

Table (5) Shows Correlation between mothers' total knowledge scores and total reported practice scores regarding iron deficiency anemia. It was evident that there was statistically significantly correlation between mothers' total knowledge scores and total reported practice scores before, immediately and one month after educational program (r=0.674, p=0.001**), (r=0.483, p=0.0001**), (r=0.278, p=0.031*) respectively.

Table (1): Percentage Distribution of the Studied Mothers According to Their Socio-demographic Characteristics

Socio-demographic characteristics of mothers	Total Studied Mothers (n=60)	
	No	%
• **Age (years)**		
<20	8	13.3
20<30	25	41.7
30<40	14	23.3
≥ 40	13	21.7
Range	(19-55)	
Mean & SD	31.75±10.89	
• **Education**		
Illiterate	27	45
Secondary\ Diploma	26	43.3
University or college	7	11.7
• **Occupation**		
Worked	34	56.7
House wife	26	43.3
• **Marital Status**		
Married	57	95
Divorced	0	0.0
Widow	3	5
• **Residence**		
Urban	18	30
Rural	42	70
• **Children numbers in the family**		
1	14	23.3
2	32	53.3
≥3	14	23.3

Table (2): Percentage Distribution of the Studied Children According to Their Socio-Demographic Characteristics

Socio-demographic characteristics	Total studied children (n=60)	
	No	%
Age (years)		
<1	12	20
1<3	22	36.7
3<5	26	43.3
gender		
Male	38	63.3
Female	22	36.7
Birth order		
1st	21	35
2nd	24	40
3th	15	25
≥4 th	0	0.0

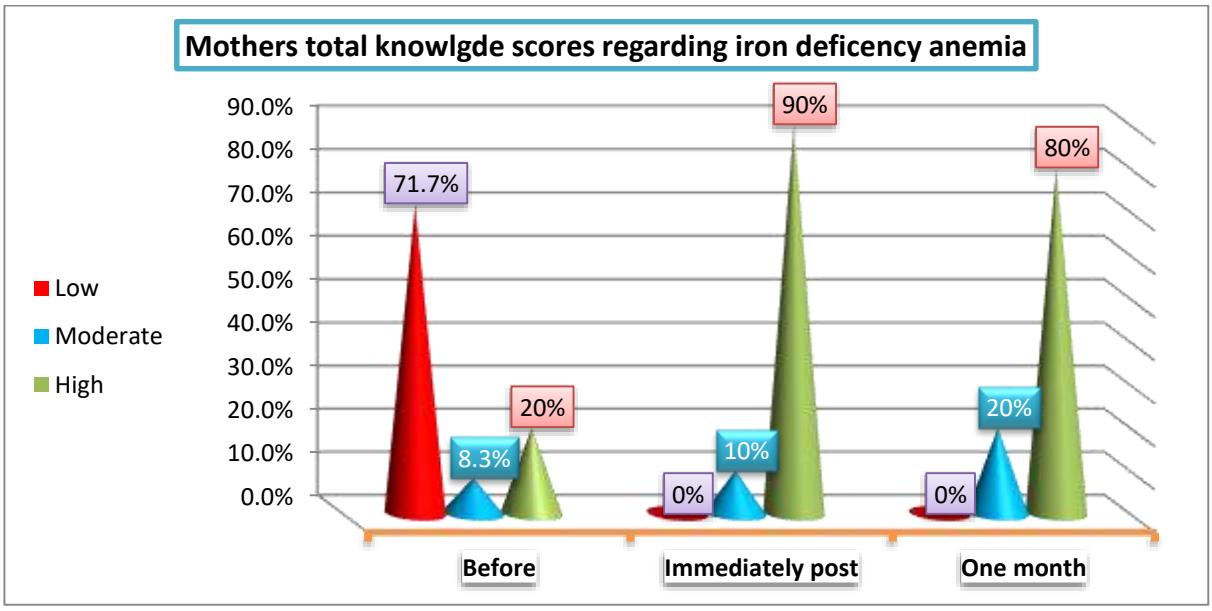

Figure (1): Total Knowledge levels of the Studied Mothers about Iron Deficiency Anemia

