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Risk Factors Associated with Osteoporotic Vertebral and Neck of Femur Fractures: A Hospital-Based Case-Control Study in Alexandria

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Abstract

Background: Osteoporotic vertebral and femoral neck fractures are major public health concerns, particularly in aging populations, due to their rising incidence and associated healthcare burden. **Objective:** To investigate sociodemographic, behavioral, nutritional, familial, and medical determinants of vertebral and femoral neck fractures in Alexandria, Egypt. **Subjects and Method:** A hospital-based matched case-control study was conducted at El-Hadara University and Ras El Tin Hospitals. The study enrolled 384 patients with confirmed vertebral or femoral neck fractures and 384 age- and sex-matched controls without fractures. Data collection encompassed sociodemographic indicators, family history, lifestyle practices, dietary intake, comorbidities, and medication use. Statistical analyses assessed associations between potential risk factors and fracture occurrence. **Results:** Advanced age (≥ 60 years), low education, unemployment, and rural residence significantly increased fracture risk ($p < 0.001$). A family history of osteoporosis or fractures was more common among cases ($p < 0.001$). Behavioral factors such as smoking, insufficient physical activity, and limited sun exposure were significantly associated with fractures ($p < 0.001$). Nutritional inadequacies—including low calcium, vitamin D, and protein intake—were markedly higher in cases ($p < 0.001$). Chronic conditions (osteoporosis, diabetes, hypertension, Parkinson's disease) and prolonged corticosteroid use further elevated risk ($p < 0.05$). **Conclusions:** Fracture risk in Alexandria is multifactorial, influenced by sociodemographic vulnerabilities, modifiable lifestyle and nutritional behaviors, genetic predisposition, chronic diseases, and medications. **Recommendations:** Prevention should emphasize education, smoking cessation, physical activity, sun exposure, improved nutrition, fracture risk screening, liaison services, and rural outreach to enhance bone health equity.

Keywords: Vertebral fracture, Femoral neck fracture, Risk factors, Case-control study

Introduction

Osteoporotic hip and vertebral fractures are rising public-health priorities because they cluster late in life, concentrate multimorbidity, and drive excess mortality, disability, and health-system costs. Globally, the incident burden of vertebral fractures remains substantial—with regionally divergent trends—and the Middle East/North Africa is among the few regions reporting increases after age-standardization, underscoring an urgent need for locally anchored evidence to guide prevention (**Lei et al., 2025**). In Egypt, contemporary registry analyses indicate that hip fractures are common, geographically heterogeneous, and expensive to the health system, sharpening the case for risk-targeted strategies that move upstream from treatment to prevention (**El Miedany et al., 2023**).

Case-control designs are well suited to disentangle proximal, modifiable determinants of fracture—particularly in urban settings where exposures such as falls risk, sarcopenia, polypharmacy, malnutrition, and low bone mineral density (BMD) intersect with social and environmental factors. Recent syntheses highlight a multifactorial causal web: intrinsic factors (age, prior fracture, low BMD, muscle weakness), behavioral factors (physical inactivity, smoking,

alcohol), and clinical factors (vitamin D deficiency, comorbidity load, glucocorticoid use) interact to precipitate both hip and vertebral fragility fractures (**Yu et al., 2023**). Egyptian data further emphasize muscle health as a lever: among hip-fracture patients, sarcopenia prevalence is high and independently associated with adverse profiles, suggesting that screening and nutrition-focused interventions could reduce fracture susceptibility and sequelae (**Mahran et al., 2025**).

At the hip, granular phenotyping shows that bone quality (e.g., Singh index), BMD, and concomitant medical disease meaningfully stratify risk, including the risk of contralateral hip fracture—a proxy for persistent vulnerability after the index event (**Zhao et al., 2024**). For vertebral fractures—many of which remain clinically silent—the epidemiologic signal in North Africa and the Middle East points to a growing burden in aging women and men, with implications for targeted spine imaging and secondary prevention pathways integrated into fracture liaison services (**Lei et al., 2025**). In Egypt specifically, economic analyses estimate substantial direct costs attributable to hip fractures, reinforcing the value proposition of prevention that focuses on modifiable exposures in

high-incidence locales (**El Miedany et al., 2023**).

Against this backdrop, a case–control study in Alexandria that jointly evaluates hip (femoral neck) and vertebral fractures can quantify locally relevant, modifiable risk factors to inform pragmatic prevention bundles (falls prevention, sarcopenia screening/management, vitamin D and nutrition optimization, medication review, and osteoporosis treatment). Such evidence can directly feed Egyptian screening guidance and help regional health systems prioritize high-yield interventions that are feasible in resource-constrained settings (**El Miedany et al., 2023**).

Vertebral and hip (femoral neck) fractures represent a major and growing public health concern, particularly in aging populations across low- and middle-income countries where epidemiological data remain limited. In Egypt, hip fractures account for significant morbidity, mortality, and economic burden, while vertebral fractures are often underdiagnosed despite their role as predictors of future fragility fractures. Although global research has identified multiple risk factors—including advanced age, low bone mineral density, comorbidities, nutritional deficiencies, and behavioral determinants such as smoking and physical inactivity—there is a paucity of context-specific

evidence from North Africa. Given that risk exposures are shaped by sociocultural, dietary, and environmental factors, extrapolation from Western cohorts may not accurately reflect local realities. Therefore, a hospital-based case–control study in Alexandria focusing on both vertebral and femoral neck fractures is warranted to clarify the interplay of sociodemographic, familial, behavioral, dietary, medical, and environmental determinants in this setting. Such evidence is essential not only for developing effective prevention and early detection strategies, but also for informing national guidelines, optimizing resource allocation, and reducing the personal and healthcare system burden of fragility fractures in Egypt.

Aim of Work:

To identify the risk factors of vertebral and neck of the femur fractures in El-Hadara University Hospital and Ras El Tin Hospital in Alexandria.

Research Questions

1. What sociodemographic factors (age, education, employment status, and residence) are significantly associated with increased risk of vertebral and neck of femur fractures among patients in Alexandria, Egypt?
2. How do behavioral and lifestyle factors (smoking, physical activity, sun exposure, dietary intake)

contribute to the incidence of vertebral and femoral neck fractures in the studied population?

3. What is the impact of medical comorbidities (osteoporosis, diabetes, hypertension, Parkinson's disease) and long-term corticosteroid use on the risk of developing vertebral and femoral neck fractures in Egyptian adults?

SUBJECTS AND METHOD:

Subjects

This study included adult patients diagnosed with vertebral or neck of femur fractures and matched controls without fractures. The subjects were recruited from the Orthopaedic Departments of El-Hadara University Hospital and Ras El-Tin Hospital in Alexandria, Egypt. A total of 384 fracture cases and 384 age- and sex-matched controls were enrolled during the 12-month period from October 2006 to September 2007.

Research Design

The present study followed a hospital-based matched case-control design aimed at identifying risk factors associated with vertebral and femoral neck fractures.

Setting

The study was conducted in the Orthopaedic Departments of two major hospitals in Alexandria: El-Hadara University Hospital and Ras El-Tin Hospital.

The cases included adult patients (≥ 18 years) newly diagnosed with

vertebral or femoral neck fractures, confirmed by clinical and radiological evaluation. Controls were selected from hospital patients without fractures, matched by age and sex. Patients with pathological fractures due to malignancy or severe trauma were excluded.

Tools of the Study

Data were collected using a structured questionnaire developed by the researchers to gather information on:

- Sociodemographic factors: age, sex, marital status, education, occupation, residence.
- Familial history: presence of osteoporosis or previous fractures among relatives.
- Behavioral factors: smoking status, alcohol and caffeine intake, physical activity, sun exposure.
- Nutritional factors: intake levels of calcium, vitamin D, and protein.
- Medical history: presence of osteoporosis, diabetes mellitus, hypertension, Parkinson's disease, and corticosteroid use.
- Environmental hazards: household conditions contributing to fall risk.

Method

The study was implemented following these steps: Obtaining Approval:

Official permissions were obtained from the administration of El-Hadara University Hospital and Ras El-Tin Hospital to conduct the study and collect data.

Ethical Considerations:

The study protocol was approved by relevant ethical committees. Written informed consent was obtained from all participants after explanation of the study aims. Confidentiality and privacy of participants were strictly maintained throughout the study. The research posed no harm or discomfort to the participants.

Preparation of Study Tools:

The questionnaire was designed and validated by experts in orthopedics and epidemiology. A pilot test was conducted on a small subset of patients to assess clarity and applicability, and adjustments were made accordingly.

Data Collection:

Trained researchers interviewed participants and reviewed medical records to collect relevant data on sociodemographic, familial, behavioral, nutritional, medical, and environmental factors.

Statistical Analysis:

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 24.0. Quantitative variables were expressed as means $\pm$ standard deviation, and qualitative variables as frequencies and percentages. Chi-square tests were used to compare categorical variables between cases and controls. Statistical significance was set at $p < 0.05$.

This methodology enabled the identification of significant

modifiable and non-modifiable risk factors associated with vertebral and neck of femur fractures in the studied Egyptian population.

Results

The findings confirm age as a dominant non-modifiable determinant of fracture risk. Individuals aged ≥ 60 years accounted for over 70% of cases, compared with just over half of controls, indicating a nearly twofold excess risk. This aligns with biological evidence that advancing age accelerates bone mineral loss and muscle weakness, heightening fall and fracture susceptibility. The sex distribution was balanced between groups due to design matching, ruling out sex bias. Thus, age emerges as the strongest demographic predictor, underscoring the need for targeted geriatric screening and early intervention strategies in populations over 60 years (**Table 1**).

Sociodemographic disadvantages were strongly linked to fracture risk. Illiteracy and low education were significantly more common among cases, suggesting limited awareness of preventive practices. Unemployment and retirement also predominated, which may reflect both socioeconomic hardship and reduced physical activity. Rural residents were overrepresented among cases, possibly due to nutritional limitations, reduced

healthcare access, and environmental hazards such as poorly equipped housing. These associations illustrate the social gradient in health, where fracture risk is amplified by educational, occupational, and residential disparities. Addressing these gaps through targeted health education and rural outreach could mitigate fracture incidence in vulnerable subgroups (**Table 2**).

The results demonstrate a strong familial component in fracture risk. Cases reported a significantly higher prevalence of family history of osteoporosis and fractures, suggesting genetic predisposition and potential shared lifestyle exposures within households. This clustering highlights the importance of incorporating family history into clinical risk assessments, particularly when evaluating candidates for early screening or dual-energy X-ray absorptiometry (DXA). It also emphasizes the intergenerational dimension of fragility fractures, where awareness campaigns targeting families with fracture history could improve prevention. Recognizing family history as a key risk factor offers a simple, low-cost means of stratifying patients in resource-limited settings (**Table 3**). Behavioral determinants played a critical role in fracture occurrence. Smoking was significantly more prevalent among cases, consistent with evidence that nicotine impairs

bone remodeling. Low physical activity also contributed substantially, reflecting the importance of mechanical loading in maintaining bone density. Sunlight exposure, a major source of vitamin D, was markedly lower among cases, reinforcing its protective role. Interestingly, alcohol intake showed no significant difference, perhaps due to low baseline consumption in this population. Collectively, these findings underline the importance of modifiable lifestyle behaviors, highlighting opportunities for prevention through exercise promotion, smoking cessation, and vitamin D optimization strategies (**Table 4**).

Nutritional risk factors were prominent among fracture cases. Inadequate intake of calcium, vitamin D, and protein were all significantly more common in cases than controls. These dietary deficiencies impair bone mineralization and muscle strength, increasing susceptibility to fragility fractures. Adequate diet was reported by only one-quarter of cases compared to half of controls, reflecting a substantial nutritional gap. These results underscore the critical role of balanced diet in fracture prevention and point to the need for community-based nutritional education, dietary supplementation, and food fortification programs. Improving

diet quality could represent a cost-effective, population-level intervention in Egypt (**Table 5**). Medical comorbidities substantially influenced fracture risk. Osteoporosis emerged as the strongest predictor, reported in nearly half of cases. Chronic illnesses such as diabetes and hypertension were also significantly associated, possibly reflecting shared metabolic pathways that weaken bone quality. Neurological conditions such as Parkinson's disease added risk via impaired balance and higher fall propensity. Long-term corticosteroid use, a known cause of secondary osteoporosis, was almost threefold more common among cases. These findings stress the importance of integrated clinical management, whereby chronic disease and medication reviews become part of fracture prevention strategies, especially in older and multimorbid patients (**Table 6**).

Table 1: Distribution of fracture cases and controls according to age and sex:

Variable	Cases (n=384)	Controls (n=384)	χ^2	p-value
Age group (years)				
<40	35 (9.1%)	61 (15.9%)		
40–59	78 (20.3%)	114 (29.7%)		
≥60	271 (70.6%)	209 (54.4%)	22.73	<0.001
Sex				
Male	148 (38.5%)	148 (38.5%)	–	Matched
Female	236 (61.5%)	236 (61.5%)	–	Matched

Table 2: Sociodemographic characteristics:

Variable	Cases (n=384)	Controls (n=384)	χ^2	p-value
Illiterate/Primary	211 (54.9%)	133 (34.6%)		
Secondary/Higher	173 (45.1%)	251 (65.4%)	34.6	<0.001
Employed	122 (31.8%)	187 (48.7%)		
Unemployed/Retired	262 (68.2%)	197 (51.3%)	24.9	<0.001
Rural residence	249 (64.8%)	202 (52.6%)		
Urban residence	135 (35.2%)	182 (47.4%)	12.1	0.001

Table 3: Family history and fracture risk:

Variable	Cases (n=384)	Controls (n=384)	χ^2	p-value
Family history of osteoporosis	141 (36.7%)	72 (18.8%)	35.8	<0.001
Family history of fracture	105 (27.3%)	52 (13.5%)	27.7	<0.001
No family history	138 (35.9%)	260 (67.7%)	–	–

Table 4: Behavioral risk factors among cases and controls:

Variable	Cases (n=384)	Controls (n=384)	χ^2	p-value
Current smoker	117 (30.5%)	65 (16.9%)	23.1	<0.001
Alcohol use	22 (5.7%)	13 (3.4%)	2.1	0.14
Low physical activity	252 (65.6%)	158 (41.1%)	54.8	<0.001
Adequate sun exposure	132 (34.4%)	226 (58.9%)	54.8	<0.001

Table 5: Dietary factors among cases and controls:

Variable	Cases (n=384)	Controls (n=384)	χ^2	p-value
Low calcium intake	243 (63.3%)	142 (37.0%)	62.9	<0.001
Low vitamin D intake	211 (54.9%)	123 (32.0%)	47.4	<0.001
Low protein intake	190 (49.5%)	126 (32.8%)	26.4	<0.001
Adequate diet	94 (24.5%)	192 (50.0%)	–	–

Table 6: Medical history factors among cases and controls:

Variable	Cases (n=384)	Controls (n=384)	χ^2	p-value
Osteoporosis	188 (49.0%)	89 (23.2%)	70.8	<0.001
Diabetes mellitus	132 (34.4%)	88 (22.9%)	12.5	<0.001
Hypertension	110 (28.6%)	78 (20.3%)	7.1	0.008
Parkinson's disease	42 (10.9%)	15 (3.9%)	15.3	<0.001
Long-term corticosteroid use	58 (15.1%)	21 (5.5%)	19.7	<0.001
No comorbidity	91 (23.7%)	212 (55.2%)	–	–

Discuusion

Our case–control analysis identifies a classic fragility-fracture risk profile—advanced age, female sex, diabetes, hypertension, smoking, low sunlight exposure/physical activity, prior fracture/family history, and corticosteroid use. Each signal aligns with contemporary evidence and, taken together, argues for a locally adapted, multidomain prevention strategy.

First, the age and sex gradients you observed mirror global patterns in fragility fractures, with risk rising steeply after 65 and remaining higher in women. Egyptian epidemiology reinforces the importance: a 2023 national analysis showed hip-fracture incidence highest in older adults, with pronounced burden in women, and underscored the system-level implications for hospital resources and rehabilitation (**El Miedany et al., 2024**). Coupled with new estimates

of direct costs to Egyptian hospitals, which are substantial at index admission and extend into post-acute care, our data frame the stakes for targeted prevention in primary care and at discharge.

Lifestyle factors in our model—especially current smoking—are robust, modifiable levers. A large 2021 systematic review and meta-analysis found smoking independently elevates total, hip, and vertebral fracture risks across populations, supporting aggressive cessation counseling in orthogeriatric and primary-care pathways (**Smolle et al., 2021**). Our low-sunlight/low-activity signal dovetails with emerging population studies. In 2024, an analysis in Scientific Reports linked low sunlight exposure to higher fracture probability, plausibly via vitamin-D-related and balance/conditioning mechanisms; while observational by design, the

directionality matches our finding and strengthens the rationale for safe sunlight exposure plus weight-bearing exercise in secondary prevention bundles **(El Miedany et al., 2024)**. Beyond sunlight per se, a 2020 meta-analysis concluded exercise training reduces fragility-fracture risk, arguing for rehabilitation programs that begin in-hospital and continue community-based, especially for women >65 years **(Keene et al., 2020)**.

Our comorbidity effects are also well-grounded. Contemporary syntheses confirm that type 2 diabetes (T2D) confers excess fracture risk despite often normal/higher BMD—risk that seems to be mediated by impaired physical function, microarchitectural deficits, neuropathy, hypoglycemia/falls, and some drug effects. A 2024 cohort study in JAMA Network Open showed older women with T2D had higher hazard for any and major osteoporotic fractures after adjusting for femoral-neck BMD and clinical risks, highlighting function rather than density as the dominant pathway—precisely the nuance our data suggest when traditional densitometry doesn't fully explain case status **(Zoulakis et al., 2024)**. Hypertension's association with osteoporotic fractures in our model is consistent with a meta-analysis (pooled OR ≈ 1.33), possibly

reflecting shared vascular/bone pathways and antihypertensive-related orthostatic effects that raise fall risk; this supports tighter BP control alongside fall-prevention tactics **(Li et al., 2017)**.

Neurologic comorbidity, particularly Parkinson's disease (PD), often emerges in fragility-fracture phenotyping because it combines bone and falls biology. Prior syntheses indicate more than a 2-fold fracture risk in PD; while our sample may include few PD cases, the directionality strengthens the call for early balance training, home hazard mitigation, and medication review in any patient with gait disorder or bradykinesia **(Naylor et al., 2025)**.

Medication exposures in our dataset—especially systemic glucocorticoids—are highly actionable. Current guidelines (ACR 2023) treat ≥ 2.5 mg prednisone-equivalent for ≥ 3 months as a fracture-prevention trigger, recommending prompt risk stratification, calcium/vitamin D, and pharmacotherapy where indicated **(Humphrey et al., 2023)**. Observational data show even “low-dose” oral glucocorticoids (≤ 7.5 mg/day) increase vertebral-fracture risk by $\sim 60\%$ in RA cohorts, emphasizing that any chronic exposure warrants proactive mitigation **(Abtahi et al., 2022)**. Our tables' GC signal therefore supports routine GC-specific pathways

(automatic fracture risk flagging, DXA scheduling, and bisphosphonate/denosumab initiation per guideline thresholds). Family history and prior fracture—both prominent in our results—remain among the strongest clinical predictors and are embedded in FRAX and guideline algorithms. Their presence in our local population is a reminder to operationalize simple intake questions (prior low-trauma fracture after age 50; parental hip fracture) as electronic health record (EHR) hard stops that trigger fracture assessment and education. This is particularly pertinent in resource-constrained Egyptian settings, where opportunistic case-finding may be more scalable than universal screening **(Naylor et al., 2025)**.

Two implementation implications arise from our context. First, case-finding must be paired with context-appropriate secondary prevention. The Egyptian cost analysis shows direct inpatient expenditures are only the visible tip of the iceberg; preventing a single hip fracture—via smoking cessation, GC stewardship, fall-proofing, and exercise—likely dominates downstream costs. Embedding a “fracture liaison” workflow that initiates at the index event and bridges to community services could be cost-saving in Egypt, as it has been elsewhere. Second, risk communication should

de-emphasize BMD alone. Our findings—and the 2024 diabetes study—show that functional capacity (gait speed, chair stands, balance), comorbidities, and medications often drive risk, especially when BMD is misleadingly “normal.” Integrating short functional batteries into clinic visits and incorporating falls history into FRAX-based decision-making can better capture the real hazard **(Zoulakis et al., 2024)**.

Finally, several signals in our data propose pragmatic, testable interventions. For smokers and chronic-GC users, bundling cessation support and GC dose-minimization protocols with automatic bone-protective therapy could reduce vertebral and hip events within 12–24 months. For individuals with limited sunlight exposure or low activity, structured, supervised programs (progressive resistance + balance) have the best evidence for fracture reduction and can be deployed via community centers or digital physiotherapy, with culturally tailored adherence supports for older Egyptian women. Given hypertension’s and diabetes’ contributions, we also advocate co-managing bone health in NCD clinics, screening for falls risk at the time of antihypertensive titration or diabetes medication changes.

Study Limitations

This study has several limitations that should be acknowledged. First, its case-control design is prone to recall bias, particularly regarding self-reported lifestyle and dietary factors, which may have been under- or overestimated by participants. Second, cases were hospital-based, which may limit generalizability to community-dwelling populations, as patients presenting to tertiary care often have more severe disease or comorbidities. Third, bone mineral density (BMD) measurements were not systematically available for all participants, restricting direct assessment of fracture risk independent of osteoporosis status. Finally, residual confounding cannot be entirely excluded, despite adjusting for multiple sociodemographic, clinical, and behavioral factors.

Conclusion

This study highlights the multifactorial determinants of vertebral and femoral neck fractures in Egypt, demonstrating that advanced age, low educational attainment, family history, comorbidities, smoking, poor diet, low physical activity, and inadequate sun exposure significantly increase fracture risk. These findings are consistent with international literature and emphasize the need for integrated prevention strategies that combine education, lifestyle

modification, comorbidity management, and early detection. In resource-limited settings, prioritizing high-risk groups—such as elderly individuals with comorbidities or chronic corticosteroid use—offers the most effective approach to reduce the burden of fragility fractures. Implementing targeted, context-specific fracture prevention programs could substantially decrease morbidity, mortality, and healthcare costs in Egypt.

Recommendations

To reduce vertebral and neck of femur fractures in Alexandria, Egypt, targeted prevention strategies are essential. Implement community-based educational programs focusing on smoking cessation, physical activity promotion, and adequate sun exposure to improve vitamin D levels. Enhance nutritional interventions by encouraging calcium, vitamin D, and protein-rich diets through supplementation and food fortification. Integrate fracture risk assessment in routine clinical care, especially for older adults, those with chronic diseases, and long-term corticosteroid users. Establish fracture liaison services to coordinate secondary prevention, including medication review and rehabilitation. Prioritize rural outreach and health literacy programs to address sociodemographic disparities and optimize bone health management across populations.

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Relation between Mindfulness and Academic Procrastination among Nursing Students

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Abstract

Background: Addressing mindfulness in nursing education is essential for promoting a positive learning environment and ultimately decreases academic procrastination. **Aim of the study:** To assess the relation between mindfulness and academic procrastination among nursing students. **Subjects and Method:** **Research design:** Descriptive-correlational research design was used. **Setting:** The study was conducted in the Faculty of Nursing at Tanta University. **Subjects:** Stratified proportional randomized sampling (n=1085) of nursing students. **Tools:** Two tools were used to collect data; 1) Five-Facet Mindfulness Questionnaire and 2) Procrastination Assessment Scale. **Results:** About two-thirds (62.4%) of nursing students had a high perception regarding mindfulness as well as, the majority (80.1%) of them had a low level of overall procrastination. Institution-related factors were identified as the most significant factor causing procrastination while educator-related factors were the least significant factor. **Conclusion:** A negative statistically significant correlation was found among nursing students' perception of overall mindfulness and procrastination. **Recommendations:** develop and integrate structured mindfulness-based programs into the nursing curriculum to support students' emotional and cognitive well-being, and provide clear academic guidelines, timely feedback, and consistent communication to reduce uncertainty and academic stress. **Keywords:** Academic procrastination, Mindfulness, Nursing students.

Introduction

Nursing education is a comprehensive and rigorous process designed to prepare individuals for the challenges of providing quality patient care in various healthcare settings **(Sumpter, Blodgett, Beard & Howard, 2022)**. It combines theoretical learning with practical experience, equipping students with a deep understanding of human biology, medical conditions, nursing theories, ethics, and clinical skills. The curriculum also emphasizes the development of problem-solving, critical thinking, mindfulness and communication skills, all essential for efficient patient assessment, decision-making, and collaboration within healthcare teams **(Tariq, 2024)**.

Mindfulness is described as the practice of maintaining awareness of the present moment with a nonjudgmental attitude. By fostering self-awareness, mindfulness helps nursing students recognize procrastinator behaviors and the emotions driving them, such as fear of failure or perfectionism **(Coleman, 2022)**. Additionally, mindfulness enhances emotional regulation and focus, enabling nursing students to approach tasks with greater clarity and purpose. For nursing students, cultivating mindfulness can be particularly beneficial, as it not only reduces procrastination but also equips them with skills to handle the emotional demands of their future profession **(Rani, 2023)**.

Mindfulness is associated with the enhancement of executive functioning, which refers to the

mental processes that occur in the prefrontal region of the brain and allow a student to effectively plan, concentrate, remember instructions, and manage multiple tasks **(Coleman, 2022)**. It has been conceptualized as a multidimensional and multifaceted construct that encompasses five dimensions: observing, which is the capacity to identify and interpret internal or external stimuli. Description involves the act of labeling the living experience with words, acting with awareness like focusing attention on one's current activity, non-judging of inner experience, which involves experiencing thoughts and feelings without criticizing them, and non-reacting to inner experience, which is a means of accepting their existence and choosing not to react to them. Mindfulness has emerged as a promising strategy to combat procrastination. **(Matshaka, Downing & Ntshingila, 2022)**.

Academic procrastination is a common challenge faced by students, remarkably in demanding fields like nursing. It includes delaying academic tasks although knowing the potential negative consequences, often causes stress, reduced performance, and compromised learning outcomes. Nursing students, who juggle rigorous coursework, clinical practice, and personal responsibilities, are particularly vulnerable to procrastination **(Berdida, Lopez & Grande, 2023)**. This behavior is often linked to many factors such as poor time management, lack of motivation, and

difficulty managing academic pressure. Addressing procrastination is essential to ensure the emotional well-being and academic success of nursing students (Elsayed, Mohamed, Hussein & Morsy, 2024).

Significance of the study

In the field of nursing education, where students often experience high levels of stress, heavy academic workloads, and rigorous clinical training. Academic procrastination is a common challenge between nursing students, potentially causing poor academic performance, compromised clinical readiness, and elevated anxiety levels (Ghattas & El-Ashry, 2024). Mindfulness promotes present-moment awareness and emotional regulation, may serve as a protective factor against procrastination by helping students stay focused, manage academic pressures, and make intentional decisions. (Portela et al., 2022). Mindfulness can teach nursing students how to be present and attentive not just in their studies, but also in their future patient care responsibilities (Green & Kinchen, 2021).

From researcher's perspective, nursing students are under unique academic and emotional pressures, which make them particularly vulnerable to procrastination. Mindfulness has the potential to empower students by helping them develop greater self-awareness, reduce anxiety, and respond to academic challenges more effectively (Roslan et al., 2022). Understanding relations between

mindfulness and procrastination may reveal psychological factors that influence their academic behaviors, and well-being can contribute to the development of mindfulness. The findings of this study could be valuable to nursing educators, curriculum developers, and mental health professionals working in academic settings (Luo, Ma & Hu, 2023).

Aim of the study

Assess the relation between mindfulness and academic procrastination among nursing students.

Research Questions

1. What are the levels of mindfulness among nursing students?
2. What are the levels of academic procrastination among nursing students?
3. What is the relation between mindfulness and academic procrastination among nursing students?

Subjects and Method

Research design:

Descriptive-correlational research design was used in the present study.

Study setting:

The current study was conducted in the Faculty of Nursing at Tanta University, which is affiliated with the Ministry of Higher Education and Scientific Research. It includes seven departments. Medical and Surgical nursing, Critical care and Emergency, Nursing obstetric, Pediatric nursing, Community health nursing, Psychiatric and Mental health nursing, and nursing Administration department. These departments offer comprehensive

programs designed to offer nursing students the necessary knowledge and skill to excel in their chosen nursing specialties. It obtained a certificate of accreditation in 2019.

The subjects:

The subjects of this study included a stratified proportional randomized sampling of undergraduate nursing students who are enrolled in different years of Bachelor of Science in nursing during the academic year 2023-2024 in the Faculty of Nursing. The technique for selecting the sample from the previously mentioned setting was proportional to the number of nursing students in each year. The sample size and power analysis were calculated using Epi-Info software statistical 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 will be as follows:

Table (A): Distribution of nursing students according to academic year

Academic year	Total number of nursing students	Stratified proportional sampling	%
First	600	235	39.2%
Second	1200	290	24.2%
Third	1050	280	26.7%
Forth	1037	280	27%
Total	3887	1085	100%

Tools of data collection:

The data of the study was collected using the following two tools:

Tool (I): Five-Facet Mindfulness Questionnaire (FFMQ)

It consisted of two parts:

Part (1): Nursing students' personal and studying related data
It included age, gender, academic

year, residence, system of studying, participation in any university activities, and working while studying.

Part (2) Five-Facet Mindfulness Questionnaire

It was developed by Baer et al. (2006) and used by Williams, Karl and Kuyken (2014), and modified by the researcher guided by the related literature Harrison, Buckley, Ross, Witte and Thompson (2024), to assess the nursing students' level of mindfulness. This tool consists of 34 items categorized into five dimensions as follows:

- **Observation:** included 8 items.
- **Describing:** included 6 items.
- **Acting with awareness:** included 6 items.
- **No judging of inner experience:** included 8 items.
- **Non reactivity to inner experience:** included 6 items.

Scoring system:

Nursing students' responses measured by five points Likert Scale ranging from very rarely true (1) to always true (5) (1= very rarely true, 2=rarely true, sometimes true, 4=often true, 5=always true). The total responses of mindfulness were determined according to statistical cutoff points as follows:

- High level of mindfulness >75% (equal 127)
- Moderate level of mindfulness “60-75%” (126-102)
- Low level of mindfulness <60% (equal 101)

Tool (II) : Procrastination Assessment Questionnaire

It included 2 parts :

Part (1) : Procrastination Assessment questionnaire

This tool was developed by Solomon and Rothblum (1988), The scale showed good reliability and construct validity through exploratory and confirmatory factor analyses when used by Mortazavi, Mortazavi and Khosrorad (2015) and modified by the researcher guided by the related literature (Kooren, Paas & Van, 2024), to assess the level of procrastination in six academic domains (each domain included 3 items):

- **Writing an academic assignment.**
- **Studying for an exam.**
- **Keeping up with weekly studying lectures.**
- **Performing administrative tasks.**
- **Attending meetings.**
- **Performing academic tasks in general.**

Scoring system:

The items of frequency for each task procrastination scored on a 5-points Likert Scale according to the degree to which they procrastinate on the task, the degree to which procrastination on the task is a problem for them and the extent to which they want to decrease their procrastination behavior on each academic task. (1=never, 2=almost never, 3=sometimes, 4=nearly always, 5=always) The total level of task procrastination frequency determined according to cutoff points as the following:

- High level of procrastination > 75% (equal>68).
- Moderate level of procrastination “60- 75%” (equal 68-54).

- Low level of procrastination <60% (equal< 54).

Part (2): Identify the factors that cause procrastination among nursing students. It contained 26 items categorized into 5 sub-dimensions as follows.

- **Student-related factors:** included 6 items.
- **Educator-related factors:** included 7 items.
- **Assignment characteristic-related factors:** included 5 items.
- **Institution-related factors:** included 3 items.
- **Nursing work-related factors:** included 5 items.

Scoring system:

While reasons of tasks procrastination scored on a 3-points Likert Scale ranged from 1-3 where (1=disagree, 2=neutral and 3=agree). The items of procrastination factors summed up and the total score ranked.

- The highest rank indicated the most important factor.
- While the lowest indicated the least important factor.

Methods:

1. An official permission was obtained from the Dean of Faculty of Nursing.
2. **Ethical considerations:**
 - Approval was obtained from the Nursing Scientific Research Ethical Committee before conducting the study with code 391-2-2024.
 - The researcher introduced herself to the participants, a full explanation of the aim and method of the study done to obtain acceptance and cooperation.
 - The nature of the study didn't cause

- harm to the entire participants.
- Informed consent obtained from nursing student after explanation of the study's aim.
 - Confidentiality and privacy maintained regarding data collection and the participants have the right to withdrawal from the study at any time.
3. Tools I and II were adapted and translated from English to Arabic to ensure that they are comprehensible and culturally relevant for the participant. This translation process followed a standard translation and the back -translation procedure:
- **Initial Translation:** The tools were translated into Arabic by a qualified translator fluent in both English and Arabic and familiar with the culture nuances of both languages.
 - **Back-Translation:** Different translator, who was not involved in the initial translation and is also fluent in both languages, was independently translating the Arabic version back into English. This step helped to check for consistency and accuracy in the translation.
 - **Comparison and revision:** The original English version and the back translated. English versions were compared. Any discrepancies were discussed and resolved by a panel of experts including translators and researchers, to finalize the Arabic version of the tools.
4. Tools (I, II) presented to jury of five experts in the area of specialty to check their content validity and the clarity of the questionnaire. The experts were three professors and two assistant professors of nursing administration from the Faculty of Nursing at Tanta University.
5. The experts' responses were presented in four points rating scale ranging from (4-1): 4=strongly relevant, 3=relevant, 2=little relevant and 1=not relevant. Necessary modifications were made including clarification, omission of certain items, adding others and simplifying work-related words. The face validity value of tool (I) Five facet mindful questionnaire was 97.75%, tool (II) part (1) Procrastination assessment questionnaire was 98.33% & part (2) reason for academic procrastination questionnaire was 98.4%.
6. A pilot study was carried out on 10% of subject (n=108) after the development of the tools. The aim of pilot study was to test the sequence of items, clarity, applicability and relevance of question. Simple modifications were made, including changing some words and clarifying some items. The subjects of pilot study were excluded from the main study sample.
7. Reliability of tools was tested using Cronbach Alpha Coefficient test. The reliability value of tool (I) Five-Facet Mindfulness Questionnaire (FFMQ) was 0.773 and for tool (II) Procrastination Assessment Scale, Part (1): level of procrastination was 0.874, Part (II): causes of procrastination among nursing students was 0.910.
8. **Data collection phase:** The data were collected from nursing students by the researcher. The researcher met nursing students in a small group in the Faculty of Nursing to distribute the questionnaire. The subjects

recorded their answers in the presence of the researcher to ascertain that all questions were answered and return them back.

9. The data was collected over a period of three months, starting from the first of April 2024 until the end of June 2024.

Statistical analysis of data

The statistical analysis of the data was performed using IBM SPSS software version 20.0 (Armonk, NY: IBM Corp, released 2011). Categorical data were summarized as numbers and percentages. For continuous data, normality was assessed using the Kolmogorov-Smirnov test. Quantitative data were described using range (minimum and maximum), mean, and standard deviation. The significance of the results obtained was judged at the 5% level. The tests used were Chi-square test: for categorical variables, to compare between different groups, Fisher's Exact: Correction for chi-square when more than 20% of the cells have expected count less than 5, Student t-test: For normally distributed quantitative variables, to compare between two studied groups, F-test (ANOVA): For normally distributed quantitative variables, to compare between more than two groups and Pearson coefficient to correlate between two distributed quantitative variables.

Results

Table (1): Shows the distribution of nursing students according to their personal and studying-related data. Over half (51.2%) of nursing students are relatively young and aged between 18 and 20 years. The

gender distribution shows that nursing students in this study are predominantly female, comprising 66.2% of the sample. The data also indicated a fairly balanced distribution across academic years, with a slight increase in the second, third, and fourth years (each around one quarter) compared to first-year students, who make up 21.7%. Regarding living arrangements, a substantial portion of students (57.4%) live at home, in terms of academic systems, majority (91.8%) of nursing students follow the credit hour model. Additionally, more than half (55.6%) of the students participate in extracurricular or university activities. Lastly, the nearly split between working (48.2%) and non-working students (51.8%) raises important considerations.

Table (2): Displays the mean scores, standard deviation and ranking of nursing students' perception about mindfulness dimensions. As noticed, the nonjudgmental inner experience was ranked as the highest dimension of mindfulness. While the aware action was ranking the lowest dimension of mindfulness.

Table (3): Shows mean scores, standard deviation and ranking of nursing students about levels of procrastination dimensions. Keeping up with studying lectures dimension ranked the highest level of procrastination, followed by studying for an exam dimension. While attending meetings ranks the last dimension reflecting the least common procrastination behavior.

Table (4): Presents mean scores, standard deviation and ranking of nursing students perceived factors causing procrastination. Institution-related factors were identified as the most significant factor. Following closely are nursing work-related factors. While educator-related factors were the least significant factor.

Figure (1): Show that more than two-thirds (62.4%) of nursing students had a high perception level regarding mindfulness, more than one third (37.1%) of nursing students had a moderate perception level regarding to mindfulness while only 0.5% had a low perception level regarding to mindfulness.

Figure (2): Show that the majority (80.1%) of nursing students had a low level of overall procrastination, while only 0.8% had a high level of procrastination.

Figure (3): Illustrate that a negative statistically significant correlation was found among nursing students' perception of overall mindfulness and procrastination ($r=0.139$, $p=0.001$).

Figure (4): Illustrate a statistically significant negative correlation was found among nursing students' perception of overall mindfulness and their reported causes of procrastination ($r=0.496$) at($p=0.001$).

Table (5): Presents relations between nursing students' perception about mindfulness and their personal and studying related data. There was a statistically significant relation between nursing students' perception about overall mindfulness and their

personal and studying related data except their participation in university activities and working while studying where $p> 0.05$.

Table (6): Presents the relation between nursing students' perception about procrastination and their personal and work-related data. There was a statistically significant relation between nursing students' perception about procrastination and their all personal and studying-related data at $p\leq 0.05$.

Table (7): Presents relation between factors that cause procrastination and Nursing students' personal and studying related data. There was no statistically significant relation between nursing students' reported causes of procrastination and their personal and studying related data except academic year, residence and working while studying where $p\leq 0.05$.

Table (1): Distribution of nursing students according to their personal and studying-related data (n = 1085)

Personal and studying-related data	No.	%
Age		
18 – 20	555	51.2
20 – 22	335	30.8
22 – 25	195	18.0
Mean $\pm$SD (Range) = 20.43 $\pm$ 1.69 (18-25)		
Sex		
Male	367	33.8
Female	718	66.2
Academic year		
First	235	21.7
Second	290	26.7
Third	280	25.8
Forth	280	25.8
Residence		
University housing	253	23.3
Private housing	209	19.3
At home	623	57.4
System of studying		
Traditional	89	8.2
Credit hours	996	91.8
Participation in university activities		
Yes	603	55.6
No	482	44.4
Working while studying		
Yes	523	48.2
No	562	51.8

Table (2): Mean scores, standard deviation and ranking of nursing students' perception about mindfulness dimensions (n = 1085)

Five-Facet Mindfulness Questionnaire (FFMQ) Subscales	Score Range	Total score		Average Score	Rank
		Min. –Max.	Mean $\pm$ SD.	Mean $\pm$ SD.	
Observation	(8 – 40)	8.0 – 40.0	32.52 $\pm$ 4.20	4.06 $\pm$ 0.53	3
Description	(6 – 30)	7.0 – 30.0	23.77 $\pm$ 3.50	3.96 $\pm$ 0.58	4
Aware action	(6 – 30)	14.0 – 30.0	22.83 $\pm$ 3.41	3.81 $\pm$ 0.57	5
Nonjudgmental to inner experience	(8 – 40)	24.0 – 40.0	34.67 $\pm$ 2.89	4.33 $\pm$ 0.36	1
Non reactivity to inner experience	(6 – 30)	20.0 – 30.0	25.62 $\pm$ 1.82	4.27 $\pm$ 0.30	2
Total score	(34 – 170)	100.0 – 170.0	139.4 $\pm$ 9.23	4.10 $\pm$ 0.27	-

Table (3): Mean scores, standard deviation and ranking of nursing students about levels of procrastination dimensions (n = 1085)

Measure the level of procrastination	Score Range	Total score		Average Score	Rank
		Min. – Max.	Mean $\pm$ SD.	Mean $\pm$ SD.	
Writing an academic assignment	(3 – 15)	3.0 – 14.0	7.76 $\pm$ 2.60	2.59 $\pm$ 0.87	4
Studying for an exam	(3 – 15)	3.0 – 15.0	7.95 $\pm$ 2.82	2.65 $\pm$ 0.94	2
Keeping up with studying lectures	(3 – 15)	3.0 – 15.0	8.42 $\pm$ 2.73	2.81 $\pm$ 0.91	1
Performing administrative tasks	(3 – 15)	3.0 – 15.0	7.71 $\pm$ 2.63	2.57 $\pm$ 0.88	5
Attending meetings	(3 – 15)	3.0 – 15.0	7.64 $\pm$ 2.80	2.55 $\pm$ 0.93	6
Performing academic tasks in general	(3 – 15)	3.0 – 15.0	7.84 $\pm$ 2.75	2.61 $\pm$ 0.92	3
Overall	(18 – 90)	18.0 – 86.0	47.33 $\pm$ 13.73	2.63 $\pm$ 0.76	–

Table (4): Mean scores, standard deviation and ranking of nursing students perceived factors causing procrastination (n = 1085)

Identify the factors that cause procrastination	Score Range	Total score		Average Score (1 – 3)	Rank
		Min. –Max.	Mean $\pm$ SD.	Mean $\pm$ SD.	
Student related factors	(6 – 18)	6.0 – 18.0	10.96 $\pm$ 2.87	1.83 $\pm$ 0.48	3
Educator related factors	(7 – 21)	7.0 – 21.0	12.06 $\pm$ 3.70	1.72 $\pm$ 0.53	5
Assignment characteristic-related factors	(5 – 15)	5.0 – 15.0	8.93 $\pm$ 2.58	1.79 $\pm$ 0.52	4
Faculty related factors	(4 – 12)	4.0 – 12.0	7.60 $\pm$ 2.35	1.90 $\pm$ 0.59	1
Nursing work related factors	(4 – 12)	4.0 – 12.0	7.43 $\pm$ 1.92	1.86 $\pm$ 0.48	2
Overall	(26 – 78)	26.0 – 78.0	46.99 $\pm$ 11.68	1.81 $\pm$ 0.45	

SD: Standard deviation

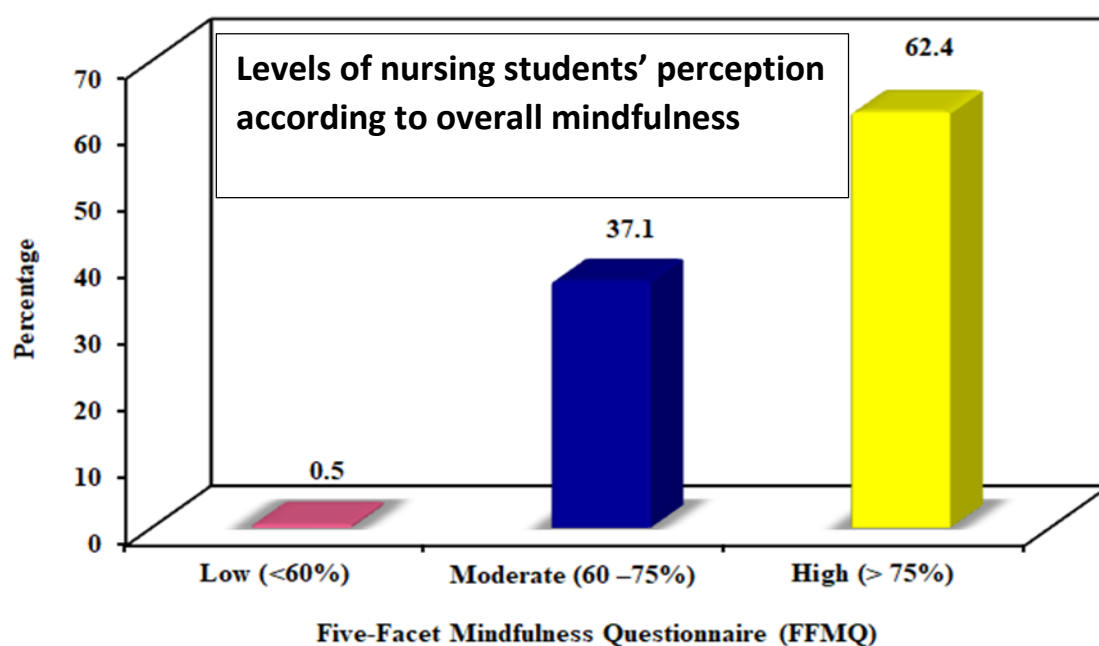


Figure (1): Levels of nursing students' perception according to overall mindfulness (n = 1082)

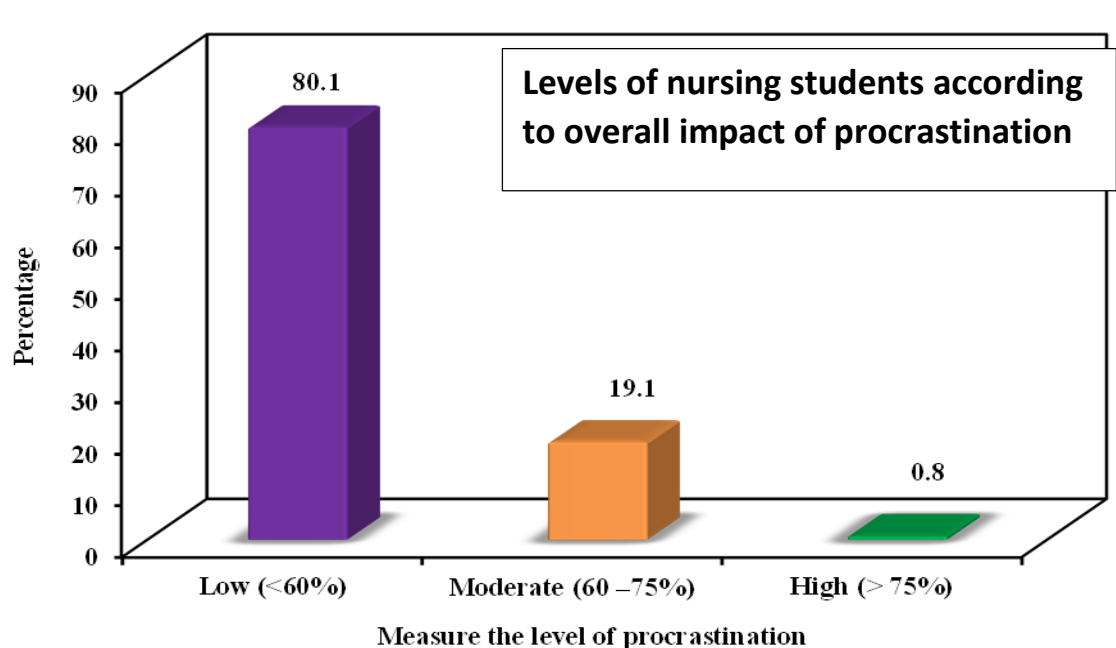


Figure (2): Levels of nursing students according to overall impact of procrastination (n = 1082)

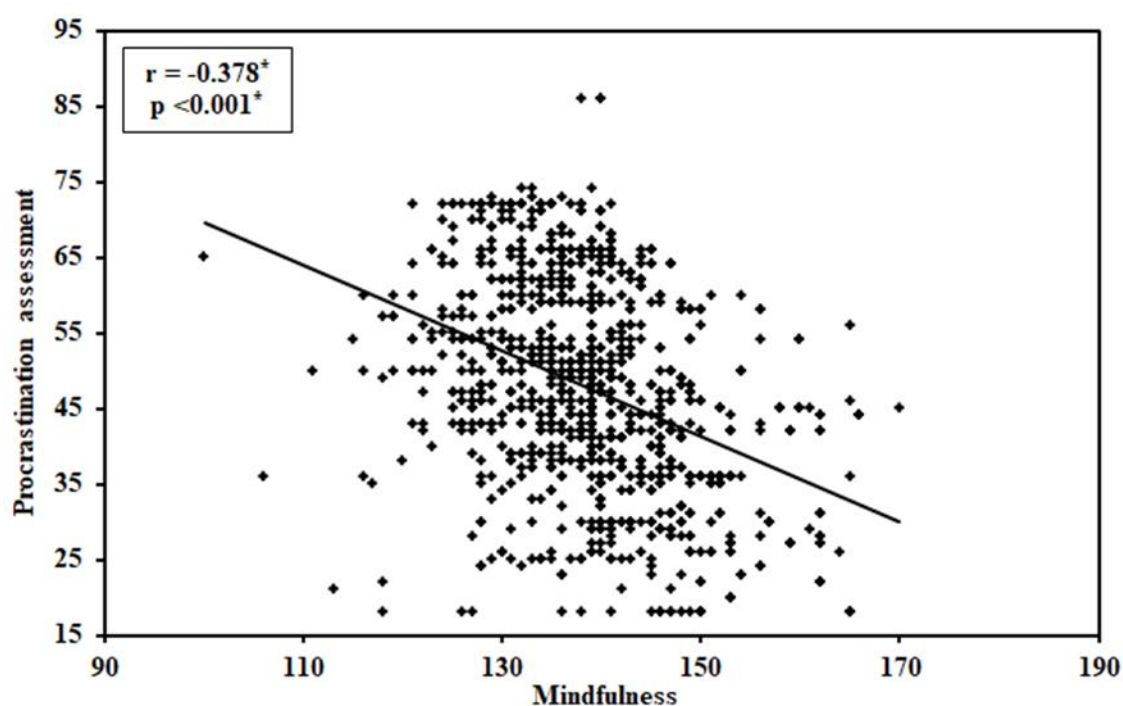


Figure (3): Correlation between nursing students' perception of overall mindfulness and their procrastination (n = 1082)