Table (3): Mean scores of mothers' practice regarding care of their children with iron deficiency anemia

Mothers reported practice with score	Total Studied Mothers (n=60)						
	Before	Immediately post	One Month After	F\P	T\P1	T\P2	T\P3
	Mean & SD	Mean & SD	Mean & SD				
Mothers' infant reported practice	19.33±6.09	34.01±1.12	31.41±2.71	48.57 0.0001**	-9.46 0.0001**	-6.43 0.0001**	2.92 0.014*
Mothers' toddler reported practice	22.13±7.45	42.50±2.77	39.90±3.02	81.67 0.0001**	-13.09 0.0001**	-11.86 0.0001**	3.83 0.001**
Mothers' preschool reported practice	17.50± 3.59	41.07±2.57	37.46±3.58	583.94 0.0001**	-30.98 0.0001**	- 25.56 0.0001**	5.50 0.0001**
Total Mothers' practice	19.50±5.92	40.18±3.98	37.15±4.42	312.24 0.0001**	-25.18 0.0001**	-22.30 0.0001**	7.30 0.0001**

**** Highly Significant at P<0.01 (two sides) * Significant at p<0.05 (two sides) P: Before and immediately and one month after Educational program**
P1: Before and immediately after educational program P2: Before and one month after educational program P3: Immediate and one month after educational program P2: Before and one month after educational program P3: Immediate and one month after educational program

Table (4): Percentage Distribution of the Studied Children According to Their Clinical Outcomes

Clinical Outcomes	Total Studied Children (n=60)									
	Before educational Program		Immediately Post educational intervention		One Month after educational intervention		X^2 P	X^2 P1	X^2 P^2	X^2 P^3
	No	%	No	%	No	%				
Observation of tooth decay										
Present	41	68.3	41	68.3	35	58.3	131.60 0.0001**	0.000 1.000	86.47 0.0001**	86.47 0.0001**
Absent	19	31.7	19	31.7	25	41.7				
B- Laboratory investigation to measure:										
Hemoglobin level (g/dL)										
<6	0	0.0	0	0.0	0	0.0	27.98 0.0001**	5.21 0.022*	22.57 0.0001**	10.20 0.001**
6<10	60	100	55	91.7	41	68.3				
≥10	0	0.0	5	8.3	19	31.7				
Range	(6.1-9.5)		(6.80-10.20)		(8-11)		**F\P**	**T\P1**	**T\P2**	**T\P3**
Mean &SD	7.50± 0. .89		8.39± 0.93		9.48±0.85		156.06 0.0001**	-13.72 0.0001**	-55.64 0.0001**	-18.16 0.0001**
2-Hematocrit level %										
<20	8	13.3	0	0.0	0	0.0	116.70 0.0001**	38.41 0.0001**	88.12 0.0001**	34.14 0.0001**
20<25	35	58.3	13	21.7	0	0.0				
25<30	17	28.3	32	53.3	15	25				
≥30	0	0.0	15	25	45	75				
Range	(17.5-29)		(22.4 -33.7)		(26.4- 36.3)		**F\P**	**T\P1**	**T\P2**	**T\P3**
Mean &SD	22.77±2.94		27.13±3.40		31.20±2.79		589.78 0.0001**	-17.27 0.0001**	-40.53 0.0001**	-13.20 0.0001**
3-Serum iron (µg/L)										
<20	60	100	56	93.3	9	15	126.35 0.0001**	4.13 0.042*	88.69 0.0001**	70.05 0.0001**
20<30	0	0.0	4	6.7	51	85				
≥30	0	0.0	0	0.0	0	0.0				
Range	(6-17)		(8-24)		(15-32)		**F\P**	**T\P1**	**T\P2**	**T\P3**
Mean &SD	11.95± 2.721		15.10± 3.34		22.48± 3.79		352.66 0.0001**	-12.10 0.0001**	-37.12 0.0001**	-19.11 0.0001**