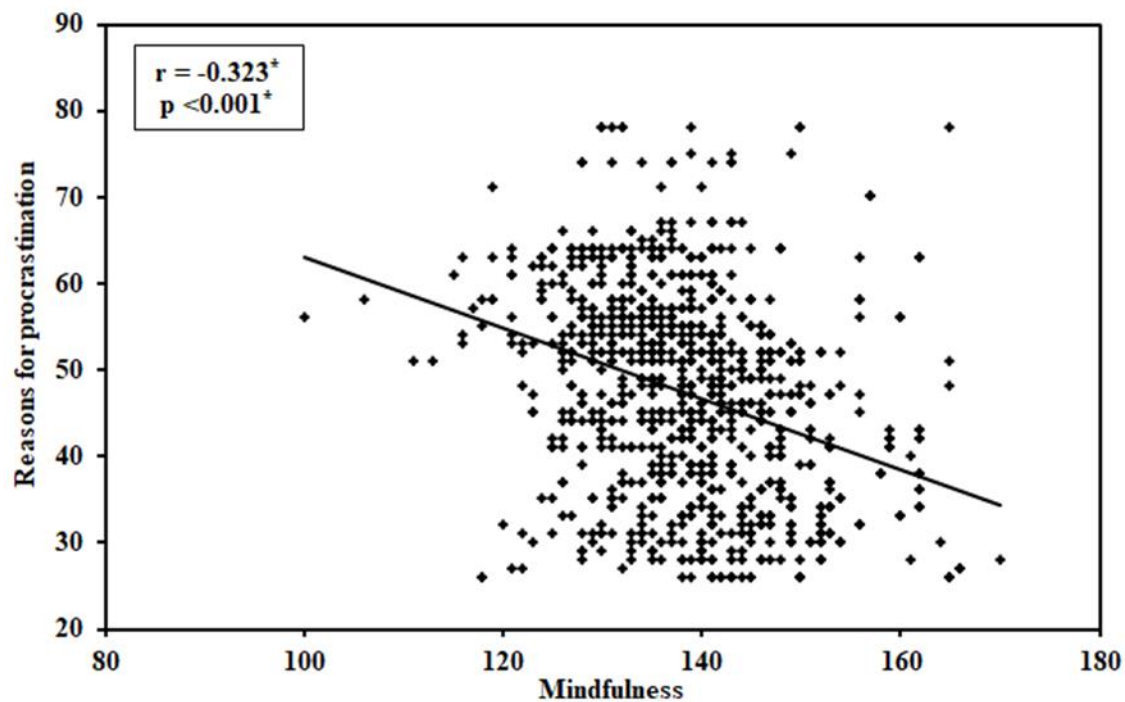


Figure (4): Correlation between nursing students' perception of overall mindfulness and perceived causing factors of procrastination (n = 1082)

Table (5): Relation between nursing students' mindfulness and their personal and studying related data (n = 1085)

Factors	No	Total score of Five-Facet Mindfulness Questionnaire	Test of sig.	P
		Mean $\pm$ SD.		
Age (years)				
17 – 20	555	138.9 $\pm$ 10.24	F=4.176*	0.016*
20 – 22	335	139.3 $\pm$ 7.65		
22 – 25	195	141.1 $\pm$ 8.50		
Sex				
Male	367	138.4 $\pm$ 10.11	t=2.477*	0.014*
Female	718	139.9 $\pm$ 8.70		
Academic year				
First	235	137.3 10.25	F=6.053*	<0.001*
Second	290	140.5 9.39		
Third	280	139.4 8.87		
Fourth	280	140.1 8.22		
Residence				
University housing	253	138.72 8.54	F=5.223*	0.006*
Private housing	209	141.23 8.45		
At home	623	139.09 9.67		
System of studying				
Traditional	89	133.6 $\pm$ 11.55	t=5.075*	<0.001*
Credit hours	996	139.9 $\pm$ 8.81		
Participation in any university activities				
Yes	603	139.8 $\pm$ 8.86	t=1.527	0.127
No	482	138.9 $\pm$ 9.66		
Working while studying				
Yes	523	139.3 $\pm$ 9.27	t=0.523	0.601
No	562	139.6 $\pm$ 9.19		

SD: Standard deviation

t: Student t-test

F: F for One way ANOVA test

p: p value for comparison between the studied categories

*: Statistically significant at $p \leq 0.05$

Table (6): Relation between nursing students' perception about overall procrastination and their personal and studying related data (n = 1085)

Personal and studying related data	No	Total score Measure the level of procrastination	Test of sig.	P
		Mean $\pm$ SD.		
Age (years)				
17 – 20	555	46.22 $\pm$ 14.33	F= 3.774*	0.023*
20 – 22	335	48.39 $\pm$ 12.41		
22 – 25	195	48.68 $\pm$ 13.92		
Sex				
Male	367	50.55 $\pm$ 15.67	t= 5.186*	<0.001*
Female	718	45.69 $\pm$ 12.31		
Academic year				
First	235	45.83 $\pm$ 15.54	F= 4.558*	0.004*
Second	290	48.60 $\pm$ 14.17		
Third	280	45.64 $\pm$ 11.52		
Fourth	280	48.97 $\pm$ 13.40		
Residence				
University housing	253	54.13 $\pm$ 15.12	F= 50.434*	<0.001*
Private housing	209	48.06 $\pm$ 11.62		
At home	623	44.33 $\pm$ 12.75		
System of studying				
Traditional	89	44.63 $\pm$ 11.89	t= 2.208	0.029*
Credit hours	996	47.58 $\pm$ 13.86		
Participation in any university activities				
Yes	603	49.81 $\pm$ 14.36	t= 6.909*	<0.001*
No	482	44.23 $\pm$ 12.22		
Working while studying				
Yes	523	50.60 $\pm$ 14.29	t= 7.738	<0.001*
No	562	44.29 $\pm$ 12.44		

SD: Standard deviation

t: Student t-test

F: F for One way ANOVA test

p: p value for comparison between the studied categories

*: Statistically significant at $p \leq 0.05$

Table (7): Relation between nursing students' reported causes of procrastination and their personal and studying related data (n = 1085)

Factors	No	Total scores identify the factors that cause procrastination	Test of sig.	P
		Mean $\pm$ SD.		
Age (years)				
17 – 20	555	46.55 $\pm$ 11.45	F= 2.474	0.085
20 – 22	335	46.73 $\pm$ 11.81		
22 – 25	195	48.66 $\pm$ 12.03		
Sex				
Male	367	46.23 $\pm$ 12.73	t= 1.458	0.145
Female	718	47.37 $\pm$ 11.10		
Academic year				
First	235	46.07 $\pm$ 12.28	F= 7.208*	<0.001*
Second	290	45.18 $\pm$ 12.15		
Third	280	47.13 $\pm$ 9.87		
Fourth	280	49.49 $\pm$ 11.97		
Residence				
University housing	253	50.13 $\pm$ 12.23	F= 15.615	<0.001*
Private housing	209	47.83 $\pm$ 11.31		
At home	623	45.43 $\pm$ 11.31		
System of studying				
Traditional	89	46.60 $\pm$ 10.37	t= 0.330	0.742
Credit hours	996	47.02 $\pm$ 11.80		
Participation in any university activities				
Yes	603	46.90 $\pm$ 11.76	t= 0.278	0.781
No	482	47.10 $\pm$ 11.59		
Working while studying				
Yes	523	48.48 $\pm$ 12.38	t= 4.080	<0.001*
No	562	45.59 $\pm$ 10.82		

SD: Standard deviation

t: Student t-test

F: F for One way ANOVA test

p: p value for comparison between the studied categories

*: Statistically significant at $p \leq 0.05$

Discussion

The life of a nursing student is filled with numerous tasks and assignments. Academic procrastination is a significant concern in nursing education, where students are often faced with demanding coursework, clinical responsibilities, and high expectations for academic and professional performance. Procrastination in this context can lead to increased stress, poor academic outcomes, and reduced confidence. Mindfulness in nursing education is the practice of cultivating focused, non-judgmental awareness of the present moment, which can help in managing the unique stresses and demands of nursing education. ultimately affecting students' readiness for clinical practice **AlSubai et al. (2024)**.

Regarding the current study, more than two-thirds of nursing students had high perception level of overall mindfulness. From the viewpoint of the researcher, this result might be explained by that nursing education often emphasizes self-awareness, reflection, and emotional regulation, core components of mindfulness (observation, description, aware action, non-judging of inner experience and non-reactivity to inner experience) which may naturally enhance students' mindfulness levels. These results are supported by **Kurt, Gündoğan and Uslu (2024)** who reported that most nursing student's perception of mindfulness fell in moderate ranges. contrasting results are reported by

Liu, Lee, and Wu (2024) who found baseline mindfulness levels among nursing students were low.

Nonjudgmental inner experience was ranked as the highest, aware action was ranked as the lowest among all dimensions. These findings may be explained by the students' greater capability to accept their internal emotions and thoughts without criticism or reaction, possibly due to increased exposure to emotional challenges throughout their academic journey. The results conflicted with those of **Tzelepi et al. (2023)**, who found that non-reactivity was not consistently associated with improved academic outcomes under high stress conditions among university students.

Regarding the current study, the majority of nursing students had a low level of overall procrastination. This finding may be explained by those students' motivation to meet academic and clinical deadlines; nursing programs often emphasize the importance of timely task completion due to the critical nature of patient care. This result aligns with **Catacutan et al. (2024)** who reported low procrastination levels among university students. However, this result contrasts with the findings of **Tahir et al. (2022)** who found that more than one half of students fell in high procrastination.

Keeping up with studying lectures was ranked as the highest area of procrastination. This may be attributed to the perceived repetitiveness and lack of immediate accountability associated with lecture reviews. These findings are

supported by **Zhang et al. (2024)** who found that nursing students are more likely to procrastinate on tasks lacking immediate consequences or those that require sustained focus over time. However, **Budury et al. (2022)**, who reported that clinical duties, rather than academic tasks, were the primary source of procrastination among nursing students.

As regards nursing students' causes of procrastination, the current study revealed that among the five examined dimensions, faculty-related factors were ranked as the highest contributor to procrastination. This result may be explained by organizational issues such as lack of timely feedback, unclear communication, on the other hand, educator-related factors were ranked the lowest, suggesting that most students may not perceive their instructors' behavior as a primary cause of procrastination. From the researcher's perspective, these results highlight the importance of faculty engagement and workload balance in reducing academic procrastination. The findings are reliable with the conclusions of **Bhatt (2023)** who clarified that the faculty-related factors were identified as external contributors to academic procrastination. These organizational shortcomings can demotivate students and lead to delays in academic task completion. In the other hand, **Santelli, Larson, and Humphrey (2020)** found that students often attributed delays to personal time management and life stressors, not faculty behavior.

Correlation between nursing students' mindfulness and their procrastination

The recent study's results showed a negative statistically significant correlation among nursing students' overall perception of mindfulness and their level of procrastination. This result may be interpreted by the notion that higher mindfulness is associated with lower tendencies to procrastinate, as mindfulness fosters self-awareness, present-moment focus, and emotional regulation factors that directly counteract the avoidance behaviors characteristic of procrastination.

This finding is supported by **Shi, Zhang and Wang (2023)** who confirmed that increased mindfulness among nursing students significantly reduced academic procrastination through enhanced self-control and emotional clarity. In the other hand, **Eltayeb (2021)** emphasized that although a negative correlation was observed, it was not strong or consistent across all student groups. Some students with high mindfulness still reported high procrastination, suggesting other moderating factors. However, directly opposing studies that show a positive correlation between mindfulness and procrastination are rare.

The current study's results revealed a negative statistically significant correlation between nursing students' perception of overall mindfulness and their reported causes of procrastination. This result may be interpreted by the understanding that students who

exhibit higher mindfulness tend to experience fewer internal and external factors that trigger procrastination, such as stress, poor time management, or lack of motivation. Mindfulness enhances students' ability to remain focused, regulate emotions, and respond thoughtfully to academic demands, thereby reducing the influence of both student-related and environment-related procrastination factors.

In agreement with the current findings, **Schutte and del Pozo de Bolger (2020)** who demonstrated that greater trait mindfulness is linked to less procrastination. The study also found that attention mediates this relationship meaning mindfulness improves attention, which in turn reduces procrastination. However, contrasting evidence was presented by **Tarman and Sari (2023)** who found that while mindfulness partially facilitated the relationship between social anxiety and procrastination, it did not fully eliminate procrastination behaviors.

The relation between nursing students' mindfulness and procrastination and their personal and studying-related data

The data analysis of the recent study clarifies that there was a statistically significant relation between nursing students' perception of overall mindfulness and their personal data, except for their participation in university activities and working while studying. This finding indicated that certain demographic factor as age, academic level, and

possibly marital status may influence how students perceive and practice mindfulness. These results may be related to the idea that personal and academic maturity, life experience, and varying levels of academic pressure can shape an individual's mindfulness disposition.

This finding is consistent with the results of **Sanyal (2025)** who emphasized that socio-demographic factors, including age and educational exposure, play a critical role in shaping students' mindfulness. They argued that older and more academically advanced students were more likely to engage in reflective practices and emotional regulation. In contrast, **Tarman and Sari (2023)** found no significant influence of demographic factors like age or academic year on mindfulness levels. Instead, psychological traits (e.g., anxiety levels) were more predictive.

The recent study findings demonstrated a statistically significant relation between nursing students' perception of procrastination and all their personal and studying-related data. These results could be interpreted by the idea that students' backgrounds and daily responsibilities shape how they manage academic demands and prioritize tasks.

This result aligns with the findings **Li, Su, Zhao, Wang and Wang (2023)** who found that future time perspective and mindfulness both directly and indirectly influenced procrastination levels highlighting the relevance of demographic and personal characteristics in shaping

time management and task prioritization. In contrast, **George (2024)** found no significant relations between procrastination and personal data such as age, gender, religion, or year of study.

The analysis of the recent study revealed that there were no statistically significant relations between nursing students' reported causes of procrastination and their personal and studying-related data, except for academic year, place of residence, and working while studying. This finding suggested that in general, demographic and employment variables may not substantially influence the underlying reasons for procrastination. From a researcher's viewpoint, this may be explained by the fact that students in different academic years face varying academic demands and levels of adjustment. For instance, junior students may struggle with adapting to the academic workload, while senior students might face burnout or clinical responsibilities. In alignment with these findings is **Salihu and Abdulkareem (2024)**, who found no significant difference in procrastination by gender or age, but employed students showed lower procrastination than unemployed.

Conclusion

Regarding the findings of the existing study, it was concluded that about two-thirds of nursing students had a high perception regarding mindfulness. Also, the majority of nursing students had a low level of overall procrastination and Institution-related factors were

identified as the most significant factor causing procrastination, educator-related factors were the least significant factor. In addition to that, there was a negative statistically significant correlation found among nursing students' perception of overall mindfulness and procrastination.

Recommendations

Faculty of Nursing:

- Provide clear academic guidelines, timely feedback, and consistent communication to reduce uncertainty and academic stress.
- Offer workshops or seminars on time management, self-regulation, and effective study strategies.
- Upgrade Access to Academic Search Facilities, Clearly Communicate Assignment Expectations and Evaluation Criteria and Offer Constructive, Individualized Feedback.

Nursing Students:

- Engage in mindfulness practices as breathing exercises, meditation, or reflective journaling to improve concentration and reduce procrastination.
- Attend training sessions or workshops focused on academic planning, prioritization, time management skills and self-confidence and coping strategies.
- Seeking peers or faculty mentoring when facing academic challenges to maintain motivation and accountability.

Further Studies need to:

- Conduct longitudinal research to examine the sustained influence of mindfulness on procrastination over time among nursing students

and reasons behind procrastination.

- Expand research across multiple nursing faculties and universities to validate and generalize findings.
- Investigate other psychological variables (e.g., stress, burnout, motivation) and their interaction with mindfulness and procrastination.

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Perceived Nurses' Barriers and Facilitators of Pain Management among Oncology Critically Ill Patients

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Abstract

Background: Cancer pain is one of the worst, debilitating experiences among oncology critically ill patients. However, it is still undervalued and undertreated. So, it is critical to address barriers and facilitators of pain management among critical care nurses. **Aim:** Identify perceived nurses' barriers and facilitators of pain management among oncology critically ill patients. **Subjects and Method: Design & Setting:** A descriptive correlational research design was conducted in the oncology hospital of Tanta Main University Hospital, Affiliated to the Ministry of Higher Education and Scientific Research. **Subjects:** A convenience sample of 70 critical care nurses from both sex. **Tools:** included **Tool I:** Nurses' structured questionnaire regarding barriers and facilitators of pain management. **Tool II:** Nurses' perception regarding pain management. **Results:** Findings showed that the most perceived barriers from nurses' perspectives were related firstly to hospital then nurse and finally patient, but facilitator were related firstly to nurse then hospital and finally patient. Finding also demonstrated that 72.86% of nurses had low knowledge level and 65.71% of them had low perception level toward cancer pain. Also, there is a negative correlation between total barriers score and total knowledge score and a negative correlation between total attitude score and barriers related to nurses. **Conclusions:** Ineffective cancer pain management is related definitely to many barriers and facilitators that nurses encounter during their work, In addition to their low perception level toward cancer pain. **Recommendations:** There is an urgent need for creating educational programs for nurses about cancer pain in accordance with WHO standards and evidence-based nursing practice.

Keywords: Barriers, Cancer pain management, Facilitators, Oncology critical ill patients.

Introduction

Cancer is the second leading cause of premature death after cardiovascular diseases worldwide and is projected to be the first leading cause of death by the end of this century with steadily increasing global prevalence which in 2020, 19.3 million people globally were diagnosed with cancer, and 28.4 million people predicted to be newly diagnosed with cancer in 2040 **(Saklani, 2024)**. One of the most significant, serious, and terrible symptoms related to cancer is pain especially during the advanced metastatic stage of the disease. It has a profound effect on all dimensions of patient's life, that include emotional well-being, cognitive function, daily activities, and communication with beloved ones **(Colosia et al., 2022)**. So, it is imperative to seek effective pain management that involves alleviating or controlling pain via various strategies including pain assessment and treatment, health education in addition to psychological care.

Although management of cancer pain is provided in accordance to the analgesic ladder approach proposed by the World Health Organization, it was found that this method positively impacts alleviating cancer pain, anxiety about addiction and the negative effects of pharmaceutical interventions but continue to have difficulties related to management approach **(Dave., 2024)**.

So, in accordance to the first national clinical practice guidelines on cancer pain that produced by the Agency for

Health Care Policy and Research In 1994, it was found that there are many barriers in addition to facilitators that affect negatively or even positively on pain management and categorized into three strata: patient, nurse and system related barriers and facilitators **(Sørensen et al., 2024)**.

Patient-Related Barriers and Facilitators; the golden standard for pain assessment is the own self-reporting of pain by the patient. As the high subjectivity of pain experience make pain self-reporting is the premium way to assess patients' pain **(Rababa, Al-Sabbah & Hayajneh, 2021)**, despite a considerable proportion of nurses do not trust or have faith in patients' self-reporting of pain and this consider a strong barrier for pain management especially for patients who are cognitively impaired or have communication deficits **(Kodagoda Gamage, Pu, Todorovic & Moyle, 2024)**.

Health-care professional Related Barriers and Facilitators, the most considerable pain management barriers include physicians, nurses and other health care staff' lack of knowledge about critical areas of pain management, including misconceptions about the pharmacological effects of analgesics and inconsistent practice related to pain assessment. Conversely, improved collaboration among doctors and nurses was perceived by nurses to be a major facilitator to the

effective pain management (**Shaban, Shaban, Mohammed & El-Kest, 2024**).

System related barriers and facilitators, the study finding demonstrated that absence of standardized pain assessment tools, guidelines, and treatment protocols is considered the first systemic obstacle to efficient pain management in the intensive care unit. Therefore, one key component of effective pain control is the availability of standardized procedures and protocols for pain assessment and treatment (**Chaleewong, Chaiviboontham & Christensen., 2024**).

The role of nurses in pain treatment is crucial, without a doubt. For the simple reasons that it is one of their specialized roles and because nurses spend the greatest amount of time directly interacting with patients compared to other members of the treatment group. So, it is critical for oncology nurses to have basic knowledge in order to identify pain, assess its severity, and take the necessary measures for treatment in addition to the necessity of adopting a positive attitude from nurses which is essential component in the delivery of pain management (**Alsaiani, Alhofaian & Tuns, 2024**).

Significance of study:

More than 10 million individuals across the globe are already diagnosed with cancer annually. Pain related to cancer diagnoses is a serious concern and one of the most prevalent symptoms as reported

by cancer patients and have a detrimental impact on patient's performance status and outcome of care (**Snijders, Brom, Theunissen; van den Beuken-van Everdingen, 2023**). Unfortunately, pain management in oncology units is frequently undervalued, despite its significance, resulting in numerous numbers of patients who experiencing insufficient pain relief (**Filipponi., 2025**). Thus, the significance of this research comes from its potential to provide database information about barriers and facilitators of pain management as perceived by nurses in oncology critical care areas, which can be incorporated in cancer patient's care plan to decrease their sufferings.

The aim of the study:

Was to identify perceived nurses' barriers and facilitators of pain management among oncology critically ill patients.

Research questions:

- 1-What are the barriers affecting pain management for oncology critically ill patients?
- 2-What are the facilitators affecting pain management for oncology critically ill patients?
- 3-What is the nurse's perception regarding pain management for oncology critically ill patients?

Subjects and Method

Design:

A descriptive research design was employed in this study.

Setting:

The study was conducted in the critical care units at the oncology hospital of Tanta Main University Hospital.

Subjects:

This study involved conveniences sampling of all nurses who are working and available at the previously mentioned setting from both genders and provided direct care for cancer patients who were included. The determined sample size was 70 nurses, with the significance level of <0.05 .

Tools of the study: Two tools were employed in this study.

Tool I: Nurses Structured Questionnaire regarding Barriers and Facilitators of Pain Management. It included three parts:

Part (A) Nurse's socio demographic characteristics sheet: This part was developed by the researcher, to identify nurse's socio demographic data (Brant, Mohr, Coombs, Finn and Willmarth., 2017).

Part (B) Nurses' Structured Questionnaire regarding Barriers of Pain Management. It included collecting data regarding the following:

- **Barriers related to the patients from nurses' perspectives:** It intended to identify barriers of pain management in cancer patient from nurses' perspectives (Batiha., 2014; Dequeker, Van Lancker & Van Hecke., 2018) such as, patient' fear of side effects and dependency of analgesics.

- **Barriers related to nurses and other health care providers.** It designed to

identify barriers of pain management between oncology patients from nurses' perspectives (Gunnarsdottir, Donovan, Serlin, Voge & Ward, 2002). Such as, interruption of nurses during pain management.

- **Barriers related to health care organization:** It was developed by the researcher based on relevant literature (Alotni, Guilhermino, Duff, & Sim, 2023). It aimed to identify barriers of pain management according to health care facility such as lack of clear policies and guidelines for pain management in hospital.

Scoring system will be as follow: Score (1) not barrier, score (2) weak barrier, score (3) strong barrier.

Part (C) Nurses Structured Questionnaire regarding Facilitators of Pain Management. It included collecting data regarding the following:

- **Facilitators related to patients from nurses 'perspectives.** It aimed to identify facilitators of pain management according to patient (Alotni et al., 2023) such as self-reporting of pain by the patient as this is the golden pain facilitator.

- **Facilitators related to nurses and other health care providers.** It aimed to identify facilitators of pain management according to nurse and other health care provider (Wøien, 2020) such as, better understanding and interpretation of pain behavior from nurses.

- **Facilitators related to health care organization.** It aimed to identify facilitators of pain management according to facility (Alnajar et al., 2021) such as establishing a proper guideline for proper pain management.

Scoring system will be as follow: Score (1) not facilitator, score (2) weak facilitator, score (3) strong facilitator.

Tool II: nurses' perception regarding pain management: It contain two parts

Part (a) Nurses' knowledge regarding pain management: this part developed by the researcher after reviewing of relevant literature (Delgado-Guay et al., 2021; Eshete, et al., 2019) that included nurse's knowledge about different types of pain and mechanism of pain.

Scoring system will be as follow: Score (2) correct and complete answer, score (1) correct and incomplete answer, score (0) incorrect answer.

Part (b): Nurses' Attitude regarding Pain Management: Included if the nurses know that pain is life-threatening for the patient or not and the impact of pain on the outcome of care.

Scoring system will be as follows: Score (1) strongly disagree, score (2) disagree, score (3) neutral, score (4) agree and (5) strongly agree.

Method:

This study was accomplished through the next steps:

1. Administrative process: an official permission for data collection was attained from the responsible authorities at the faculty of nursing, Tanta University, to the director of Tanta Main

University oncology center to carry out the study.

2. Ethical considerations:

- An ethical committee approval was obtained from the Faculty of Nursing Tanta University with code No: 467 \ 5 (2024) before conducting the study.

- Informed consent was obtained from the nurses to participate in the study after explaining the aim of the study. They were also informed that their participation in this study was voluntary and that they had the right to accept or refuse to take part in the study.

- Moreover, participant nurses were notified that they had the right to withdraw from the study at any time without responsibility

- Confidentiality and privacy were assured using code numbers on sheets instead of names.

- Tools of data collection have been developed and translated into Arabic by the researcher.

- This questionnaire was distributed to nurses to fill out at morning shift and last for 20 to 30 minutes. And researcher helped them with any explanation and teach them how to fill out the questionnaire.

3.Tools development:

Tool I Part (A) of the study was adopted from (Brant et al., 2017). The researcher developed Part (B) and (C) after reviewing the literature review (Batiha, 2014; Dequeker et al., 2018; Gunnarsdottir et al., 2002).

Tool II Part (A) and (B) was developed by the researcher after reviewing the literature (Delgado et al., 2021; Eshete et al., 2019).

4.Validity of the tools:

All tools were tested by five panels of experts in the field of critical care and emergency nursing to check content validity and clarity of questionnaire prior to its utilization.

5.Reliability of tools:

Cronbach's Alpha for **tool I is 0.941** for 54 items, Cronbach's Alpha for **tool II is 0.838** for 26 items, Cronbach's Alpha for the sheet in total is **0.927** for 80 items.

6.Apilot study:

It was conducted on 10% (7 nurses) of the study sample to test the clarity, feasibility and applicability of tools and determine any obstacles that may encountered during data collection period. accordingly, needed modification was done, and pilot study was excluded from the study subjects.

7. Data collection:

Data collected within 6 months started from the first of October 2024 to the end of March 2025.

8.Tools of data collection were developed and translated into Arabic by the researcher.

The study was carried out into three phases:

Preparation phase:

- Met the head nurse, introduce myself, explain the aim of the study and take acceptance for collecting data.

- Prepared the data collection tools after reviewing the recent relevant literature.
- Set up a meeting with the available nurses working in the selected study setting
- Introduce myself to the staff nurse, explained the aim and nature of the study.
- Explain the questionnaire sheet items, given the staff opportunities to read clearly and asked for more questions.
- Gave each participant nurse a code number to be used as an identifier during data entry and to ensure confidentiality.
- Translate tools into the Arabic version and the back translation technique to ensure the validity of translation.
- Estimate the time required for data collection, it estimated that 20 minutes.

Implementation phase:

- Screened nurses for eligible participation. Upon agreeing to participate in the research, nurses' questionnaire was distributed to nurses to fill out during morning shifts and it took between 20 and 30 minutes to complete.
- The researcher was available to help participants if they needed any explanation while filling out the questionnaire.

Evaluation phase:

- As mentioned before, researcher used a three- point Likert Scale to score participant nurses' response to pain management barriers, facilitators

and to assess nurses' knowledge.

- In addition to five - point Likert Scale to score participant nurses' attitude to pain management.

Results

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

It showed that the mean age of the studied nurses was 29.77 ± 3.592 and that more than half of them 54.3% were between 20 - 30 years old, 57.1% of them were females, and the majority 82.9% were married also, 58.6% of nurses were technical institute and 41.4% of them have experience (2-<5) years in addition to 88.6% of them didn't attend any previous pain management training programs.

Table (2): Revealed distribution of the studied nurses regarding the barriers of pain management related to the patient.

It demonstrated that 64.29% of the participants nurses perceived that patient afraid from annoying the doctor if he talks about his pain, was the strongest barriers of pain management. On the other hand, 65.71% of the participants did not view that pain is a test from god, is barrier to pain management. But 57.14% of them viewed that pain is inevitable/avoidable part of having cancer was the weakest barrier.

Table (3): Revealed distribution of the studied nurses regarding the barriers of pain management related to nurse and other health care providers.

It illustrated that 71.43% of the

participants nurses perceived that lack physicians' trust in nursing assessment and interruption of nurses during pain management were the strongest barriers to pain management. Contrary to 50.00% of the studied nurses viewed that inconsistent practice around as needed medications was the weakest barrier to pain management and 28.57% of them did not view this as barrier for pain management.

Table (4): Revealed distribution of the studied nurses regarding the barriers of pain management related to hospital organization.

It showed that 67.14% of the participants nurses perceived that lack of clear and constant polices and guidelines for pain management in the hospital was the strongest barrier of pain management. And actually, most of barriers related to hospital organizations consider strong barrier of pain management with percentage exceed 50%.

Table (5): Revealed distribution of the studied nurses regarding the facilitators of pain management related to the patient.

It revealed that 71.43% of the participants nurses perceived that family and peer support for patient was the strongest facilitator of pain management. On contrary, 57.14% of the participants perceived that the ability of patients to complete pain scales was the weakest facilitator of pain management. Moreover, 35.71% of the studied nurses

perceived that patient's positive thinking about pain management and using music therapy, relaxation technique to enhance comfort, wasn't considered a facilitator to pain management.

Table (6): Revealed distribution of the studied nurses regarding the facilitators of pain management related to the nurse and health care provider. It showed that 71.43% of the participants nurses perceived that good collaboration between doctors and nurses was the strongest facilitator of pain management. Actually, all the facilitators related to nurse and health care practitioners considered strong facilitator for pain management with percentage 50% and above.

Table (7): Revealed distribution of the studied nurses regarding the facilitators of pain management related to the health care organization. It showed that 64.29% of the participants nurses perceived that availability of painkillers and opioids in the hospital was the strongest facilitator of pain management. On the other hand, 57.14% of the participant perceived that availability of nurses' training programs regarding pain management was the weakest facilitator of pain management and only 14.29% of nurses perceived that hospital adherence to financial and budgetary support weren't facilitator to pain management.

Table (8): Revealed distribution of the studied nurses according to total level of knowledge about pain management. It was found that 72.86%

of the studied nurses have **low level of knowledge** about pain management and only 27.14% of them showed **moderate level of knowledge** with Mean $\pm$ SD knowledge score was 17.64 ± 4.999 .

Table (9): Revealed distribution of the studied nurses according to their perception level regarding pain management. It showed that 65.71% of nurses had **low perception level** and 34.29% of them had **moderate perception level** with Mean $\pm$ SD perception score was 26.11 ± 2.986 .

Table (10): Reveals correlation among barriers and facilitators related to patient, nurse and hospital facility, their total score, knowledge and attitude score. It was shown that there was a highly significance correlation among **total barriers score** and **total facilitator score** where $R = 0.658$ and $p = 0.000^{**}$. In addition, a negative correlation between **total barriers score** and **total knowledge score** were $R = -0.005$ and $p = 0.968$. Also, there was a negative correlation between **total attitude score** and **barriers related to nurse** where $R = -0.040$ and $p = 0.744$.

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

Characteristics	The studied nurses (n=70)	
	No	%
Age (in years)		
- (20-<30)	38	54.3
- (30-<40)	30	42.9
- (40-<50)	2	2.9
Range	(25-41)	
Mean $\pm$ SD	29.77$\pm$3.592	
Gender		
- Male	30	42.9
- Female	40	57.1
Marital status		
- Single	12	17.1
- Married	58	82.9
Educational level		
- Technical institute	41	58.6
- Bachelor	28	40.0
- Post studies	1	1.4
Experience (in years)		
- (<2)	22	31.4
- (2-<5)	29	41.4
- (5-<10)	19	27.1
Range	(1-7)	
Mean $\pm$ SD	3.13$\pm$1.857	
Previous attendance of pain management training programs		
- None	62	88.6
- 1	2	2.9
- 2	6	8.6

Table (2): Distribution of the studied nurses regarding the barriers of pain management related to the patient

Barriers related to the patient	The studied nurses (n=70)					
	Not barrier		Weak barrier		Strong barrier	
	No	%	No	%	No	%
- Patient does not want to annoy nurse	28	40.00	18	25.71	24	34.29
- Preferring to report pain to the doctor, not to the nurse.	19	27.14	26	37.14	25	35.71
- Thinking that the doctor's priority is to manage illness not to control pain.	11	15.71	39	55.71	20	28.57
- Fearing annoying the doctor if he talks about his pain.	24	34.29	1	1.43	45	64.29
- Hesitating to report his pain.	20	28.57	20	28.57	30	42.86
- Lacking self-motivation to comply with prescribed medical treatment	10	14.29	35	50.00	25	35.71
- Believing that talking means that a complainer patient.	16	22.86	34	48.57	20	28.57
- Difficulty in completing pain scales.	13	18.57	15	21.43	42	60.00
- Thinking that will be a good patient if not complain of patient.	6	8.57	24	34.29	40	57.14
- Believing that pain is inevitable/avoidable part of having cancer and nothing can be done	5	7.14	40	57.14	25	35.71
- Thinking that pain is a test from god and bearing it will help him to have faith in Allah.	46	65.71	20	28.57	4	5.71
- There is relationship between patient health status and severity of pain.	18	25.71	30	42.86	22	31.43

Table (3): Distribution of the studied nurses regarding the barriers of pain management related to nurse and other health care providers

Barriers related to nurse and other health care providers	The studied nurses (n=70)					
	Not barrier		Weak Barrier		Strong barrier	
	No	%	No	%	No	%
- Nurses have a lack of knowledge about pain management	5	7.14	20	28.57	45	64.29
- Lacking physicians' trust in nurses' assessment of pain	5	7.14	15	21.43	50	71.43
- Interruption of nurses during pain management by doctors, alarms and calls	5	7.14	15	21.43	50	71.43
- Following pain management regimens and measures is difficult for nurses in presence of heavy workload (time limitations)	5	7.14	30	42.86	35	50.00
- Administering of medications as needed varies from one nurse to another (inconsistent practice around as needed medications)	20	28.57	35	50.00	15	21.43
- Nurse cannot ascertain whether patient is in pain due to the patient frequent complaints about pain	10	14.29	30	42.86	30	42.86

Table (4): Distribution of the studied nurses regarding the barriers of pain management related to hospital organization

Barriers related to hospital organization	The studied nurses (n=70)					
	Not Barrier		Weak barrier		Strong barrier	
	No	%	No	%	No	%
- Lack of clear and constant policies and guidelines for pain management in the hospital	13	18.57	10	14.29	47	67.14
- Lack of proper assessment tool in the hospital	4	5.71	21	30.00	45	64.29
- Hospital lacking psychological support services for patients.	5	7.14	20	28.57	45	64.29
- Unavailability of pain medications sometimes in the hospital.	15	21.43	10	14.29	45	64.29
- Hospital policy does not allow the patients to get pain medications from outside the hospital.	16	22.86	23	32.86	31	44.29
- Prescribing pain medications in the hospital sometimes is restricted to pain management physician who attend according to hospital policy	5	7.14	25	35.71	40	57.14
- Shortage of nursing staff (patient to nurse ratio not followed)	0	0.00	25	35.71	45	64.29
- Lack of nurses' training programs regarding pain management.	5	7.14	20	28.57	45	64.29

Table (5): Distribution of the studied nurses regarding the facilitators of pain management related to the patient

Facilitators related to the patient	The studied nurses (n=70)					
	Not Facilitator		Weak facilitator		Strong facilitator	
	No	%	No	%	No	%
- Patient able to self-report his pain	10	14.29	24	34.29	36	51.43
- Preferring to report his pain to the nurse	8	11.43	16	22.86	46	65.71
- Patient has support from family and peers	0	0.00	20	28.57	50	71.43
- Patient adopting positive thinking about pain management	25	35.71	5	7.14	40	57.14
- Patient has self-motivation to comply with prescribed medical treatment	5	7.14	30	42.86	35	50.00
- Patient able to complete pain scales	15	21.43	40	57.14	15	21.43
- using music therapy and simple relaxation therapy to relieve pain and enhance comfort	25	35.71	35	50.00	10	14.29

Table (6): Distribution of the studied nurses regarding the facilitators of pain management related to the nurse and health care provider

Facilitators related to the nurse	The studied nurses (n=70)					
	Not facilitator		Weak facilitator		Strong facilitator	
	No	%	No	%	No	%
- Nurses have sufficient pain management knowledge	12	17.14	20	28.57	38	54.29
- Nurses use adequate pain assessment and use pain rating scales in clinical practice	5	7.14	25	35.71	40	57.14
- Nurses follow pain management regimens and measures easily	5	7.14	30	42.86	35	50.00
- Nurse able to ascertain whether patient is in pain or not and administrating as needed medications	10	14.29	25	35.71	35	50.00
- Good collaboration between physicians and nurses	0	0.00	20	28.57	50	71.43
- There is ongoing education and professional training related to pain assessment and management	5	7.14	25	35.71	40	57.14
- Nurse considering physiological indicators, when carrying out pain assessment and management	10	14.29	15	21.43	45	64.29
- Nurse considering verbal and nonverbal indicators, when carrying out pain assessment and management	15	21.43	20	28.57	35	50.00

Table (7): Distribution of the studied nurses regarding the facilitators of pain management related to the health care organization

Facilitators related to the health care organization.	The studied nurses (n=70)					
	Not facilitator		Weak facilitator		Strong facilitator	
	No	%	No	%	No	%
- Hospital establishes a proper guideline for quality pain management	8	11.43	20	28.57	42	60.00
- Hospital provides adequate levels of privacy in hospital environment to facilitate nurses' pain assessment and management practices	8	11.43	18	25.71	44	62.86
- Hospital adheres to financial and budgetary support	10	14.29	30	42.86	30	42.86
- Availability of painkillers and opioids.	5	7.14	20	28.57	45	64.29
- Availability of nursing staff (patient to nurse ratio is followed)	8	11.43	30	42.86	32	45.71
- Availability of nurses' training programs regarding pain managements.	5	7.14	40	57.14	25	35.71

Table (8): Distribution of the studied nurses according to total level of knowledge about pain management

Total knowledge level	The studied nurses (n=70)	
	No	%
- Low	51	72.86
- Moderate	19	27.14
Range	(7-25)	
Mean ± SD	17.64±4.999	

Low (<60%)

Moderate (60-<80)%

High (≥80)

Table (9): Distribution of the studied nurses according to their perception level regarding pain management

Perception level	The studied nurses (n=70)	
	No	%
- Low perception level	46	65.71
- Moderate perception level	24	34.29
Range	(21-32)	
Mean ± SD	26.11±2.986	

Low (<60%)

Moderate (60-80)%

High (>80)

Table (10): correlation among barriers and facilitators related to patient, nurse and hospital facility, their total score, knowledge and attitude score

	The studied nurses (n=70)							
	Barriers related to patient		Barriers related to nurse		Barriers related to hospital organization		Total barriers score	
	r	P	r	P	r	P	r	P
- Facilitators related to the patient	0.275	0.021*	0.743	0.000*	0.373	0.001**	0.534	0.000**
- Facilitators related to the nurse and health care provider	0.455	0.000**	0.656	0.000*	0.596	0.000**	0.686	0.000**
- Facilitators related to the health care organization	0.362	0.002**	0.560	0.000*	0.477	0.000**	0.560	0.000**
Total facilitators score	0.411	0.000**	0.703	0.000*	0.542	0.000**	0.658	0.000**
Knowledge score	0.162	0.181	-0.015	0.904	-0.202	0.094	-0.005	0.968
Attitude score	0.038	0.756	-0.040	0.744	0.137	0.260	0.061	0.614

r: Pearson' correlation coefficient

* Statistically significant level at P<0.05

Discussion

Cancer patients suffer from pain frequently as a result of the disease process or its treatment. While it is true that 95% of cancer pain may be effectively treated, the insufficient treatment may slow recovery of oncology patients, increased complication rates, and diminished their outcome of care. Because pain management is an intervention that nurses often employ, it is critical to identify the perceived facilitators and barriers of cancer pain management (Mangolianshahrbabaki, Farokhzadian, Ahmadi & Khabazadeh, 2025). The purpose of this research was to assess nurses' knowledge and attitude and identify potential barriers and facilitators to cancer pain management among cancer patients. Furthermore, this study is essential to evaluate nurses' pain management practices in order to enhance the outcome of care for oncology critically ill patients.

Section I: Socio-demographic characteristics of the participant nurses. The study research revealed that more than three quarter of participant nurse were female between the age of twenty and thirty years, consistent with a relevant study in Mansoursa which demonstrated that the majority of nurses were female and 68.9% of them being between 25 and 30 years (Khalil, Meawad & Abd Elhameed, 2022). Moreover, in accordance with educational level,

above half of studied nurses had a technical institute degree in nursing, corresponding to Khalil et al. (2022) which revealed that more than half of the nurses graduated from a technical nursing institute. Also, the current study demonstrated that the higher percentage of the participants nurses were around 2-5 years of work experience in the oncology theatre. This may be due to the shortage of qualified nursing staff and relying on newly graduated nurses. This not corresponds with Khalil et al. (2022) who found that most of the participants nurses had Bachelor degree and had from 0 to 10 years of oncology nursing experience.

Consistent with a prior study on cancer pain management among Ethiopian oncology nurses, which found that the majority of the nurses surveyed had never attended a pain management training program, this one also found that most of the nurses surveyed had never received either internal or external pain management training (Adams, Varaei & Jalalinia, 2020).

Section II: As regard to nurses' perspectives on pain management barriers related to the patient, more than half of the participant nurses demonstrated that “patients’ fear from annoying the doctor if he talks about his pain and thinking that will be a good patient if not complain” as the strongest barrier for pain management, corresponding to Zeng, Li, Lin and Mizuno (2020) who

rated that good patients should avoid talking about their pain and don't complain from pain and this may lead to distracting physicians and annoying them.

Regarding to nurses perspectives on pain management barriers related to nurse, more than two thirds of the participant nurses reported that “Lacking physicians’ trust in nurses’ assessment reporting and documentation of pain” as the strongest barriers of pain management related to the nurse, and this finding agreed with **Rababa et al. (2021)** who believe that inadequate interaction between doctors and nurses about nonverbal cues of pain impedes pain assessment and effective treatment.

Regarding to nurses perspectives on pain management barriers related to hospital organization, more than two thirds of the participant nurses reported that “Lack of clear and constant policies and guidelines for pain management in the hospital” as the strongest barrier of pain management related to hospital organization and this finding agreed with **Ayoub, Jibreel, Nusei, and Al-Taani (2022)**.

Section III: Regarding to nurses’ perspectives on pain management facilitators related to the patient, more than two thirds of the participant nurses rated that “having support from family and peers to cancer patient” as the strongest facilitator of cancer pain management related to the patient, and

this finding align with a previous study conducted in Iran, which demonstrated that organizational and emotional support from peers, presence and support of family emerged as the most important factors in facilitating pain management for patients with cancer (**Mangolianshahrbabaki et al., 2025**).

Regarding to nurses perspectives on pain management facilitators related to the nurse, more than two thirds of participant nurses reported that “Good collaboration between physicians and nurses” from the most strongest facilitator of cancer pain management and this finding supported by **Rababa et al. (2021)** who viewed that good collaboration between doctors and nurses was a major facilitator to cancer pain management.

Regarding to nurses perspectives on pain management facilitators related to the health care organization, the study finding showed that above half of participant nurses stated that “Availability of painkillers and opioids in the hospital” as the strongest facilitator of pain management regarding to the hospital. Corresponding with **Offu, Visram, Rathbonen and Lindsey (2024)** who illustrated that the availability of analgesics in pharmacies, low costs of pain medications, and sufficient health insurance reimbursement for pain services and medications from the

strongest facilitator of pain management.

Section V: Nurses' knowledge about pain management. The current analysis has shown that nurses had low level of knowledge regarding cancer pain control, with a mean knowledge score of 17.64. Corresponding with the findings of other relevant research studies regarding nurse's knowledge, attitudes and clinical practices related to pain management. Such as **Al-Sayaghi et al. (2022)** who demonstrated knowledge deficit among nurses working in Saudi, with mean score of 45.29%. In addition, Jordanian nurses who have limited knowledge score (**Othman & Al-Atiyyat., 2022**).

Section VI: Nurses' perception about pain management. The study result revealed that the vast majority of the respondents nurses 65.71% had low level of perception towards cancer pain management and the remaining nurses 34.29 % had a moderate perception level, with overall mean perception score of 26.11 and a standard deviation of 2.986. On the whole, the result revealed poor attitudes among oncology nurses concerning pain management, who dealing with cancer patients, which corresponding to previous literature (**Liyew, Dejen Tilahun, Habtie Bayu & Kassew, 2020**; attitude score = 49.33; **Admass et al., 2020**; attitude score = 20.4; **Nguyen, et al., 2021**; attitude score = 45.2). All these

results support current finding but conflicting with **Majeed, Hassan & Abidet. (2020)** who found that majority of the nurses 82.8% have positive attitude toward cancer pain management.

Section VII: Regarding to the **correlation among barriers and facilitators related to patient, nurse and hospital facility, their total score, knowledge and attitude score**, there was a highly significance correlation among total barriers score and the total facilitator score where $R = 0.658$, corresponding to **Gorzelitz, Bouji and Stout (2022)** where Pearson correlation coefficients illustrated strong association between facilitators and barriers ($R = 0.62$).

In addition, a negative correlation between total barriers score and total knowledge score where $R = -0.005$. This credible finding supported from a study from North Saudi Arabia (**Alenezi et al., 2022**) which found a significant negative correlation between barrier scores and knowledge ($R = -0.315, p < 0.001$). Finally, there was a negative correlation between total attitude score and barriers related to nurse which is consistent with the Saudi study which found that nurse-related obstacles had the greatest detrimental impact on nurses' attitudes and knowledge ($R = -0.040$) (**Maribbay, Bdair, Alalyani & Al-Shloul, 2023**).

Conclusion

The current research study illustrated many barriers and facilitators related to cancer pain management from nurses' perspectives. Findings also revealed severe knowledge deficit among nurses toward cancer pain management in addition to their negative attitude about pain management and its strategies.

Recommendations

- There is an urgent need for designing educational programs about effective cancer pain assessment and management in order to improve nurses' knowledge and attitude regarding cancer pain.
- It is worthy to eliminate all barriers related to cancer pain management and maximize all facilitators and facilitate the access to it.
- Replicate the study after educating nurses about cancer pain management and monitoring the effect on patient's outcome of care.

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Effect of Nursing Guidelines on Clinical Outcomes for Patients Undergoing Transurethral Resection of Prostate

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Abstract

Background: Transurethral Resection of the Prostate (TURP) still the benchmark surgical management for benign prostatic hyperplasia (BPH), in spite of newer minimally invasive technique. Patient teaching is essential to lessen anxiety and complications. **Aim:** To investigate the impact of structured nursing guidelines on clinical outcomes for patients undergoing TURP. **Design:** Quasi - experimental research was employed. **Setting:** The study executed at Student's Hospital connected to Tanta University Hospitals, Ministry of Higher Education, Egypt. **Subject:** A purposive sample of 50 adult male patients scheduled for undergoing TURP allocated to control group who obtained routine care and intervention group who was given pre/postoperative nursing instructions **Tools:** Three tools were used in this study: **Tool I:** Patients' Assessment Structured Interview Questionnaire .**Tool II:** Patients Clinical Outcomes sheet including three parts: **Part1:** Pain Assessment tool, **Part 2:** Beck Anxiety Inventory, **Part 3 :** Post Resectoscope Patient's Observation for risks of Complication Checklist. **Tool III:** A questionnaire for rating health-related quality of life **Result:** The intervention group showed significant improvement in total knowledge (100%) high level of knowledge ($p < 0.001$), decreased total anxiety (Beck Inventory , 80% had mild anxiety level ; $p < 0.001$) , lower pain scores (Numeric rating scale ; P value = 0.001 , complications rates (hematuria , urinary incontinence and dysuria) were lower at 2 months follow up ($p < 0.05$) and there was a statistical significant differences in total life quality level between both groups ($p = 0.000$). **Conclusion:** The implementation of structured nursing instructions positively influences clinical outcomes in patients undergoing TURP . **Recommendations:** Structured patient education using diverse educational materials (verbal, written, visual aids) should be integrated into routine nursing care for TURP patients.

Keywords: Clinical Outcomes, Nursing Guidelines , Transurethral Resection of the Prostate(TURP)

Introduction

Transurethral resection of the prostate is now the most popular endourological management for BPH. However, a number of problems such as sequent hemorrhage , urinary incontinence, urinary tract infection, urine retention, and the urethral stricture, are likely to arise if the intervention is not appropriate following surgery. **(Niu , Huang , Wang &Liu , 2021).** A resectoscope is introduced through the urethra to perform transurethral resection of the prostate , which involves resecting prostate tissue using an electrically powered cutting-coagulating metal loop. The prostatic capsule is kept intact while as much prostatic tissue as feasible is removed with the benefits of minimal trauma, tremendous impact, quick recuperation, and brief hospitalization. **(Leslie , Chargui & Stormont, 2023).**

There are between 150,000 and 300,000 TURP procedures performed each year. **(Mahmoud & Shady, 2025).**

Certain patients are more likely to experience unpleasant emotions. They are concerned about the impact of surgery and the recuperation period following the procedure, which could lower their level of compliance, affect the therapeutic outcome, and ultimately lower their life quality. given the seriousness of the illness , some research has

indicated that extensive nursing care is crucial for enhancing patients' psychological well-being and lowering the risk of consequences. **(Niu et al., 2021).** Anxiety levels grow when patients are informed that an operation is required, which can lead to life-threatening situations. This anxiety starts when they are admitted to the hospital, between 60% and 80% of patients have preoperative anxiety, which can lead to medical issues like headaches, nausea, and confusion. Additionally, it has a negative effect on postoperative pain and comfort levels and anxiety throughout the postoperative phase. For the majority of patients, postoperative discomfort is an inevitable occurrence. In Western nations, 75% of surgical patients have moderate, severe, or excruciating pain throughout the recovery phase. **(Atay & Sayılan, 2020).**

Patients often want to know a lot about their illnesses and health conditions, and giving them the most updated, reliable, and relevant information helps them and their families make decisions about their care. The disease must be explained to patients; they must understand their condition, their symptoms, diagnostic procedures, drug administration, and when to seek medical help. Materials for patient education improve health literacy, teach

patients about their conditions, and assist and promote informed decision-making based on patient preferences and the most current and accurate clinical and medical data.

(Bhattad & Pacifico, 2022) So, it is crucial to investigate the influence of nursing guidelines on clinical outcomes of patient undergoing TURP.

Significance of the study

The rate of flow in 2023 was 100 patients based on Tanta university student's hospital statistical record, (2023). It was noted that most patients undergoing transurethral resection of the prostate are susceptible to postoperative risks due to deficiency of knowledge regarding the operation, so they need unique nursing guidelines to minimize these risks . Moreover, being that patients frequently depart the hospital with expectations and questions, particularly about the functioning of the reproductive and urinary systems, as well as social and emotional requirements, nurses are crucial in helping patients get ready for discharge. **(Da Mata & Napoleão, 2010).**

The aim of present study was to: Determine the impact of structured nursing instructions on clinical results for patients undergoing transurethral resection of the prostate

. Research Hypotheses: -

- Patients who received structured nursing guidelines exhibited

improvement of their knowledge ,had better clinical outcomes and life quality after TURP than patients who did not receive nursing guidelines .

Subjects and Method

Design: A quasi - experimental design was used in study.