**** Highly Significant at P<0.01 (two sides) * Significant at p<0.05 (two sides) P: Before, immediately and one month after P1: Before and immediately after P2: Before and one month after P3: Immediate and one-month after**

Table (5): Correlation between Mothers' Total Knowledge Scores and Total Reported Practice Scores Regarding Iron Deficiency Anemia

Total **reported** Practice scores	Total Knowledge Score					
	Before educational intervention		**Immediately after educational intervention**		**After one month educational intervention**	
	R	**P**	**r**	**P**	**r**	**P**
	0.674	0.0001**	0.483	0.0001**	0.278	0.031*

Significant correlation at p<0.01 (two sides) * Significant correlation at p<0.05 (two side)

Discussion

Iron Deficiency Anemia (IDA) is a common nutritional disorder caused by insufficient iron levels in the body, leading to reduced red blood cell production and impaired oxygen transport. It is a major public health concern, particularly among children. If left untreated, IDA can negatively impact physical and mental development and immune function. **(Chandrasekar et al., 2025). (Rahman et al., 2025).**

Regarding the socio-demographic characteristics of the studied mothers, the current study showed that, more than one third of the studied mothers had secondary\ diploma education and more than half of the studied mothers were working

This finding was in harmony with **Rashdan Ibrahim, Ibrahim Abd El-Moniem & Fathy El-Sayed (2022)** who reported that mothers' educational level, is an important factor which had direct effect on quality of care given to their children.

Moreover, **Ahmed A, Gouda S, Faheem S. (2025).** Found that about half of the studied mothers' age group was 25 > 32 years, most of the studied mothers were married, about half of them had secondary education. This result was in contrast with

Regarding age of the studied mothers, the study showed that, more than one third of the studied mothers their age was from twenty to less than thirty. From the researcher point of view, mothers who was less than thirty years do not have enough knowledge about iron deficiency anaemia to improve their practice regarding care of their children with iron deficiency anaemia. This point of view was in agree with ***Abd El Reheem, Mahmoued Soliman, & Melika (2020)*** who study Iron deficiency anaemia among children during weaning, suggest that younger age mothers don't have enough experience about healthy diet that increased the risk for iron deficiency anaemia among their children.

Regarding the socio-demographic characteristic of the studied children. It was observed that, nearly half of the studied children aged from

3 to less than 5 years. From the researcher point of view, this predominance of pre-school–aged children may be attributed to their increased nutritional requirements during rapid growth, combined with inappropriate dietary practices, poor intake of iron-rich foods, and increased exposure to infections, all of which make this age group more vulnerable.This finding was in harmony with **Orsango et al, (2021)** who assessed Iron deficiency anemia among children aged 2–5 years in southern Ethiopia and reported that about half of the children their age from 3 to 5 years and found that unhealthy food habit increases the risk for iron deficiency anaemia.

Concerning gender of the studied children nearly two thirds of them were males. From the researcher point of view, boys usually spoiled than girls and not follow their parents' commands. This finding was in the same line with **Abdelfatth Z, Ismaiel S, Mahmoud E. (2022).** who found that two thirds of the studied children were males. Also, **Kajoba D, Egesa W, Muyombya S, Ortiz Y and Ndeezi G. (2024).** Reported that male children had more than 60% higher odds of having IDA compared to females. Also, the study findings agree with a study in Finland conducted by **Holmlund-suila E, Hauta-alus H and Enlund-cerullo M. (2022)** where iron deficiency and IDA were more prevalent in boys compared to girls.

Regarding birth order, the present study showed that about two third of the studied children were in the second birth order or more in the family. From the researcher point of view, higher birth order may increase the risk of iron deficiency anemia due to resource dilution within the family**,** where parental attention, nutritional resources, and healthcare access are shared among multiple siblings

These finding were in agree with **Elalfy, Omar et al (2025)** Who Found that more than two third of the studied children were in the second birth order or more in the family. Also, it is one of the independent clinical risk factors in their study.