Study settings: -

The study was carried out at inpatient urological department at Student's hospital associated with Tanta university hospitals .

Study subjects: -

A purposive sample of fifty adult male patients who were scheduled to have TURP. According to Epidemiological Information Program, the sample size was determined by reviewing the statistics records of Tanta Main University Hospital and calculating the overall number of patients yearly. According to the hospital data record of Tanta University students, the flow rate in 2023 was 100 patients.

The sample was chosen, and it was split into 2 equal groups of 25 patients each.

Control Group: 25 who was given routine hospital care .

Study Group: 25 who obtained nursing instruction by the researcher.

-Inclusion criteria of subjects:

- Adult male patients aged from 40-59 yrs. old

-Conscious and able to communicate efficiently.

-Diagnosed with BPH and scheduled for undergoing TURP.

Exclusion criteria were as follows:

-Patients who were incapable of receiving, comprehending, or reacting to instructions.

-Patients who had concurrent procedures with TURP.

- Patients who underwent TURP for other causes than BPH as prostatic cancer

Study tools:

Three tools were used in this study:-

Tool I: patients' Assessment Structured Interview Questionnaire.

This tool was created by the researcher after looking over the relevant literature.(**Leslie, Chargui & Stormont, 2023**) &(**Mata & Napoleão, 2010**).

It included three parts: -

Part (A): Patient socio-demographic traits, such as, age, educational level, occupation, marital status, and residence.

Part (B): Patient's clinical data, as patient's chief complain, health history, past-surgical and medical history, family history.

Part(C): Patient's knowledge appraisal regarding TURP. This part was used to assess patient's knowledge regarding transurethral resection of prostate. It comprised of 22 multiple choose questions .

Total Scoring system:-

correct and complete scored 2, correct and incomplete scored 1 and

incorrect or no answer was scored Zero.

The total scoring of patient's knowledge was calculated and categorized as the following:

-High level of knowledge if patient's score is more than 75% of the total score.

-Moderate level of knowledge if patient's score is more than or equal 50-75% of the total score.

-Low level of knowledge if patient's score is less than 50% of the total score.

Tool II: Patients' clinical Outcomes sheet:

It consisted of three parts:

Part 1: Pain Assessment Tool:

The researcher used the numerical rating scale (NRS) to measure the intensity of pain. The NRS asks the patient to rate their pain on an 11-point scale from 0 to 10, where 10 conveys the worst possible pain and 0 indicates no pain.

Scoring system: classified into (no pain (0), mild (1-3), moderate (4-6), severe (7-9) and worse pain (10).

Part 2: Beck Anxiety Inventory (BAI):

This scale was adopted by the researcher and was developed by Beck et al (1988) to check anxiety level of the patient and their family in relation to the illness and its treatment. The BAI is a 21-item multiple-choice self-report questionnaire. On a 4-point rating scale, the options are as follows: not

at all (0), mildly but not bothersome (1), moderately: it was really uncomfortable, but I could tolerate it (2), and badly, hardly able to tolerate it (3). Anxiety is measured by adding up the items; higher scores indicate more anxiety.

Part 3: Post Resectoscope Patient's Observation Complication Checklist.

The researcher created it following an examination of relevant literature. It was employed to determine whether problems from TURP were present or not, as hemorrhage, UTIS, urinary retention, weak urinary stream, dysuria and urinary incontinence . This part comprised data from patients immediately after operation and follow-up for two months after operation.

Scoring system:

- (One mark) for existence of TURP complications.
- (Zero) for absence of post TURP complications.

Tool III: Questionnaire for rating health-related quality of life.

The WHOQOL is a quality of life measure created by the World Health Organization that accounts for many subjective aspects. The 26-item WHOQOL-BREF comprises four domains: physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items), in addition to QOL and general health questions. A five-point ordinal scale

is used as a response scale to score each individual item of the WHOQOL-BREF from 1 to 5. The scores are then transformed to a 0–100 scale in a linear fashion.

Method:

-Official permission to carry out the study was acquired from the faculty of nursing to responsible authorities at the study sitting.

- Ethical consideration:

a-The ethical committee of faculty of nursing at Tanta university approval was obtained at 20/3/2024 before conducting the study .

b- Following a clarification of the study's goal, consent was acquired from each patient included.

C-Nature of the study didn't harm or cause any pain to the entire subject.

d- The right of withdrawal was reserved anytime.

e- Privacy and confidentiality were taken into account in relation to the information gathered. Names were replaced by a code number.

-Tool development: The tools of the study was designed by the researcher after reviewing relevant literature .

-Tool validity:

Five juries of experts in medical-surgical nursing evaluated the content of validity for clarity and relevance in this profession, and modifications were made.

- Reliability of the tool

Developed tools was tested by Cronbach's Alpha test .It was 0.923

for tool I part c, 0.800 for tool II part 2 and 0.920 for tool III.

-A pilot study was carried out on five patients to evaluate the tools' applicability and viability as well as to identify any potential roadblocks to data collection. Based on the knowledge gathered from the pilot study, the researcher made the necessary adjustments. Those patients were excluded from the study subjects.

- Data collection

The six-month data collection period began in October 2024 and ended in March 2024.

-Nursing instructions was conducted on four phases as follows:

A- Assessment Phase:

-The researcher used Tool I Parts A and B to conduct an initial assessment of all study participants in both the control and study groups in order to determine which patients satisfied the study's inclusion requirements.

-Once all study participants in the control and study groups have given their informed consent, used Tool I Part C and Tool II Part 2 to collect baseline data that is relevant..

B-Planning phase: -

-All information pertaining to patients' awareness of transurethral resection of the prostate was gathered, and it was analyzed to determine the needs of the patients in light of the relevant literature.

-The instructional manual was written in Arabic and included illustrations. It was created to provide knowledge about TURP operation.

- Nursing instructions were planned to apply in two sessions: each session was taken duration 30 - 45 minutes to study groups within two days from total period of the study.

-Teaching method: Included in the instructional strategy were discussion, demonstration, and re-demonstration.

-Teaching tools: booklets, illustrated pictures, power point was used as teaching aids.

C- Implementation phase

Group (I): Control groups.

Control group received the routine hospital nursing care as prescribed by medical team and consisted of routine Pre - procedure instructions, routine post - procedure care.

Group (II): study groups.

Study groups who received nursing instructions implemented by the researcher through two sessions and each session started by pre-test and ended by post- test, instructions was given for every patient individually as the following:

Session 1 of nursing instructions:

It was provided to patient the day before the procedure and took about from 30- 45 minutes.

Content of first session was included as the following: -

knowledge about TURP (definition, brief description , indications

,contraindications , advantages , complications of operation, investigations needed before procedure , type of anesthesia used, position of patient during operation, pre operative physical and psychological preparation for operation.

Session 2 of nursing instructions:

It was started the day of operation and took about 30 -45 minutes.

Content of second session was included as following: -

Patients received discharge instructions and post-operative guidelines that included health education on urinary tract blockage, hematuria, and dysuria, as well as information on genital hygiene, catheter management, infection prevention, drinking a lot of water, and exercises to strengthen the pelvic floor muscles, return to work, signs of complications, medication administration, exercise, nutrition, sexual activity, and medical guidance were also included in the training.

D. Evaluation phase:-

-Tool I, portion (C) was used to evaluate the study group to assess patient's awareness about transurethral resection of prostate (post nursing instructions) , tool II part 2 to assess patient level of anxiety (post nursing instructions).

- Tool II part 1 to assess patient level of pain immediately and after a week of operation for both the control and study groups .

- Tool II part 3 to assess the patients for any complications (immediately after operation and follow up for two months) for the two groups.

- Tool III to assess quality of life for both the control and study groups.

-Finally, comparison was done between study and control group for clinical outcomes and quality of life.

Statistical analysis of the information gathered:

The data that was entered into the computer was examined using the IBM SPSS software package, version 20.0. (Armonk, NY: IBM Corporation, 2011). Numbers and percentages were used to describe the qualitative data. The distribution's normality was confirmed using the Shapiro-Wilk test. The mean, standard deviation, and range were used to characterize quantitative data. At the 5% level, the results' significance was assessed. The tests that were used were: Chi-square analysis When comparing groups using categorical variables, Fisher's Exact or Monte Carlo correction are utilized when more than 20% of the cells have an anticipated count below 5, chi-square correction is applied. Marginal Homogeneity Test and McNemar utilized to evaluate the importance of pre- and post-instruction, for quantitative variables that are regularly distributed, the student t-test is used to compare two groups under study, and the Pearson

coefficient For two quantitative variables that are regularly distributed to correlate.

Results

Table (1): Demonstrates distribution of the studied patients undergoing transurethral resection of prostate (TURP) regarding their socio-demographic characteristics.

In relation to age, it was found that 72 % and 76 % for control and study groups respectively with mean age range 56.00 ± 2.291 in control group and 55.96 ± 2.590 in study group.

Concerning marital status, most of the Studied groups were married 76%, 100 % for control and study groups respectively. **Considering educational level**, 20 % of the control group can read and write, 20 % of study group was illiterate , 24 % of the control group was diploma and 24 % of the study group was University education.

As for occupation, it was observed that nearly half (40%) of control group had manual work, while 36 % of the study group were farmers.

Finally, related to residence area, most of the control group and the study group (64% , 84%) respectively lived in rural area.

Table (2): Demonstrates assessment of total level of knowledge of the studied patient regarding transurethral resection of prostate (TURP) among the studied groups. It was revealed that there were no statistically significant differences

between both groups before implementation of nursing Instructions. On the other hand, it was obvious that there were a highly statistically significant improvement in study group knowledge after giving nursing instructions ($P < 0.001$).

Figure (1): Clarifies total knowledge level of the studied patient regarding transurethral resection of prostate (TURP) among the studied groups. It clarifies that most of the control and study group before giving nursing instructions had little level of knowledge (76%) of both groups and less than quarter of both groups had moderate level of knowledge (24%,16%) for control and study group respectively and only 8%)of the study group had a high level of knowledge , while after giving nursing instruction to the study group there was a great progress in their knowledge level immediately post giving nursing instructions as everyone of the study group had a high level of knowledge .

Table (3): Illustrates assessment of pain of the studied patients undergoing TURP using numerical rating scale (NRS) among the studied groups. It revealed that a highly statistically significant difference exists related to pain severity (intensity) and relieving factors for control and study group immediately post procedure and post one week as ($P = 0.001$).

Figure (2): Shows total level of anxiety among the studied groups undergoing transurethral resection of prostate according Beck anxiety inventory (BAI). It was found that (84 %) of the control group had a severe level of anxiety , (16%) had a moderate level of anxiety and there was (40%) of the study group pre instructions had a moderate level of anxiety and (60%) had a severe level of anxiety, while after giving nursing instruction there was (12%) of the study group had a minimal level of anxiety , (80%) had a mild level of anxiety ,and only (4%) had moderate and severe levels of anxiety thus indicates there was obvious decrease in anxiety level for the study group after giving nursing instruction.

Table (4): Shows percentage distribution of the studied patients undergoing transurethral resection of prostate (TURP) regarding post resectoscope complication and their mean score among the studied groups. A statistically significant difference was observed related to items of (hematuria , urinary incontinence and dysuria) as ($p = 0.034 , 0.017 , 0.049$) respectively , while there was no statistically significant difference related to UTI, urinary retention and weak urine stream as ($p = 0.490, 1.000, 1.000$) respectively. Additionally, it showed a very statistically significant difference between the two groups under study in total risk for

complication score in the follow up period for 2 months as ($p < 0.001$).

Table (5): Displays percentage distribution of the studied patients undergoing transurethral resection of prostate (TURP). Regarding their total quality of life level among the studied groups. It was noticed that there was a highly statistically significant difference between the two groups as ($p = 0.000$).

Figure (3): Illustrates total quality of life level among the studied groups according to WHO quality of life questionnaire. It exhibited that (92%) of the control group had low quality of life and (8%) of the control group had moderate quality of life, while (80%) of the study group had moderate quality of life and only (20%) of the study group had low quality of life .

Table (6): Shows Correlation between knowledge with different tools in each group .It clarifies that a negative statistically significant association was found between knowledge of studied groups and their level of Anxiety ($P < 0.001$). It also indicated that the quality of life score and the overall knowledge score of the patients undergoing transurethral resection of the prostate are positively statistically significantly correlated ($P < 0.05$). It also shows that there is a negative correlation between total knowledge score of the studied patients undergoing transurethral resection of

prostate and their pain severity and intensity and there is a negative statistically significant correlation between total knowledge score of the study group and their pain severity and intensity immediately after the procedure ($P < 0.05$). It also revealed that there is a negative statistical significant correlation between total knowledge score of the studied patients undergoing transurethral resection of prostate and their mean risk of complications score.

Table (1): Distribution of the studied patients undergoing transurethral resection of prostate (TURP) regarding their socio-demographic characteristics.

Characteristics	The studied patients (n=50)				χ^2 P
	Control group (n=25)		Intervention group (n=25)		
	N	%	N	%	
Age (in years)					
(50-<55)	7	28.0	6	24.0	FE
(56-59)	18	72.0	19	76.0	1.00
Range	(51-59)		(51-59)		t=0.058
Mean ± SD	56.00±2.291		55.96±2.590		P=0.954
Marital status					
Married	19	76.0	25	100.0	2.139
Divorced	2	8.0	0	0.0	
Widow	4	16.0	0	0.0	
Level of Education					
Illiterate	3	12.0	5	20.0	3.342
Read and write	5	20.0	3	12.0	
Basic education	3	12.0	6	24.0	
Diploma	6	24.0	3	12.0	
Secondary education	3	12.0	2	8.0	
University education	5	20.0	6	24.0	
Occupation					
Manual works	10	40.0	8	32.0	0.918
Employee	3	12.0	3	12.0	
Farmer	6	24.0	9	36.0	
Other	6	24.0	5	20.0	
Residence					
Rural	16	64.0	21	84.0	FE
Urban	9	36.0	4	16.0	0.196

FE: Fisher' Exact test

Table (2): Assessment of total knowledge level of the studied patient regarding transurethral resection of prostate (TURP) among the studied groups.

Total knowledge level	The studied patients (n=50)						Test of Sig. (p ₁)
	Control Group(n=25)		Study group (n=25)				
			Pre instruction		Post instruction		
	No.	%	No.	%	No.	%	
Low	19	76.0	19	76.0	0	0.0	2.046 (^{MC} p=0.504)
Moderate	6	24.0	4	16.0	0	0.0	
High	0	0.0	2	8.0	25	100.0	
p ₀			<0.001*				
Range	10.0 – 30.0		12.0 – 36.0		42.0 – 44.0		t=0.760 (0.451)
Mean ± SD.	18.44 ± 5.90		19.72 ± 6.00		43.92 ± 0.40		
t ₀ (p ₀)			19.480* (<0.001*)				

IQR: Inter quartile range SD: Standard deviation t: Student t-test

χ^2 : Chi square test

MC: Monte Carlo test

p₀: p value for comparing between study group Pre and **Post instruction**

p₁: p value for comparing between **control and study group Pre instruction**

* Significant at level P<0.05

(<50%) Low

(50-75)% Moderate

(>75%) High

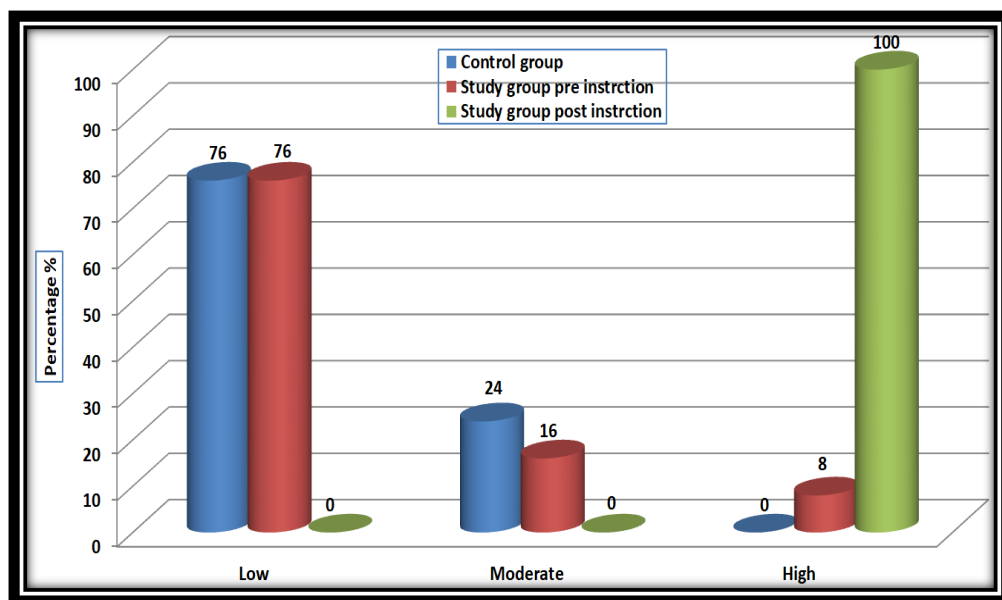


Figure (1): Assessment of total knowledge level of the studied patient regarding transurethral resection of prostate (TURP) among the studied groups.

Table (3): Assessment of pain severity of the studied patients undergoing transurethral resection of prostate (TURP) using numerical rating scale (NRS) among the studied groups.

Items	The studied patients (n = 50)								Test of Sig. (p ₁)	Test of Sig. (p ₂)
	Control group				Study group					
	Immediate		Post 1 week		Immediate		Post 1 week			
	N	%	N	%	N	%	N	%		
Pain Location										
Perineum	7	28.0	0	0.0	5	20.0	0	0.0	$\chi^2=0.791$ (0.673)	—
Suprapubic	8	32.0	0	0.0	7	28.0	0	0.0		
Tip of penis	10	40.0	25	100.0	13	52.0	25	100.0		
Pain radiation										
Lower back	5	20.0	0	0.0	4	16.0	0	0.0	$\chi^2=0.533$ (^{MC} p=0.82 2)	—
None	17	68.0	25	100.0	19	76.0	25	100.0		
Thigh	3	12.0	0	0.0	2	8.0	0	0.0		
Severity and intensity										
Range	3.0 – 7.0		2.0 – 4.0		2.0 – 7.0		1.0 – 3.0		t=3.418* (0.001*)	t=5.232* ($<0.001^*$)
Mean $\pm$ SD.	5.64 $\pm$ 1.04		3.04 $\pm$ 0.68		4.56 $\pm$ 1.19		2.04 $\pm$ 0.68			
Quality of pain										
Burning	10	40.0	25	100.0	13	52.0	25	100.0	$\chi^2=1.464$ (^{MC} p=0.71 8)	—
Aching	2	8.0	0	0.0	3	12.0	0	0.0		
Cramping	8	32.0	0	0.0	6	24.0	0	0.0		
Pressing	5	20.0	0	0.0	3	12.0	0	0.0		
Timing (in minutes)										
Range	5.0 – 15.0		2.0 – 5.0		3.0 – 10.0		2.0 – 5.0		t=3.233* (0.002*)	t=0.927 (0.358)
Mean $\pm$ SD	10.0 $\pm$ 4.08		4.32 $\pm$ 1.14		6.84 $\pm$ 2.69		4.0 $\pm$ 1.29			
Precipitating factors										
Activity and straining	8	32.0	0	0.0	7	28.0	0	0.0	$\chi^2=0.325$ (0.850)	$\chi^2=1.951$ (^{MC} p=0.49 7)
Bladder filling,	7	28.0	0	0.0	6	24.0	0	0.0		
coughing and sneezing	10	40.0	25	100.0	12	48.0	23	92.0		
Urination	0	0.0	0	0.0	0	0.0	1	4.0		
Low volume of liquids	0	0.0	0	0.0	0	0.0	1	4.0		
Movement										
	25	100.0	0	0.0	25	100.0	0	0.0		

SD: Standard deviation

t: Student t-test

 χ^2 : Chi square test

MC: Monte Carlo test

p₁: p value for comparing between two studied groups (Immediate)p₂: p value for comparing between two studied groups (post a week)*: Statistically significant at $p \leq 0.05$

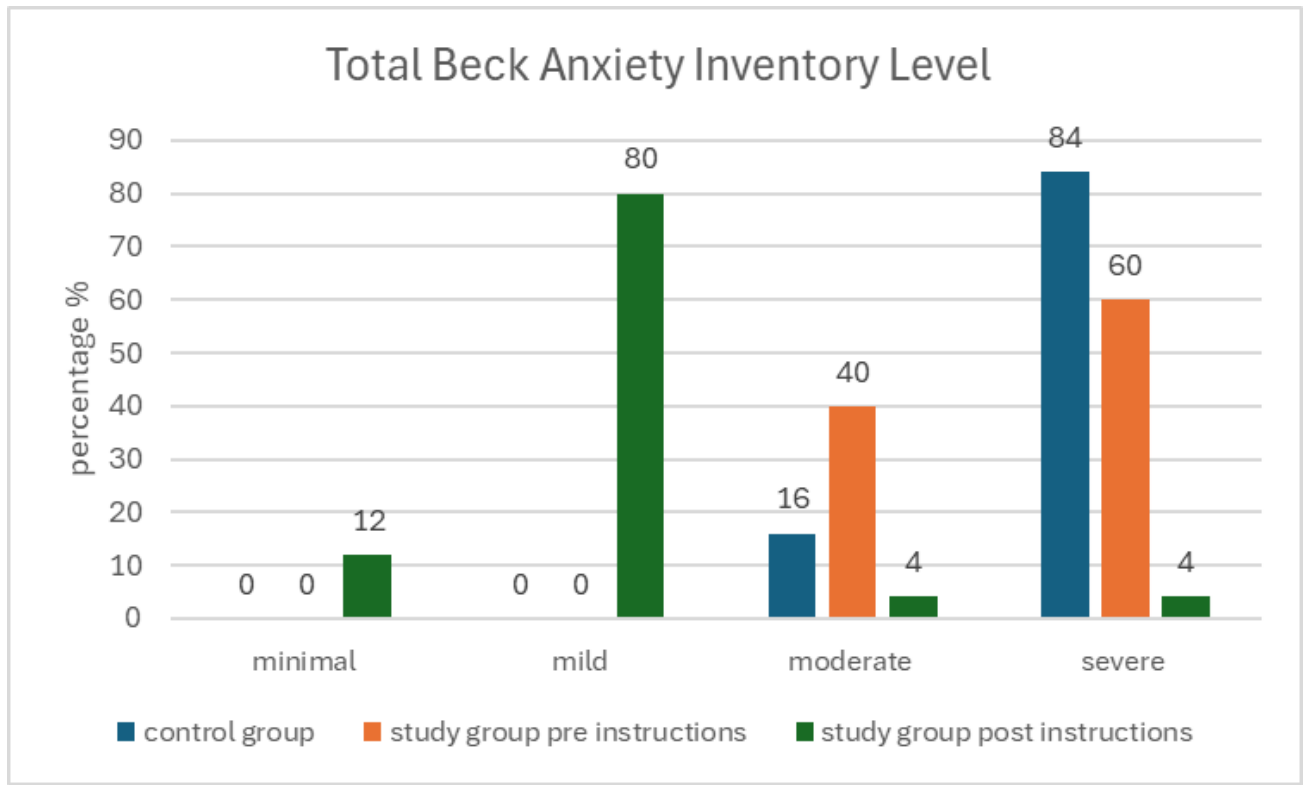


Figure (2): Percentage distribution of the studied patients undergoing transurethral resection of prostate (TURP) according anxiety level among the studied groups.

Table (4): Percentage distribution of the studied patients undergoing transurethral resection of prostate (TURP) regarding post resectoscope complication among the studied groups.

Risk	The studied patients (n=50)								χ^2 (p ₁)	χ^2 (p ₂)
	Control Group (n=25)				Study group (n=25)					
	Immediate		Follow up 2 months		Immediate		Follow up 2 months			
	No.	%	No.	%	No.	%	No.	%		
Hematuria										
Absent	0	0.0	17	68.0	0	0.0	23	92.0		4.500*
Present	25	100.0	8	32.0	25	100.0	2	8.0		(0.034*)
Urinary tract infection										
Absent	25	100.0	23	92.0	25	100.0	25	100.0	—	2.083
Present	0	0.0	2	8.0	0	0.0	0	0.0		(^{FE} p=0.490)
Urinary retention										
Absent	25	100.0	23	92.0	25	100.0	24	96.0	—	0.355
Present	0	0.0	2	8.0	0	0.0	1	4.0		(^{FE} p=1.000)
Urinary incontinence										
Absent	25	100.0	16	64.0	25	100.0	23	92.0		5.711*
Present	0	0.0	9	36.0	0	0.0	2	8.0		(0.017*)
Dysuria										
Absent	0	0.0	18	72.0	0	0.0	24	96.0		5.357*
Present	25	100.0	7	28.0	25	100.0	1	4.0		(^{FE} p=0.049*)
Weak urine stream										
Absent	25	100.0	22	88.0	25	100.0	23	92.0	—	0.222
Present	0	0.0	3	12.0	0	0.0	2	8.0		(^{FE} p=1.000)
Total Risk	Immediate		Follow up 2 months		Immediate		Follow up 2 months			
Range	2.0 – 2.0		0.0 – 4.0		2.0 – 2.0		0.0 – 2.0		t (p ₁)	t (p ₂)
Mean ± SD	2.0 ± 0.0		1.24 ± 1.05		2.0 ± 0.0		0.32 ± 0.56			3.865* (<0.001*)

 χ^2 : Chi square test

FET: Fisher Exact test

p₁: p value for comparing between **two studied groups (immediate)**p₂: p value for comparing between **two studied groups (Follow up 2 months)**

* Significant at level P<0.05

Table (5): Percentage distribution of the studied patients undergoing transurethral resection of prostate (TURP) regarding their total quality of life level among the studied groups.