Regarding total scores of mother's knowledges, the current study showed that, more than two thirds of mothers had low level of knowledge about iron deficiency anemia before educational program while immediately after educational program, mothers' knowledge improved and most of them obtained high scores. But one month after the educational program, the total scores of mothers` knowledge still improved but slightly reduced to more than two thirds of them. From the researcher point of view, this could be attributed to lack of simple Arabic references about iron deficiency anemia), low mother's educational attainment, no available time for physician and

nurses to provide mothers with proper knowledge.

While immediately improved mothers' knowledge due to the content of educational intervention and availability of the researcher in the field for more clarification and frequent repetition to fix the knowledge and motivating those mothers by providing them with an educational booklet.

This finding was supported by **Abdelfatth, E., Ismaiel, S., & Mahmoud, E. (2022).** Who found that more than half of studied mothers had poor knowledge and reported practices about iron deficiency anaemia.

Also, this finding was supported by **(Habib, Sakib & Tareq, 2025)** who found that, children whose mothers received sufficient education during anti natal care (ANC) visits were nearly twice as likely to consume iron-rich foods as children whose mothers received no anti natal care visits. In addition, this finding was consistent with **Alhaija et al. (2024),** who clarified that minority of the mothers had good level of knowledge regarding iron deficiency anemia.

Regarding mothers total reported Practice scores. The present study relieved that majority of the studied mothers had unsatisfactory practice of their children before the educational program, while immediately and one month after educational program, mothers' **reported** practice improved and most of them had satisfactory practice. From the researcher point of view, this reflects marked improvement in studied mothers **reported** practice after implementation of the educational program.

This finding was in harmony with **Al-Suhiemat A, Shudifat R, & Obeidat H (2020) who** Found that the majority of mothers of pre-schoolers had poor practices then recommended that the importance of implementation of national awareness program for parents regarding best Practice to overcome iron deficiency anaemia.

Also, this result was in the same line with **Abu-Baker et al., (2021)** who stated that educational intervention is an effective method to improve mothers' practice regarding iron deficiency anemia. Also, this result agreed with **Amer et al. (2021),** who clarified that the most of the mothers had unsatisfactory total reported practices regarding prevention of iron deficiency anemia.

Regarding children clinical outcome, the result of the present study indicated that significant changes were found from pre- to post educational program in Hb, ferritin and Serum Iron. No one of the studied children were healthy at the pre-educational program period, while in the post- educational program haemoglobin, haematocrit and serum iron level started to increase among the majority of the studied children.

These findings are consistent with previous studies which demonstrated that nutrition education combined with iron supplementation results in significant improvement in haemoglobin levels and serum iron. Such improvement is mainly attributed to enhanced nutritional knowledge, improved dietary practices, and increased adherence to iron supplementation (**Kefiyalew et al., 2021; Nguyen et al., 2022; WHO, 2023).**

Regarding the Correlation between mothers' total knowledge scores and total reported practice scores about iron deficiency anemia of their children. It was evident that there was statistically significantly positive correlation between mothers' total knowledge scores and total practice scores before, immediately and one month after implementation of educational program. From the researcher point of view, knowledge plays important role for improving practices leading to high practices level and effect on mothers' care for their children with iron deficiency anemia.

This finding was in agree with **Abdelfatth E, Ismaiel S, & Mahmoud E (2022)** who found that there was a highly statistically significant positive correlation between mothers' knowledge and practices about iron deficiency anaemia. In the same line, **Abd El Reheem, Mahmoued Soliman & Melika (2020)** found that, there was statistically significant positive correlation were found between mothers' knowledge and reported practices about iron deficiency anaemia,

Conclusion

The current study concluded that: There was an improvement in mothers` knowledge and reported practice after the educational program in relation to caring of their children with iron deficiency anemia.

Recommendations

1-Periodic educational program about caring of children with iron deficiency anemia should be to nurses and mothers at pediatric outpatient clinic to improve their knowledge and healthy eating habits.

2- Develop instructional guideline for mothers about breast feeding, ideal weaning schedule and care of their children with iron deficiency anemia based on the evolvement of the international evidence-based criteria in maternal and child health centres.

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