Total quality of life level	The studied patients (n=50)				χ^2 P
	The Control group (n=25)		The Study group (n=25)		
	N	%	N	%	
Low	23	92.0	5	20.0	FE 0.000*
Moderate	2	8.0	20	80.0	
Range	(59-79)		(70-103)		t=8.978 P=0.000*
Mean ± SD	67.80±5.172		85.40±8.327		

(<50%) Low

(50-75)% Moderate

(>75)% High

* Significant at level P<0.05

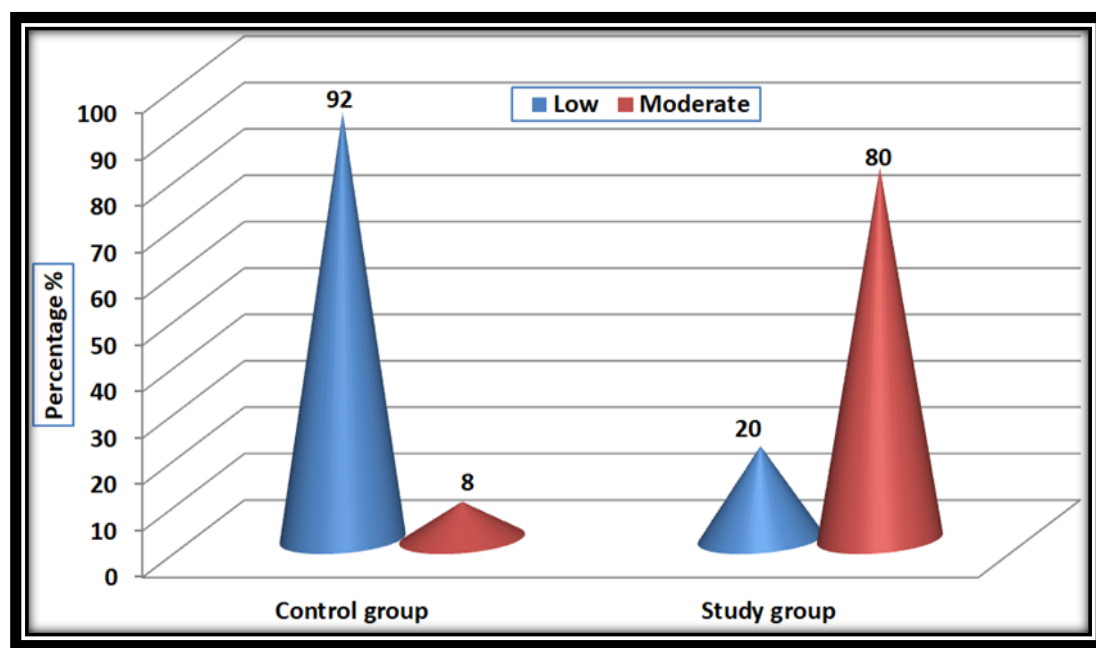


Figure (3): Percentage distribution of the studied patients undergoing transurethral resection of prostate (TURP) regarding their total quality of life level among the studied groups

Table (6): Correlation between Knowledge with different tools in each group

Knowledge vs.	Control (n = 25)		Study (n = 25)			
			Pre instruction		Post instruction	
	r	p	r	r	r	p
Beck anxiety inventory (BAI)	-0.233	0.263	0.011	0.960	-0.726*	<0.001*
Quality of life	0.483*	0.014*	0.107	0.610	0.405*	0.047*
Pain Severity and intensity						
Immediate	-0.307	0.136	0.192	0.359	-0.426*	0.034*
Post a week	-0.381	0.060	-0.100	0.635	-0.296	0.151
Risk of complications	Control (n = 25)		Study (n = 25)			
	r	p	R		p	
	-0.192	0.357	-0.629*		0.001*	

Discussion:

Transurethral resection of the prostate (TURP) is considered the gold standard treatment for benign prostatic hyperplasia (BPH) (**Chughtai et al., 2016**). For patients having TURP, health education is important since they have a lot of expectations and worries about their long-term function and results. Positive patient outcomes are a result of effective patient education. (**Mahmoud et al., 2025**).

This study aimed to evaluate the effect of nursing instructions on Clinical Outcomes for Patients Undergoing Transurethral Resection of Prostate (TURP) . In the present study, most patients were between 51 and 59 years old, with a mean age of approximately 56 years for both groups. This reflects an age distribution at a younger spectrum often seen in international TURP series. For example, **Mahamat et al., 2022**) reported a mean age of 66 years (range 50–92), with most patients falling within the 60–69 age group. Similarly, (**Schembri, Attard, Micallef, Mifsud & Busuttil, 2024**) reported average age about 69.5 years, and the most common age group was 60–69 years. Despite these reports, younger patients undergo TURP, particularly when they present with severe lower urinary tract symptoms (LUTS) or when medical management has failed. This agreed with (**khalil, Sayed, Ahmed & Gadelkareem, 2021**) who found that the plurality of the studied patients were between fifty to sixty five years old , also. (**Mahmoud, S., Hasssanin, et al 2025**)

who reported that most of the control and the study group ranged between 51% to 60% years old. From the researcher point of view the finding of the current study is due to the inclusion of age group from 40-59 years old , while the disease is more common on older age groups .

Regarding marital Status, the majority of patients in both groups were married . This high prevalence of married individuals is consistent with (**Khalil et al., (2021)**). Also supported this high percentage, aligning closely with the current results. This study disagree with. (**Mahmoud, et al., 2025**) who reported that that nearly half of the study and control groups were widowed and (**Mishriki, Grimsley, Lam, , Nabi, & Cohen, 2017**) who reported that more than half of the study and control groups were widowed.

As for educational Level, a heterogeneous distribution of educational levels was found: a notable proportion were illiterate or had only basic education, with fewer holding higher educational degrees. Similar results are reported in literature. (**Khalil et al., 2021**) reported that low literacy and basic education are common in patients undergoing TURP, particularly in public-sector hospitals in developing countries. This come in disagreement with (**Zheng et al., 2022**) who found that more than one quarter of BPH patients were high school graduates. From the researcher opinion, this could be the result of social or cultural

variations in how different communities learn.

Regarding occupation, a substantial portion of patients were engaged in manual labor and farming, with lower proportions employed in non-manual professions. This is agreed with (**Afenigus et al.,2024**) which reported that a great percentage of patients undergoing TURP were farmers, with most others involved in manual or informal work. (**Khalil et al., 2021**) also reported similar occupational distributions.

Also, we can see that most of the participants resided in rural areas , this is agreed with (**Afenigus et al., 2024**) which found around eighty percentage of TURP patients come from rural backgrounds. From the researcher mind, factors such as delayed presentation, limited awareness, and reduced access to early urological services are thought to explain this trend.

Regarding the knowledge of patients undergoing transurethral resection of the prostate , evaluated before and after the implementation of nursing instructions. The findings show that in the Pre-instruction phase, both study and control groups exhibited limited knowledge regarding TURP. In the post-instruction phase, there was a clear statistically significant improvement in the study group's knowledge across all measured domains after receiving structured nursing instructions. highlighting the specific impact of targeted education.

(**Khalil et al., 2021**) reported similar findings, demonstrating that patients who received structured preoperative nursing instructions showed a significant improvement in knowledge, while controls did not. The authors recommend routine use of preoperative nursing education for all TURP patients. Another study by (**Mahmoud, etal., 2025**) demonstrated a notable increase in the study's overall knowledge level compared to the control group following educational instructions.

This is also supported by the findings of (**Subrata ,2020**) who discovered that the total knowledge score before and after attending TURP surgery education programs differed statistically significantly.

From the researcher's view point regarding how structured nursing instructions impact patient's knowledge when undergoing TURP, all knowledge domains showed statistically significant improvement in the study group post-instruction compared to both their baseline and to a control group, indicating the direct and robust effect of targeted nursing education on patient preparedness and self-care ability.

Regarding the pain experiences of patients undergoing TURP, using the Numerical Rating Scale . Immediately after surgery, most patients experienced mild to severe burning pain, primarily at the tip of the penis, often precipitated by urination and physical activity, but this pain significantly decreased by one-week

post-procedure and was typically relieved by rest and analgesics. One relevant study by (**Köse et al., 2013**) proved that the use of a local anesthetic agent in the irrigation fluid after TURP significantly reduced postoperative pain scores, underscoring the relevance of adequate postoperative pain management.

The current study revealed that there is an extremely statistical significant difference related to pain severity and relieving factors between the two groups immediately post procedure and post one week as P value = 0.001. This finding agreed with (**Aloweni, Li, Tesalona & Salleh, 2008**) who reported that Patients who received pre-operation education reported a faster decrease in post-operative pain and expressed greater satisfaction with the treatment and reduced anxiety. Another study by (**Vigneswaran et al, 2021**) performed painless nursing using mind maps for patients undergoing TURP. It was found that this nursing approach might successfully lessen the need for analgesics and relieve patient's discomfort. This is inconsistent with (**Robinson, Hepburn, Turner & Zarrabi, (2022)**) who used the clinical nursing pathway to help patients following TURP; no discernible difference between the clinical nursing approach and the standard nursing strategy was seen in postoperative pain levels or nursing satisfaction.

From the researcher estimation ,the pain is subjective experience which can be affected by biological ,psychological and social status , social and environmental status .The study group experienced lower levels of stress and anxiety , had sufficient knowledge about strategies to cope up with pain and good expectation about the operative outcomes, all of this could contribute to the decreased pain severity .

Regarding physical and psychological anxiety symptoms via the Beck Anxiety Inventory before and after nursing intervention. The findings show a statistically significant reduction in symptoms in the intervention group post-instruction. It was found that plurality of the control group and two third of the study group had a severe level of anxiety , while after giving nursing instruction, most of the study group had a mild level of anxiety and only four percentage had moderate and severe levels of anxiety.

The finding of the current study is consistent with(**Li et al., 2021**) who reported that personalized education combined with shared valuable physiological and psychological experience and expectations coping with BPH may more effectively lower perioperative anxiety in BPH patients. Also a study by(**Beiramijam, Anoosheh & Mohammadi, 2013**). reported that the tension and anxiety levels of BPH patients after TURP surgery are considerably decreased by

a well-designed instructional program on self-care.

Regarding complications following transurethral resection of the prostate. The key findings show ,hematuria was present in all patients immediately post-procedure, this finding is conforming to **(Carnevale, et al., 2015)** who reported that in the first two weeks after the procedure, hematuria was noted in every patient in the TURP group.

Also, **(Kusljic, Aneja &Manias 2017)** and **(Basirun, 2024)** reported haematuria with the majority of the patients post operatively.

In the follow up for 2 months hematuria persisted in 32% of the control group versus only 8% in the study group , a statistically significant difference ($P=0.034$). From the researcher opinion, this statistically significant difference may be due to the compliance of the study group with the instructions provided by the researcher . This in line with a study by**(Beyramijam, Anoosheh & Mohammadi, 2014)** ,which demonstrated that education could lower the experimental group's gross hematuria level, also (**Khalil et al., (2021)** supported this finding .

Regarding Urinary incontinence (UI) was significantly higher in the control group 32% compared to the study group 8% at 2 months. From the researcher standpoint, this significant difference may be due to the adherence of the study group to the guidelines provided by the researcher as the implementation of pelvic floor

muscle strengthening exercises and bladder and urinary urgency control trainings. This finding agreed with (**Mahmoud et al., 2025**) who declared that a nurse-led educational intervention effectively prevented urinary incontinence incidence in the study group compared to the control group .Also **(Guo B., 2025)** stated that post-nursing intervention could decrease the incidence, volume, and frequency of postoperative UI. Similar percentage was reported in **(Khalil et al., 2021)** for study group which reported 5% , but much higher percentages were reported in **(He, Mao, Shu, & Liu, 2025)**. (36.4%) and **(Rassweiler, Teber, Kuntz, Hofmann, 2006)** (30 %- 40%).

Regarding dysuria was noted in all patients immediately after procedure, this finding is consistent with **(Carnevale, et al., 2015)**who mentioned the same finding. Dysuria persisted in 28% of the control group and only 4% of the study group at two months follow up , again showing significant improvement with nursing instructions. This finding come in line with **(Beyramijam et al ., 2014)** who found the suggested self-care approach can greatly lower the risks of TURP surgery including dysuria.

Regarding total quality of life, there was a clear advantage in total quality of life (QOL) for the study group versus the control group. According to the WHOQOL-BREF scale, most of the study group had moderate QOL and only 20% had low QOL, while in the control group, the majority had

low QOL and only 8% achieved moderate QOL. From the researcher judgment, these results highlight the effectiveness of structured nursing education and guidance in enhancing not just health status, but total life satisfaction and adaptability after TURP. This is agreed with **(Mahmoud et al., 2025)** who maintained that the trial group's patients had a higher life quality than those in the control group.

Regarding correlation between patients' knowledge scores and their anxiety levels, the results show a strong negative correlation between patients' knowledge scores and their anxiety levels in the study group after receiving nursing instructions ($R = -0.726$, $p < 0.001$). This suggests that structured education significantly reduces anxiety in patients undergoing TURP. A study by **(Li et al., 2021)** discovered that BPH patients may have less preoperative anxiety when personalized instruction is combined with common physiological and psychological experiences and expectations.

Regarding correlation between total knowledge scores and pain severity, the results show a negative correlation between total knowledge scores and pain severity and intensity in the study group immediately post-procedure ($r = -0.426$, $p = 0.034$), though not at later follow-up. In the control group, no statistically significant association was found.

A study by **(Darville-Beneby et al., 2023)** reported that preoperative

patient education programs show promise for enhancing pain scores and other postoperative outcomes for patients undergoing elective surgery. Regarding correlation between knowledge and the mean risk of complications score, the results demonstrate a statistically significant negative correlation between knowledge and the mean risk of complications score in the study group ($r = -0.629$, $p = 0.001$), but not in controls. This indicates that better-informed patients face fewer complications following TURP. This is agreed with **(Khalil et al., (2021)** who revealed a negative relationship between the study group's postoperative complications and total knowledge score on the post-test ($P = 0.001$ and $r = -0.720$), meaning that as patient knowledge rises, postoperative complications following TURP fall.

Conclusion:

The results of this study indicate that: The nursing guidelines improved clinical outcomes, patient knowledge, and quality of life for patients having Transurethral Resection of Prostate.

Recommendation: Based on the results of the current investigation, the following recommendations are made:

Recommendation for patients:

-In the urological department, an educational instructions should be given for all patient undergoing Transurethral resection of the prostate

(TURP) with various educational materials and strategies

Recommendations for further research studies:

- It is necessary to repeat the current study with a bigger patient sample in various contexts in order to generalize the findings.
- Additional research is required to extend the follow-up period for patients who have undergone transurethral resection of the prostate.

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Nurses' Knowledge and practices regarding Care Bundle of Infection Associated with Indwelling Urinary Catheterization for Children

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Abstract

Background: Catheter Associated Urinary tract infection is one of the most common complications among pediatric intensive care patients. The best preventive measures involve avoiding unnecessary catheterization and removing catheters as soon as possible. **Aim:** The present study aimed to assess nurses' knowledge and practices regarding care bundle of infection associated with indwelling urinary catheterization for children. **Design:** A descriptive exploratory research design was utilized. **Setting:** The study was conducted at Pediatric Intensive Care Unit and pediatric medical department of Tanta Main University Hospital. **Subject:** Purposive sampling composed of 60 nurses and children associated with indwelling urinary catheterization. **Tools:** Three tools were used, Tool (1): Structured Interviewing Questionnaire to assess the Knowledge of nurses regarding care bundle of urinary tract infection. Tool (2): Observational Checklist of nursing practices regarding care bundle of urinary tract infection associated with indwelling urinary catheterization for children. **Results:** Most of studied nurses had low level of knowledge regarding care bundle of infection associated with indwelling urinary catheterization for children. All studied nurses had unsatisfactory total practices level regarding care bundle of infection associated with indwelling urinary catheterization for children. **Conclusion:** The total level of knowledge and practices of the studied nurses were unsatisfactory regarding urinary tract infection associated with indwelling urinary catheterization for children. **Recommendation:** Applying an educational program for nurses at pediatric Intensive Care Units for improving nurses' knowledge and practices regarding urinary tract infection associated with indwelling urinary catheterization for children.

Keywords: Catheter-related urinary tract infections, Care bundle, Nurses' Knowledge, Practices, and Pediatric Intensive Care Units.

Introduction

In the Pediatric Intensive Care Unit (PICU), urinary catheterization is a routine procedure. It is used in many contexts for both therapeutic and diagnostic objectives. The presence of catheter is the greatest predictor for infections of the urinary system in the hospital setting, resulting in 70-80% of infections of the urinary tract. Infections of the urinary tract account for 32% of all Hospital Associated Infections (HAIs) and 13% of all HAI related deaths, making it a significant contributor to hospital-associated morbidity **(Siegel, et al, 2018)**.

Catheter-Associated Urinary Tract Infections (CAUTIs) in pediatric Patient must meet 3 criteria: 1- Patient had an indwelling urinary catheter that had been in place for > 2 days on the date of event (day of device placement = day 1) or Patient had indwelling urinary catheter removed within the 48 hours prior to specimen collection and at least one of the following signs or symptoms with no other recognized cause. 2- Patient has at least one of the following signs or symptoms: fever (>38°C), suprapubic tenderness, costovertebral angle pain or tenderness, urinary urgency, urine frequency or dysuria. 3- Patient has a urine culture with no more than

two species of organisms identified, at least one of which is a bacterium of $\geq 10^5$ CFU/ ml **(CDC, 2017)**.

The Healthcare Infection Control Practices Advisory Committee guidelines for prevention of catheter-associated urinary tract infection has estimated that between 17% and 69% of hospital acquired CAUTI can be prevented by implementation of evidence based prevention program. Evidence suggests that certain nursing interventions can reduce the incidence of this infection include: Selecting of optimal catheter and drainage system, proper and sterile catheter insertion technique. In addition to, maintenance catheter care, shorten the duration of indwelling urinary catheterization and using of alternative methods for bladder drainage and remove catheters in a timely manner proper catheter management to prevent risk of urinary tract infection **(Abdelmoaty, et al, 2020)**.

Medical treatment aimed to treat and prevent complications of it. It is based on its location either in the upper or the lower tract and on pediatric patient characteristics. Antibiotics given for pediatric patients with clinical signs of septic shock or neutropenic fever, its initiation should not be delayed and for pediatric patients with an

isolated fever, it should generally be withheld pending additional investigation (fever isn't an indication for antibiotics) **(Rubi, Mudey, & Kunjalwar, 2022)**.

The routine administration of systemic antibiotics at the time of catheter insertion or removal is not recommended. Routine prophylactic antibiotics while the catheter is in situ must not be used as this does not prevent CAUTI; it leads to resistant bacteria. The antibiotic treatment of CAUTI in the presence of long – term indwelling catheter may not be successful because the causative bacteria are often embedded in biofilm on the surface of the catheter and protect from the action of antibiotics **(WHO, 2023)**.

The CAUTI care bundle includes both the insertion and maintenance bundles. Insertion Bundle which includes need verification before insertion, hand cleanliness, sterile catheter insertion, and urinary catheter management by authorized standards. The maintenance bundle includes avoiding unnecessary catheterization, bathing the perineum daily, removing catheters once not required, and keeping a closed system with unimpeded flow. Such evidence-based treatments are intended to improve patient outcomes when implemented in a systematic and

consistent manner **(Lehane, et al 2022)**.

Significance of the study

Indwelling catheterization associated with urinary tract infections are common nosocomial infections in children, which increase mortality, morbidity, bacterial resistance, length of hospital stay, and cost. It accounts for 40% to 60% of hospital infection **(Long, & Koyfman, 2018)**. National Nosocomial Infections Surveillance reported that 13% of nosocomial infections in urinary tract infections in 75 Pediatric Intensive Care Units from 1992 to 2003 were urinary tract infections, and the urinary infection rate was 4.3 per 1000 catheter days **(Abdelmoaty, 2020)**.

The National Healthcare Safety Network demonstrated that pooled mean CAUTI rates were similar in adults and children. The national pooled mean for pediatric intensive care units (PICUs) was 2.5 infections per 1000 catheter-days. In a recent study of 2015 CAUTI events in 10 hospitals, 83% of cases were reported in PICUs, as compared with 13% reported in pediatric inpatient units **(Siegel, et al, 2018)**. Indwelling catheter-associated urinary tract infections however, are potentially preventable by using practices which promote judicious use of

urinary catheters and attention to aseptic insertion and proper catheter maintenance practices (Abdel-Hakeim & Hamza 2018).

The Aim of the Study The present study aimed to assess nurses' knowledge and practices regarding care bundle of infection associated with indwelling urinary catheterization for children.

Research questions.

- 1- What is nurses' knowledge regarding care bundle of infection associated with indwelling urinary catheterization for children.
- 2- What is nurses' practices regarding care bundle of infection associated with indwelling urinary catheterization for children.

Subjects and methods:

Research design:

A descriptive exploratory research design was utilized.

Subjects: Sample type and size

Inclusion criteria of Children:

Children aged between 1 to 18 years, both sex and children who stay at pediatric intensive care unit or pediatric medical department for over 48hours and have no symptoms of urinary tract infection during first 48hours from admission.

Exclusion criteria

Children who stay less than 48 hours at pediatric intensive care unit stay and children who have positive urine culture during

admission or within 48 hours of stay

Setting:

The study was conducted at Pediatric Intensive Care Unit and pediatric medical department of Tanta Main University Hospital, which are affiliated to Ministry of Higher Education and Scientific Research.

Subject:

A Purposive sampling of (60) nurses and children associated with indwelling urinary catheterization.

Tools of the study

Two tools were utilized as follows:

Tool (1): Structured Interviewing Questionnaire to assess the nurses' Knowledge of nurses regarding care bundle of urinary tract infection

It was prepared by the researcher after extensive reviewing of recent literatures to collect data. It was consisted of three parts:

Part (1): Socio demographic characteristics of studied nurses:

It was covered the characteristics of the nurses which include age, gender, level of education and attendance of clinical training courses about infection control.

Part (2): Socio demographic characteristic of studied children

It covered the characteristics of studied children which include Age, gender, medical diagnosis and

history of any previous infection.

Part (3): Nurses' knowledge regarding care bundle of urinary tract infection.

It was developed by the researcher after reviewing the related literature which includes: causes of hospital acquired infection, risk factors catheter associated urinary tract infection, care provided to child for prevention, preparation of insertion sites, and use of aseptic technique.

The total scores of Nurses' knowledge were calculated as follow:

Less than 60% was considered low level of knowledge. From 60- 80% was considered moderate level of knowledge. From 80% and more was considered high level of knowledge.

Tool (II): Observational checklists of nurses' practices care bundle regarding urinary tract infection associated with indwelling urinary catheterization for children

It was included nurses' practices regarding implementation of indwelling urinary catheter care bundle and was contained three actions, insertion action, after insertion action and maintenance care.

The total scores for nurses' practice will calculated as follows:

Less than 80 was considered

unsatisfactory.

From 80-100 % was considered satisfactory

Methods:

The study was accomplished through the following steps:

1. Administrative Process

To carry out this study, an official permission for data collection was obtained from the Dean of the Faculty of Nursing, Tanta University directed to administrators responsible for the selected hospitals.

2. Ethical considerations

- Ethical approval was taken from the Scientific Research Ethics Committee of the Faculty of Nursing, Tanta University before conducting the study code No. 261/6/2023

- Confidentiality and privacy were taken into consideration regarding the data collection and was maintained by coding number
- Nature of the study didn't cause any harm or pain to the entire sample.
- Nurses' informed consents to participate in this study were obtained after explanation of the aim and benefits of the current study. The nurses had the right to withdraw from the study at any time.

3. Tools development

Three tools were developed by the researcher after reviewing of

recent literatures and under the supervision of the supervisors.

4. Content validity

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.

5. Pilot study:

A pilot study was carried out on 10% of nurses and children (6 nurses and children). It study was done to test the tool for its clarity, applicability, feasibility to determine any obstacles that my encountered the researcher during the period of data collection. Pilot study was excluded from the total sample.

6. Reliability test

Testing reliability of proposed tools was done by using Cronbach's alpha coefficient test. It was 0,813 for tool (I), 0.806 for tool (II) which indicates that the two tools were reliable to detect the objectives of the study.

7. Statistical analysis

Data was entered and analyzed by using SPSS statistical package version 30. Graphics were done using Excel program. Quantitative data were presented by mean ($\bar{X}$) and Standard Deviation (SD). Qualitative data were presented in the form of frequency distribution tables, number and percentage. It was analyzed by chi-square (χ^2)

test, ANOVA test (F). Level of significance was set as P value <0.05 for all significant tests (Lisa, 2023).

Result

Table (I): represents the percentage distribution of the studied nurses regarding their socio- demographic characteristics. It was observed that the age of studied nurses was ranged from 20-30 years, and more than three fourths (81.66%) of them were females. While about 60% of them had nursing bachelor. As regards to attendance of clinical training course about infection control, it was found that more than half (63.33%) of them attended clinical training course about infection control. Regarding their experience, nearly three quarters (73.33) of studied nurses had less than five years

Table (2): represents percentage the distribution of socio-demographic characteristics of the studied children with tract infection associated with indwelling urinary catheterization. It was observed that more than half (60%) of them were less than five years. Regarding their gender 58.33% were female, 41.66% were male. It was found that 43.33% of them had central nervous system disorder; also 85% of them not had previous infection.

Table (3): represents distribution of the studied nurses regarding their

total knowledge about care bundle of urinary tract infection associated with indwelling urinary catheterization. It was observed that 90% of studied nurses had low level of knowledge.

Table (4): represents distribution of the studied nurses regarding their practice about insertion standard element. Regarding hand hygiene, 20% of the studied nurses had done correctly. On other hand it was found that 63.33% of the studied nurses had an appropriate antiseptic or sterile solution for periurethral cleaning. The same table demonstrated that 20% of studied nurses use a single-use packet of lubricant jelly for insertion correctly.

Table (5): represents distribution of the studied nurses regarding their total practice level about care bundle regarding urinary tract infection associated with indwelling urinary catheterization for children. It was observed that all studied nurses were unsatisfactory regarding total practice level.

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

Characteristics	The studied nurses (n=60)	
	No.	%
Age (in years)		
(20-<30)	57	95.00
(30-<40)	3	5.00
Gender		
Male	11	18.33
Female	49	81.66
Level of education		
Technical health institute	27	40.00
Nursing bachelor	33	60.00
Attendance of clinical training course about infection control		
Yes	38	63.33
No	22	36.67
Experience (in years)		
(<5)	44	73.33
(5-<10)	14	23.33
(10-<15)	2	3.33

Table (2): percentage distribution of socio-demographic characteristics of the studied children with tract infection associated with indwelling urinary catheterization.

Socio demographic characteristics	The studied children (n=60)	
	NO	%
Age (in years)		
(<5)	36	60.00
(5-<10)	16	26.67
(10-<15)	6	10.00
(15-18)	2	3.33
Gender		
Male	25	41.66
Female	35	58.33
Diagnosis		
Central Nervous System disorder	26	43.33
cancer	6	10.00
cardiac failure	4	6.66
Diabetic Ketoacidosis	4	6.66
Respiratory disorder	12	20.00
renal failure	8	13.33
Previous infection		
Yes	9	15.00
No	51	85.00

Table (3): percentage distribution of the studied nurses regarding their total knowledge level about care bundle of urinary tract infection associated with indwelling urinary catheterization.

Total knowledge level	The studied nurses (n=60)	
	No	%
Low	54	90.00
Moderate	6	10.00
High	0	0.00
Range	(12-27)	
Mean ± SD	17.17±3.35	

Table (4): Percentage distribution of the studied nurses regarding their practice about insertion standard element.

Insertion standard element	The studied nurses (n=60)	
	No	%
- Perform hand hygiene before insertion		
Incorrect done/Not done	48	80.00
Complete correct done	12	20.00
- Ensure that only properly trained persons who know the correct technique of aseptic catheter insertion	60	100.00
Complete correct done		
- Using aseptic technique and sterile equipment		
A. Use sterile gloves		
Incorrect done/Not done	55	91.66
Complete correct done	5	8.33
B. Use sponges		
Complete correct done	60	100.00
C. an appropriate antiseptic or sterile solution for periurethral cleaning		
Incorrect done/Not done	22	36.67
Complete correct done	38	63.33
D. A single-use packet of lubricant jelly for insertion		
Incorrect done/Not done	48	80.00
Complete correct done	12	20.00
- Using the smallest bore catheter, consistent with good drainage		
Complete correct done	60	100.00
- Properly secure indwelling catheters after insertion		
Incorrect done/Not done	7	11.66
Complete correct done	53	88.33
Range	(4-7)	
Mean $\pm$ SD	5.87$\pm$0.90	

Table (5): Percentages distribution of the studied nurses regarding their total practice level about care bundle regarding urinary tract infection associated with indwelling urinary catheterization for children.

Total practices level	The studied nurses (n=60)	
	No	%
Unsatisfactory	60	100.00
Satisfactory	0	0.00
Range	(7-15)	
Mean ± SD	11.17±1.73	

Discussion

Urinary tract infections are the most common healthcare-associated infections, particularly in pediatric patients. Indwelling urinary catheterization, is often necessary for diagnostic or therapeutic reasons, significantly increases the risk of catheter-associated urinary tract infections (CAUTIs). In children, CAUTIs can lead to severe complications such as sepsis, prolonged hospital stays, and increased healthcare costs **Werneburg, (2022)**. The proper management and care of indwelling urinary catheters are critical in minimizing infection risks. Evidence-based practices highlight that adherence to standardized protocols can substantially reduce infection rates. Implementing a bundle of

care tailored for urinary catheter management aims to standardize practices, improve nurses’ adherence to infection prevention protocols, enhance patient safety, outcomes and ultimately reduce infection rates. This approach not only enhances patient safety but also positively influences nurses’ performance by providing clear guidelines, fostering accountability, and promoting continuous quality improvement **Patel et al., (2023)**. Regarding the studied nurses’ socio-demographic characteristics, the present study revealed vast majority of the studied nurses were in the age category 20-<30 years and most of them are female. Moreover, less than two thirds of them had nursing bachelor degree

and attended clinical training course about infection control. Also, less than three quarters of them had experience less than five years. the majority of the studied nurses were females and the rest were males. This might be related to the high ratio of female nurses comparing to male nurses.

This finding in the previous paragraph is consistent with **Abd Elbaky et al., (2023)** who conducted a study “Effect of blended training on nurses’ performance regarding controlling catheter associated urinary tract infection” in Egypt, and concluded that majority of the study samples’ ages ranged from 20 to 25 years old and 63.8% of them were female. In relation to experience’s years, it was found that 83.8% had less than 5 years’ experience.

Also, the findings were in line with a study done by **Algarni, et al., (2019)** in KSA, about “Effectiveness of nurse-targeted education interventions on clinical outcomes for patients with indwelling urinary catheters” and found that greater than half of the studied participants were female. While, far from **Crentsil, (2020)** in a study entitled “Educational Program for Decreasing Catheter-Associated Urinary Tract Infections” in USA, found that less

than quarter of the nurses’ were among the ages of twenty to thirty years old, and 32.2 percent had less than 5 years of experience.

Regarding the socio-demographic characteristics of the studied children. The current study demonstrated that less than two thirds of the studied children were in the age group less than five years and more than half of them were female. Also, less than half of them had central nervous system disorder and most of them had no previous infection.

These findings were in agreement with **Abu Samra & Abd El Aziz , (2022)** who studied “Effectiveness of evidence-based guidelines on catheter associated urinary tract infection rate among pediatric intensive care children” and concluded that 70.6% of children were in the age group (1-<6) years. However, they contrasted with the current study in terms of gender and diagnosis in which 70.6 % of children were boys and most of them had renal problems.

In relation to the studied nurses’ total knowledge level about care bundle of urinary tract infection associated with indwelling urinary catheterization. The present findings clarified that most of the studied nurses had low level of knowledge. According to the

researcher's point of view; this may be due to the majority of them not attended training course about infection control.

The result was on agreement with **(Mohamed & Abusaad, 2024)** who reported that nurses' total satisfactory level of knowledge about bundle of urinary catheter infection was 18.5%. Also, **(Abdelmoaty et al., 2020)** who concluded that knowledge score about prevention of catheter acquired urinary tract infections was low.

Concerning the studied nurses' total practice level about care bundle regarding urinary tract infection associated with indwelling urinary catheterization for children, this study revealed that all studied nurses were unsatisfactory regarding total practice level. These results may be due to the majority of them not attended training course about infection control and they have low level of experience.

The result of the current study was in the same line with **Mohamed & Abusaad. (2024)** who showed that more than three-quarters of studied nurses had incompetent practices. Likewise, these results were consistent with the findings of **Algarni et al. 2019** who revealed that almost all nurses

performed insufficient CAUTI prevention practices. Also, these results were consistent with the findings of **Abd Elbaky. (2023)** showed that 77.5% of nurses had unsatisfactory practice level regarding catheter care. Contrary to the results of the present study, **Gaber et al. (2025)** who found that the percentage of studied nurses' practice was (73.1%) indicating an average level of practice and only 2% had incompetent level of practice.

Conclusion

The total level of knowledge and practice of the studied nurses were unsatisfactory regarding urinary tract infection associated with indwelling urinary catheterization for children.

Recommendations

Applying an educational program for nurses at pediatric Intensive Care Units for improving nurses' knowledge and practices regarding urinary tract infection associated with indwelling urinary catheterization for children.

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Behavioral-Based Nursing Interventions: Impact on E-Cigarette Dependence, Social Media Usage, and Perceived Stress among High School Students

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Abstract

Background: Electronic cigarette use, and excessive social media usage have increased exponentially in Egypt and: all over the world. High school students facing simultaneous exposure to e-cigarette use and excessive social media engagement are at elevated risk for perceived stress and many psychological problems. **So, this study aimed** to evaluate the impact of behavioral-based nursing interventions in reducing e-cigarette dependence, social media usage, and the perceived stress level among high school students. **Subjects and method:** A quasi-experimental research design was utilized from March 2025 to July 2025. **Setting:** The study was conducted at the 4 secondary schools in Shebin El-Kom city, Menoufia Governorate, Egypt. **Subjects:** A purposive sample of 600 students was selected from the previously mentioned setting using stratified random sampling. **Tools of data collection:** four valid tools were used in data collection: **tool 1:** A structured interview questionnaire to assess socio demographic characteristics of the studied students, **tool 2:** electronic Fagerström test for nicotine dependence (eFTND) to assess degree of addiction to e-cigarettes, **tool 3:** social media usage scale (SMUS) to assess frequency and intensity of platform use, and **tool 4:** perceived stress scale (PSS) to assess psychological stress. Data was analyzed at two points: pre-intervention and post-intervention. **Results** showed no statistically significant differences between groups in the amount of e-cigarette dependence, social media usage, and the perceived stress level pre-intervention. But after the intervention, the study group exhibited significant reductions in e-cigarette dependence levels, social media usage, and perceived stress levels. **Conclusion:** Behavioral-based nursing interventions effectively reduce excessive e-cigarette dependence, social media usage, and perceived stress among high school students. **Recommendations:** The study recommends adding behavioral training modules to school curricula across the country, including modules on digital well-being, nicotine harm reduction, and managing stress.

Keywords: E-cigarette dependence, social media usage, perceived stress, high-school students

Introduction

High school students live in a critical developmental stage with increased susceptibility to risk behaviors and psychosocial problems. The dependance on electronic cigarettes (e-cigarettes) and the widespread use of social media among high school students have raised new public health issues. Studies by **Kong et al. (2021)** and **Gaiha et al. (2020)** indicate a significant increase in e-cigarette dependence, with adolescents viewing vaping as less harmful than conventional tobacco smoking, despite evidence associating it with nicotine addiction, respiratory diseases, and long-term health risks. Excessive social media use has been associated with sleep disruptions, subpar academic performance, reduced self-esteem, and increased stress levels (**Kelly et al., 2019; Keles et al., 2019**).

High school students are more likely to try vaping because they think it tastes better, their peers are using it, and they think it's safer than smoking (**Park-Lee et al., 2022**). High school students are becoming more worried about their dependance. Nicotine in e-cigarettes has been shown to affect brain development, impair memory and concentration, and induce long-term dependance (**Yuan et al., 2015**). Teenagers who become dependent on drugs early are more likely to move to other types of substance abuse. This indicates that smoking e-cigarettes can cause serious health and well-being problems disorders for the rest of their life (**Leventhal et al., 2025**).

High school students currently spend a lot of time on social media, which impacts how they see themselves, how they study, and how they talk to other people. Platforms can facilitate communication and education; however, excessive and indiscriminate usage has been associated with cyberbullying, social judgment, interrupted sleep patterns, and academic disengagement (**Keles et al., 2019**). Studies indicate that students who excessively engage online typically exhibit poorer mental health and elevated anxiety and despair levels (**Twenge & Campbell, 2018**). Social media is addictive, which makes it tougher to establish a balance between utilizing technology and living a healthy life (**Marino et al., 2018**).

High school students commonly experience perceived stress, stemming from a combination of academic responsibilities, social interactions, and apprehensions over their future jobs (**Pascoe et al., 2019**). Adolescent stress can adversely affect physical and mental health, resulting in weariness, reduced concentration, emotional instability, and maladaptive coping mechanisms, including substance abuse and excessive screen time (**Shankar & Park, 2024**). Unregulated stress at this critical progressive phase can compromise resilience, self-efficacy, and long-term well-being, highlighting the imperative for effective interventions to foster stress management and improved coping mechanisms (**Schneiderman et al., 2025**).

Emerging research underscores a complex and reciprocal relationship between e-cigarette dependence, excessive social media usage, and elevated perceived stress among high school students. A study by **Evgin et al. (2025)** revealed that high levels of social media use disorder in adolescents correlate positively with problematic behaviors such as cyberbullying and emotional distress, suggesting that poor digital hygiene can exacerbate psychological vulnerabilities like stress and anxiety **Evgin et al. (2025)**. Concurrently, nicotine consumption through vaping has been shown to affect mood regulation and behavior. **Wamamili et al. (2025)** demonstrated that adolescent vapers, especially from lower socioeconomic backgrounds, face heightened risks of addictive behaviors and associated stressors (**Wamamili et al., 2025**). These patterns indicate a concerning synergy: as students increasingly depend on nicotine and digital platforms for coping, they may unintentionally intensify their stress levels, creating a feedback loop of dependence and psychological strain.

High school students facing simultaneous exposure to e-cigarette use and excessive social media engagement are at elevated risk for perceived stress. Behavioral-based nursing interventions, particularly educational and counseling strategies are effective in reducing these risks by enhancing awareness, emotional regulation, and resilience. Targeted programs could play a vital role in promoting adolescent health in both school

and community settings (**Kong et al., 2021**).

Behavioral-based nursing interventions particularly those focusing on psychoeducation, stress management, and motivational interviewing—have shown promising results in addressing these interconnected issues. In a recent intervention study, **Wamamili et al. (2025)** found that educational programs significantly improved high school students' understanding of vaping-related health risks and increased their expressed desire to quit, with in-person sessions being more effective than online alternatives.

Such interventions, when tailored for adolescents, not only enhance knowledge but also build critical self-regulation skills to manage stress and reduce harmful dependencies. These programs may be even more effective when integrated with strategies targeting digital literacy and emotional resilience, thereby addressing the psychosocial dimensions of both vaping and social media use. Nursing-led behavioral strategies offer a holistic, scalable approach to curbing these co-occurring risk factors in high school populations **Wamamili et al. (2025)**.

Behavioral-based nursing interventions present promising approaches to alleviate the interrelated challenges of e-cigarette use, excessive social media usage, and stress among adolescents. Such interventions can promote better coping strategies and diminish dependence on maladaptive behaviors by emphasizing education, self-regulation, and

empowerment. Nurses can lead school-based programs that teach children about health, help them deal with stress, give them peer support, and teach them how to use technology in a way that helps them recognize dangers and become more resilient (**Kong et al., 2021**). These strategies go beyond punishment to get to the root of the problem by focusing on prevention, skill-building, and self-efficacy. As a result, behavioral interventions not only help people stop bad habits, but they also improve mental health and long-term health. This is in line with the World Health Organization's call for community-based, preventive health strategies and the global priorities for adolescent health (**Schneiderman et al., 2025**).

Psychiatric nurses are very important in helping high school students who are addicted to e-cigarettes, spend too much time on social media, and feel stressed. Because they are experts in mental health assessment, counseling, and changing behavior, they can create and carry out tailored interventions in schools and communities. Psychiatric nurses can do early evaluations to find children who are at risk, teach them about the mental impacts of nicotine and too much screen time, and provide them personalized ways to deal with stress. They also help with group interventions that encourage peer support and resilience, and they work with families, teachers, and other community members to create a supportive atmosphere. By combining health education with therapeutic communication

and behavioral counseling, psychiatric nurses help not only lower risky behaviors but also improve self-efficacy, emotional regulation, and overall adolescent well-being (**Schneiderman et al., 2025; Kong et al., 2021**).

Significance of the study

The significance of the study came from different aspects. First, it deals with an evolving public health problem by treating three problems that are all connected: e-cigarette dependence, social media use, and perceived stress. These issues all make it trickier for high school students to do well in school and stay healthy. Second, the study enhances preventative healthcare strategies that prioritize education, self-regulation, and empowerment better than punishment or restrictions, by utilizing behavioral-based nursing interventions.

E-cigarettes dependence during adolescence is associated with permanent cognitive deficits, addiction, and the transition to other substances (**Yuan et al., 2025; Leventhal et al., 2025**). At the same time, too much time spent on social media has been linked to sleep problems, lower grades, higher anxiety, and more signs of depression (**Kelly et al., 2019; Twenge & Campbell, 2018**). These behaviors increase the stress that kids already feel from school and social situations, which leads to a cycle of poor mental health and unhealthy coping mechanisms including substance abuse and too much time spent on screens (**Pascoe et al., 2019; Shankar & Park, 2024**).

The outcomes will offer significant insights for policymakers, educators, and

healthcare practitioners, emphasizing the creation of school-based wellness programs tailored to adolescent needs. This study emphasizes the necessity of expanding the roles of nurses beyond clinical environments to encompass schools and communities as catalysts for behavioral change programs. The study is in line with global health goals, such as the World Health Organization's (WHO) goal of enhancing adolescent health and national goals of lowering risky behaviors and increasing the health of teens.

Subjects and Method:

The aim of the Study:

The current study aimed to evaluate the impact of behavioral-based nursing interventions in reducing e-cigarette dependence, social media usage, and the perceived stress level among high school students.

Specifically, the study sought to answer three research questions:

1. What was the incidence of e-cigarette dependence, social media usage, and perceived stress among high school students before intervention?
2. What was the impact of behavioral-based nursing interventions on e-cigarette dependence among high school students?
3. What was the effect of behavioral-based nursing interventions on social media usage scores among high school students?
4. What was the effect of behavioral-based nursing interventions on perceived stress among high school students?

Research Hypotheses:

1. High school students who will participate in the behavioral-based nursing interventions sessions (study group) will have lower levels of e-cigarette dependence after implementation of the behavioral-based nursing interventions sessions compared to students who do not receive the sessions (control group).

2. High school students who will participate in the behavioral-based nursing interventions sessions (study group) will have lower levels of social media use after implementation of the behavioral-based nursing interventions sessions compared to students who do not receive the sessions (control group).

3. High school students who will participate in the behavioral-based nursing interventions sessions (study group) will have reduced perceived stress level scores after implementation of the behavioral-based nursing interventions sessions compared to students who do not receive the sessions (control group).

Research design: A quasi-experimental research design (study/control group) (pre-test / post-test) was utilized to achieve the aim of the study.

Research setting:

The research study was carried out at 4 selected schools in Shebin El-kom city, Menoufia Governorate, Egypt. The total number of students and their distribution across all secondary schools in the city were reviewed. The researchers wrote the names of the schools on separate papers, then put them in a bowl and selected four papers through a random sampling method

to ensure representativeness and minimize selection bias. The selected schools at Menoufia governorate in Shebin El-Kom were Istibary Secondary School, El-Mai Secondary School and El-Masaa'y El-Gadeeda Secondary School for Girls.

Sample size calculation:

The sample size for this study was calculated to ensure statistical significance and representativeness of the high school students in Menoufia governorate. A total population of 39,851 students was registered at the high school during the academic year 2024–2025. To ensure feasibility and statistical power, the sample size was calculated using the standard formula:

$$n = [DEFF * Np(1-p)] / [(d^2 / Z_{1-\alpha/2}^2 * (N-1) + p*(1-p))]$$
, to be 600 students.

Where:

- n = required sample size
- N = population size (39,851 students)
- p = estimated proportion (0.5, for maximum variability)
- d = margin of error (0.05)
- $Z_{1-\alpha/2}$ = Z-score for 95% confidence level (1.96)

Research Subjects:

A purposive sample of total 600 students were recruited and included in the final analysis from the above mentioned setting, who fit the following: **Inclusion criteria:** Students were considered if they were between 15 and 18 years of age, had experience with e-cigarettes smoking, social media use, feeling stresses, were willing to participate voluntarily and provide a written consent, free from any psychiatric or chronic illness because it

may have a negative effect on the results of the study. **Exclusion criteria:** Students were excluded if they were already in a smoking cessation program nor not smoking at all, not willing to participate in the study, not willing to provide written consent, had any psychiatric or chronic illness, and not have a mobile or any access to social media.

The 600 students were then equally and randomly assigned into two groups: 300 in the study (study) group and 300 in the control-group.

Tools of data collection:

Data collection was performed using four primary tools:

Tool (1): A structured interview questionnaire: Developed by researchers to gather information about, **part 1:** The student's socio-demographic characteristics including age, gender, class of educational level. **Part 2:** Some questions regarding behavioral habits such as frequency of social media use per day, e-cigarette use per day, and the history of past quit attempts.

Tool (2): The E-cigarette Fagerström Test for Nicotine Dependence (eFTND), it was adopted from **Heatherton et al. (1991)** and translated to Arabic by **Kassim et al. (2012)** is a 6-item version. It assessed e-cigarette dependence dimensions such as frequency, need, and ill or forbidden place or situation use. In scoring the Fagerstrom Test for Nicotine Dependence, the three yes/no items are scored 0 (no) and 1 (yes). The three multiple-choice items are scored from 0 to 3. The items are summed to yield a total score of 0-10, with higher scores

reflecting greater nicotine dependence. Scores were categorized into four levels: low (0–2), low to moderate (3–4), moderate (5–7), and high dependence (8–10).

Tool (3): The Social Media Use Scale (SMUS), adopted from **Lin et al. (2015)** and translated to Arabic by **Olufadi (2016)** is a 17-item scale translated and adapted from validated instruments in behavioral research. This scale had four subscales: image-based (5 items), comparison-based (3 items), belief-based (4 items), and consumption-based behaviors (5 items). The items were rated on a 9-point frequency scale from "Never" (1) to "Hourly or more" (9). Subscale scores were the mean of corresponding items, and total scores varied between 17 and 153, with higher scores indicating more frequent and more intense social media usage. To facilitate interpretation, overall scores were divided into three levels of use: mild (17–62), moderate (63–108), and severe (109–153), with cut-off points determined by splitting the scale into roughly equal thirds to represent different levels of engagement.

Tool (4): The Perceived Stress Scale (PSS), a standard psychological scale adopted from **Cohen et al. (1983)** and translated into Arabic by **Almadi et al. (2012)** to assess the degree to which people perceive things in their lives as stressful. The PSS consists of 10 items measuring thoughts and feelings that the person has experienced during the past month, with each item rated on a 5-point Likert scale

ranging from 0 ("Never") to 4 ("Very often").

Even though some of the items are negatively framed, four positively framed items (items 4, 5, 7, and 8) are reverse scored before calculating the total score. The PSS total score can range from 0 to 40, and the higher the score, the higher the perceived stress. Scores, for purposes of interpretation, are categorized into three levels: mild stress (0–13), moderate stress (14–26), and severe stress (27–40). The scale indicates that personal perceptions are exceedingly relevant to stress measurement, since the same life event is likely to be answered differently by different people based on their own experiences.

Ethical considerations:

An official approval was obtained from the Research and Ethics Committee of the Faculty of Nursing, Menoufia university No **(ERCNMA 1000/5/1/88/25)**. Permission was granted by the dean of the selected schools to carry out this study. A written consent was taken from each student who was willing to participate in the study after explaining the purpose and the importance of the study. The subjects who agreed to participate in the study were assured of confidentiality and anonymity in the study. They were informed about their right to withdraw from the study at any time without giving a reason.

The aim, methods, possible benefits, and right of withdrawal without penalty at any time were made clear to the students. Anonymity and confidentiality were maintained by coding the responses and

limiting access to the data to the research team.

Validity and reliability of the tools:

Validity: Tools of data collection were reviewed for their content validity by five experts who were selected to test the content and face validity of the tools. The panel included five experts from the psychiatric nursing department, and necessary modifications were made to reach the final valid version of the tools. The tools were considered valid from the experts' perspective.

Reliability: The tools were tested for reliability by using Cronbach's alpha coefficient; it was ($\alpha = 0.93$) for the e-cigarette Fagerström test for nicotine dependence tool, ($\alpha = 0.89$) for the social media usage tool, and ($\alpha = 0.96$) for the perceived stress tool. The tools were clear, comprehensive, and applicable.

Pilot Study:

A pilot study was conducted on 60 students (10% of the calculated sample size) to examine the feasibility, clarity, and applicability of the study tools. The subjects in the pilot study were selected from high schools that were not included in the main sampling frame. The pilot was intended to determine the time required to administer the questionnaire and uncover confusion in the items. There were some slight changes in wording and sequence of some of the questions for clarity, based on feedback. Data from pilot samples were not included in the final analysis.

Data collection procedure:

- Following official approval, students were enlisted and screened for eligibility. After

getting the written consent, data was collected from March 2025 to July 2025. Targeted students were recruited from four randomly selected high schools in Shebin El-Kom district, Menoufia governorate, Egypt.

- Baseline measurements were conducted using the study tools: the socio-demographic questionnaire, e-cigarette Fagerström test for nicotine dependence (eFTND), Social Media Use Scale (SMUS), and the Perceived Stress Scale (PSS).

- After baseline measurement, the 600 students were randomly divided into two equal groups: Study (Intervention) group ($n = 300$): received the behavioral-based nursing intervention sessions, and control group ($n = 300$): did not receive the behavioral-based nursing intervention sessions during the study period.

- Study group students were divided into 15 subgroups of 20 students each. Each subgroup was provided with eight structured behavioral-based nursing intervention sessions (one sessions per week for eight consecutive weeks), each lasting approximately 45 minutes.

- Sessions were run in school classrooms allocated by the school administration during non-academic time. The control group did not receive behavioral-based nursing intervention sessions but attended the post-intervention test at the same time as the study group to enable comparison of results.

Study Phases:

The implementation of the study proceeded in four distinct phases:

Phase 1: Assessment Phase

-After receiving thorough information about the study's objectives, the researchers proceeded to conduct interviews with students at their school.

-In a comfortable environment, the researchers introduced themselves to the students and were informed about the study's purpose and voluntary participation. Informed written consent was obtained before conducting individual interviews.

-Pretest questionnaires were distributed by the researchers to identify students who met the inclusion criteria. The researchers conducted baseline assessments using validated research tools, which included assessments for socio-demographic characteristics, SMUS, eFTND, and PSS.

Phase 2: Planning Phase

- After conducting a thorough review of electronic dissertations, books, articles, and journals, the researchers developed a user-friendly and inspiring Arabic guide booklet.

- Following baseline measurement, the 600 students were randomly divided into two equal groups: Study group (n = 300): received the behavior-based nursing intervention sessions, and control group (n = 300): did not receive the behavioral-based nursing intervention sessions during the study period.

- Sessions were run in school classrooms allocated by the school administration during non-academic time. The control group did not receive behavioral-based nursing intervention

sessions but attended the post-intervention test at the same time as the study group to enable comparison of results.

- Subsequently, the study group received a structured behavioral based nursing intervention session with two weekly sessions (45 minutes each) on digital mindfulness, cognitive-behavioral techniques for decreasing screen time, and urge management strategies for e-cigarettes and stress management techniques.

- As part of the behavioral-based nursing intervention sessions, a breathing control technique was incorporated to help individuals cope with acute stress and impulsive behavior, particularly those triggered by social media exposure and e-cigarette cravings.

- This skill involved training in the 4-7-8 breathing technique, in which students were told to inhale through the nose for 4 seconds, hold for 7 seconds, and then exhale slowly through the mouth for 8 seconds. This breathing skill was also practiced at each session and students were requested to use it on their own behalf during times of craving or stress. The aim of this intervention was to offer students a simple, accessible self-regulation tool to reduce physiological arousal and improve emotional regulation.

- The control group was not intervened upon at all throughout the study period. Eight weeks later, everyone completed the post-intervention assessments with the same tools.

Phase 3: Implementation Phase

- Students in the study group received structured behavioral-based nursing intervention sessions from the researchers.
- Study group students were divided into 15 subgroups of 20 students each. Each subgroup was provided with eight structured behavioral-based nursing intervention sessions (one sessions per week for eight consecutive weeks), each lasting approximately 45 minutes.
- Sessions involved a combination of psychoeducation, lectures, brainstorming, active interactive discussions, visual aids, and role-play exercises, demonstration and redemonstration of some techniques to promote behavior change, providing examples, modeling, and role-playing. The sessions covered topics concerning digital mindfulness, cognitive-behavioral strategies for reducing screen time, resisting peer influence, and stress management techniques.
- There was specific emphasis on the 4-7-8 breathing technique, which was demonstrated and practiced at the beginning of each session for stress and e-cigarette craving management.
- To support the teaching methods, booklets, data shows, pictures, and video are utilized as media. At the end of each session, feedback, summary, and time were allotted for asking any questions and explaining homework assignments for the next subsequent session.

The behavioral-based nursing intervention sessions consist of a total of eight sessions

The session outline was as follows:

Session 1: Baseline assessment of e-cigarette dependence, social media usage, and perceived stress, rules, and program orientation

The first session was an introduction to the behavioral-based nursing interventions sessions and served to set the tone for the series of sessions that followed. Students were welcomed and oriented to the format, expected outcomes, and rules of the sessions, including the creation of a safe and respectful group environment. This session also included filling baseline measures to find out students' pre-intervention e-cigarette dependence, level of social media usage, and their level of perceived stress. These measures provided a foundation for tracking progress and evaluating the effectiveness of the intervention.

Session 2: Risks and implications of overuse of e-cigarettes, social media and inability to cope with stress

In the second session, the students were educated on the possible physical, psychological, and social harm caused by intensive use of e-cigarettes, social media and inability to cope with stress. Problems such as addiction, sleep quality issues, lower grades, and respiratory disease risks were highlighted through interactive debates and multimedia displays in the session. The session was intended to increase awareness and instill intrinsic motivation for change by making it possible for students to visualize the impact of their actions in the real world.

Session 3: Minimizing screen time and regulating cravings

Session three sets out to provide students with practical solutions for minimizing screen time and regulating cravings or urges to vape. Students identified personal triggers and common habits and learned time management strategies and digital detox strategies such as app limiters, time-out breaks, and no-device zones. Cognitive-behavioral strategies were introduced to help students recognize and reframe thoughts that trigger impulsive behavior.

Session 4: Mindfulness in the digital world and breathing strategies

During session four, the students were introduced to mindfulness as a self-regulatory technique during an overwhelming online world. They practiced mindfulness exercises, including focused breathing and body scanning, to enhance awareness in the here and now and emotional control. The aim was to help the students create a sense of calm and reduce spontaneous reactions to stress or online triggers, promoting healthier engagement with technology and reducing e-cigarette dependency.

Session 5: Developing healthy substitutes for good habits in lifestyle

This session five was designed to develop long-term good habits that would replace destructive habits. Students were guided to discover enjoyable and health-promoting substitutes such as exercise, activities, or social networking. The concept of habit change was introduced, and students were guided on how to break bad habits and

reinforce pleasing behavior through practice and reinforcement.

Session 6: Making better choices and resisting peer pressure

This session six highlighted the development of decision-making skills, especially when faced with social influence. Through role-playing and discussion of scenarios, they were taught how to say no firmly, balance the risks and benefits, and make decisions that align with their long-term objectives. Techniques such as delay tactics and internal arguing were presented to develop their ability to resist peer pressure in the use of e-cigarette and social media.

Session 7: Coping with stress and managing emotions

This session seven addressed the emotional reasons for excessive social media use and e-cigarette dependency, aversive mood state, and stress. Role-players explored healthy emotional coping skills, including journal writing, relaxation, and social support networks. Emphasis was placed on identifying stressors and utilizing healthy coping skills (Deep breathing, meditation, exercise) instead of using digital devices or nicotine to relax.

Session 8: Reinforcing and generalizing skills: The final session provided the opportunity to consolidate what had been achieved throughout the sessions. Students rehearsed key strategies, reflected on how they had grown, and discussed how to maintain change in everyday life beyond the program. Relapse prevention techniques and preplanning for future

conduct were discussed to allow students to implement new habits and have sustained health. Handouts and homework assignments were given after every session. Attendance was noted, and the students were reminded every week through what's up messages through the group was initiated.

Phase 4: Evaluation Phase

After completion of the 8-week training sessions, the study and control groups were reassessed using the same tools (SMUS, eFTND, PSS). The post-test phase aimed to measure changes in e-cigarette dependence, social media usage, and the perceived stress level. Data was collected, coded, and statistically analyzed to determine the program's effectiveness.

For ethical considerations, after finishing the study and collecting all data needed for the study, the intervention sessions were given to the control group as well.

Statistical analysis

Descriptive statistics (mean, standard deviation, frequency, and percentage) were used in summarizing the students' characteristics. Data was analyzed with the assistance of SPSS version 25 (IBM Corp., Armonk, NY, USA). Inferential tests involved paired t-tests to compare within-group pre-post differences, independent t-tests to compare between groups, repeated measures ANOVA to investigate group-by-time interaction, and logistic regression models to identify predictors of meaningful change in SMUS and eFTND scores. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1 shows that the study and control groups (n=300 each) are comparable for all socio-demographic characteristics and behavioral habits. There is no statistically significant difference between the two groups pre-intervention.

The mean age in the study group is (16.12 $\pm$ 2.82) and (16.22 $\pm$ 2.79) with range 16-19 years old in the control group with no difference (P = 0.104), most of the study and control group are male, educational levels are similarly allocated across 1st, 2nd, and 3rd secondary grades in both groups (P = 0.559). Neither group tries to quit smoking, 70% or 75.3% for the study group and control group, respectively. Daily social media usage is more than 3 hours in both groups, 53.3% and 54.7% respectively. And the e-cigarette use is more than 5 times that for both groups, 37.7 % and 36.3%.

Figure 1 reveals the levels of social media usage (mild, moderate, and severe) are very similar in both the study and control groups and are not significantly different ($\chi^2 = 0.251$, p = 0.882) pre-intervention. Both groups have moderate social media use 44 % for the study group and 44.7 % for the control group, respectively.

Post intervention, a notable shift in the study group is observed: There is a highly statistically significant difference ($\chi^2 = 70.533$, p < 0.001) between the study and control group, reflecting that the behavioral-based nursing intervention sessions are effective in reducing excessive social media use among the studied students.

Table 2 demonstrates a significant reduction in e-cigarette dependence among the study group post-intervention, with marked improvements across all eFTND items (all $p < 0.001$), including a decrease in frequency of use, a reduction in urgency to vape after waking, and less use when sick or in restricted areas. In contrast, the control group shows no statistically significant changes in any dependence behaviors ($p > 0.05$), indicating that the intervention effectively mitigated e-cigarette dependence among the study group.

Figure 2 shows that both groups have moderate dependence on e-cigarettes, 38.7 % for the study group and 41.3% for the control group, respectively. Pre-intervention, the levels of dependence on e-cigarettes are equal in the study and control groups across all categories (mild, mild to moderate, moderate, and high) with no statistically significant difference ($\chi^2 = 0.548$, $p = 0.908$).

Post intervention, there is a highly statistically significant difference between the study and control group, noted reduction in the level of dependence among the study group, indicating that the behavioral-based nursing intervention sessions are effective in reducing e-cigarette dependence among high school students.

Figure 3 shows that both the study and control groups have comparable distributions of levels of perceived stress, and no statistically significant difference ($\chi^2 = 0.053$, $p = 0.974$) is observed pre-intervention. A large proportion of

students in the two groups score moderate stress (55.3% and 56.7%), followed by severe stress (27.3 and 24.3%), while mild levels of stress are the lowest recorded (17.4 % and 19%) for the study and control group, respectively pre intervention.

Post intervention of behavioral based nursing interventions sessions, there is a highly statistically significant difference between the study and control group regarding the perceived stress levels, the study group are greatly improved, there existed difference between the groups post-intervention ($\chi^2 = 66.280$, $p < 0.001$), indicating that the intervention has achieved the objective of reducing perceived stress levels among the studied students. **Table 3** shows that there are a highly statistically significant relation and positive correlation ($r = 0.729$, $p < 0.001$) between e-cigarette dependence and social media usage, indicating that as the social media usage increases, the e-cigarette dependence will also increase.

Additionally, there is a highly statistically significant relation and positive correlation ($r = 0.613$, $p < 0.001$) between e-cigarette dependence and perceived stress, indicating that as perceived stress increases, e-cigarette dependence will also increase.

Moreover, there is a highly statistically significant relation and positive correlation ($r = 0.608$, $p < 0.001$) observed between perceived stress and social media usage, indicating that as perceived stress increases the social media use will also increase.

Table (1): Distribution of the studied students according to socio-demographic characteristics and behavioral habits among the studied students (N = 300 for each group)

Socio-demographic characteristics	Study (n = 300)		Control (n = 300)		Test Used	P-value
	No	%	No	%		
Age (Mean ± SD)	16.22 ± 2.79 Range 16-19		16.12 ± 2.82 Range 16-19		Mann-Whitney U = 41554.5	0.104
Gender						
- Male	220	(73.3%)	212	(70.7 %)	χ² = 1.956	0.162
- Female	80	(26.7%)	88	(29.3%)		
Educational Level						
- 1st Secondary	83	(27.7%)	93	(31.0%)	χ² = 1.163	0.559
- 2nd Secondary	109	(36.3%)	110	(36.7%)		
- 3rd Secondary	108	(36.0%)	97	(32.3%)		
Behavioral habits	Study (n = 300)		Control (n = 300)		Test Used	P-value
	No	%	No	%		
Past Quit Attempt						
- Yes	90	(30 %)	74	(24.7%)	χ² = 0.036	0.850
- No	210	(70 %)	226	(75.3%)		
Social Media Use per Day						
- Less than 1 hour	18	(6 %)	27	(9.0%)	χ² = 0.139	0.933
- 1 to 3 hours	122	(40.7%)	109	(36.3%)		
- More than 3 hours	160	(53.3%)	164	(54.7%)		
Daily E-Cigarette Use						
- 1–2 times	102	(34%)	90	(30.0%)	χ² = 0.115	0.944
- 3–5 times	85	(28.3%)	101	(33.7%)		
- More than 5 times	113	(37.7%)	109	(36.3%)		

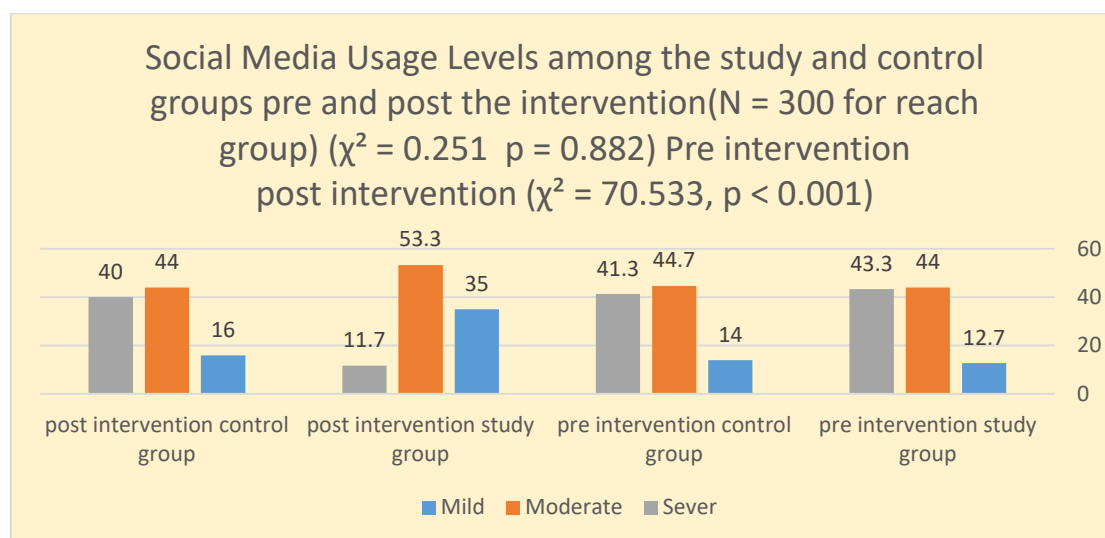


Figure (1): Distribution of social media usage levels among the study and control groups pre- and post the intervention (N = 300 for each group)

Table (2): Distribution of the studied students according to the e-cigarette Fagerström Test for Nicotine Dependence (eFTND) responses, pre- and post-intervention (N = 300 for each group)

E-cigarette dependence test responses (eFTND)	Pre intervention				p-value (Pre)	Post intervention				P-value (Post)
	Study N=300		Control N=300			Study N=300		Control N=300		
	No	%	No	%		No	%	No	%	
1. Frequency of use/day										
0–4 times	62	20.7%	58	19.3%	0.278	132	44%	80	26.7%	<0.001**
5–9 times	112	37.3%	116	38.7%		129	43%	122	40.7%	
10–14 times	78	26%	80	26.7%		39	13%	98	32.6%	
2. Difficult to refrain in forbidden places?										
Yes	128	42.7%	122	40.7%	0.624	54	18%	118	39.3%	<0.001**
No	172	57.3%	178	59.3%		246	82%	182	60.7%	
3. Hardest time to give up e-cigarette?										
Morning	94	31.3%	91	30.3%	0.663	30	10%	88	29.3%	<0.001**
Other times	206	68.7%	209	69.7%		270	90%	212	70.7%	
4. Time to first vape after waking (free-use days)										
0–5 min	30	10%	28	9.3%	0.832	6	2%	26	8.7%	<0.001**
6–15 min	42	14%	40	1.3%		12	4%	38	12.7%	
16–30 min	78	26%	80	26.7%		30	10%	78	26%	
31–60 min	74	24.7%	72	24%		40	13.3%	70	23.3%	
61–120 min	42	14%	44	14.7%		104	34.7%	46	15.3%	
121+ min	34	11.3%	36	12%		108	36%	42	14%	
5. Vape more in the first 2 hours?										
Yes	138	46%	130	43.3%	0.708	52	17.3%	126	42%	<0.001**
No	162	54%	170	56.7%		248	82.7%	174	58%	
6. Vape when sick in bed?										
Yes	120	40%	116	38.7%	0.590	48	16%	112	37.3%	<0.001**
No	180	60%	184	61.3%		252	84%	188	62.7%	

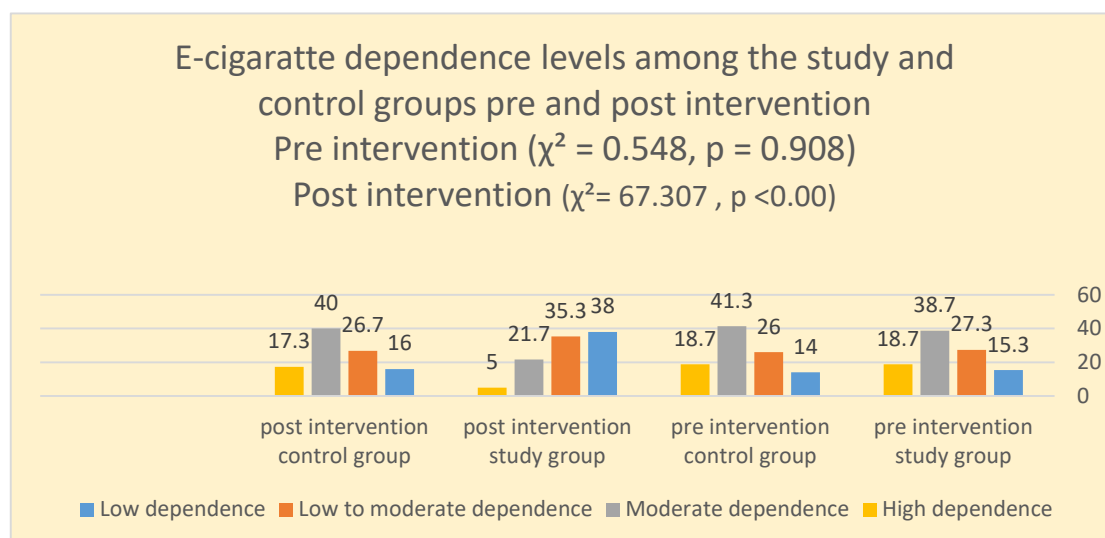


Figure (2): E-cigarette dependence levels (eFTND) among the study and control groups pre and post intervention (N = 300 for each group)

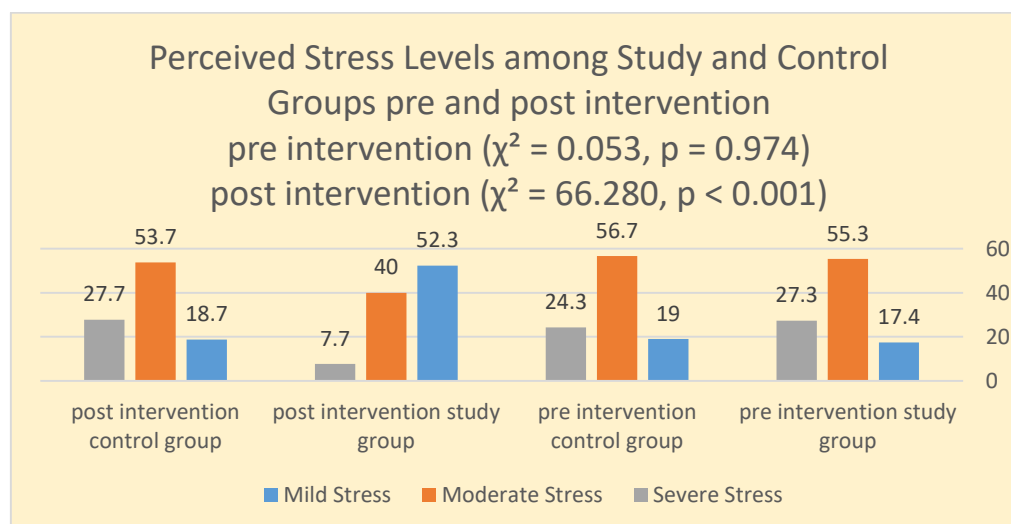


Figure (3): Perceived Stress Levels (PSS) among study and control groups pre and post intervention (N = 300 for each group)

Table (3): Relation and correlation coefficient between e-cigarette dependence, social media usage, and perceived stress scores among the study group (N = 300)

Variable	E-Cigarette dependence			
	X2	P-Value	R	P-Value
Social media usage	12.32	0.001**	0.729	0.001**
Perceived stress	16.02	0.001**	0.613	0.001**
Variable	Social media use			
	X2	P-Value	R	P-Value
Perceived stress	8.24	0.001**	0.608	0.001**

Discussion

This study aimed to evaluate the impact of a behavioral based nursing intervention on E- cigarette dependency, excessive social media use, and perceived stress among high school students. Overall findings revealed significant improvements in the study group post-intervention, with improvements evident across multiple behavioral and psychological parameters. This would enable them to avoid or correct addictive problematic behaviors, such as internet use, as well as other potentially addictive behaviors like eating, smoking, and emotional management, which could have a positive impact on their lives and future families.

Distribution of the studied students according to socio-demographic characteristics and behavioral habits among the studied students

The findings of the current study showed that, the two groups were well-

matched at baseline regarding to sociodemographic with no statistically significant differences in age, gender, education level, quit attempts, social media use, or e-cigarette frequency (**table 1**). This might be due to the study and control groups being homogeneous, or because participants were assigned to either the study group or the control group using randomization, which made sure the two groups were the same. This equivalency strengthens the study's internal validity and provides evidence that the efficacy of the behavioral-based nursing intervention was responsible for the changes that were seen after the intervention.

Regarding to age and gender: Both groups were predominantly male adolescents, aged around 16-19 years, consistent with the demographic most vulnerable to nicotine addiction and excessive social media usage at the

same age (**table 1**). This might be due to males in Egypt tend to have greater freedom of movement and social interaction than women, which translates into more extensive digital involvement. Additionally, smoking (e-cigarettes) is more socially acceptable for men in Egypt, whereas women may experience stigma.

These findings were consistent with **Van Zyl-Smit et al., (2024)** & who reported that most common student's gender was male with age between 15-16 yrs. On the same line **Erhabor et al., (2023)**; **Jha and Kraguliac (2021)** who revealed that the mean age of the study students was 16.4 yrs. and male gender. In contrast to the current findings the study conducted by **Gardner et al., (2024)** who found that mean age of the students were 13.3 years, and female gender. Additionally, **Lee et al., (2023)** and **Asdigian et al., (2023)** who reported that most common student's gender was females with age 17-19 yrs. The finding of the current study disagreed with **Mostafa and Taha, (2024)** who revealed that the mean age of the study sample was 22.12 ± 1.87 years. As soon as **AlDukhail et al., (2025)** reported that E-cigarette use is more prevalent among older adolescents. This contradiction might be due to different cultures, beliefs and attitude of the studied participants.

Concerning social media usage and e-cigarette dependance: Over half of the studied students used social media

for more than 3 hours daily, and over one-third of vaped students more than 5 times daily highlighting high baseline engagement in both behaviors (**table 1**). This might be due to this age trying to imitate their friends. They start using e-cigarettes because they observe their friends or peers using it. Social media is used by students to fill the time, escape from the stresses of life, or boost their sense of self-worth and community.

This result was aligned with **Zhang et al., (2024)** who noted that adolescents with high social media exposure are more likely to engage in e-cigarette use due to peer influence. The current study was in harmony with **Sreeramareddy et al., (2023)** and **Wężyk-Caba et al., (2022)** who showed that the prevalence of e-cigarette use is higher among younger than older adults. Additionally, the study conducted by **Mostafa and Taha, (2024)** and **Sayed et al., (2024)** who reported that most of participants (88.3%) had heard about e-cigarettes, prevalence was higher among males and students in their clinical years. This result also matched with **Kong et al., (2023)** who observed that social media use was associated with e-cigarette use and initiation. This might be influenced by social media exposure to content about e-cigarettes. **Regarding the distribution of the studied students according to of social media usage levels pre and post intervention,** the result of current study reported that, pre-intervention, both

groups had similar distributions of mild, moderate, and severe social media usage and majority of them had moderate social media usage. While post-intervention, the study group showed a dramatic shift toward milder usage (**Figure 1**).

This might be due to social media is regarded as the main way that teenagers interact with their friends and exchange ideas and experiences, amusement and leisure, as well as obtaining knowledge, help and support in fields like education or mental health. While reduction in social media usage post-intervention, indicating that the behavioral-based nursing interventions were highly effective through the effective interventions that applied during sessions as, behavioral intervention (Time management, alternative offline activities, social skills training), cognitive behavioral therapy (challenging negative beliefs and replacing them with more positive and adaptive thoughts related to social media use), dialectical behavior therapy (by teaching skills such as mindfulness techniques (as meditation and deep breathing exercises), emotion regulation, and interpersonal effectiveness), and motivational interviewing.

By combining these techniques, behavioral-based nursing intervention can empower students to reduce their excessive social media use, improve their well-being, and develop healthier relationships with technology.

These findings were consistent with **Stinson and Dallery (2023)**; **Plackett et al., (2023)** who reported that most participants had moderate social media use level pre intervention and after use of the package intervention was effective at reducing the daily duration of social media usage to goal levels, or below, for all participants. Also, this result agreed with study done by **Weaver and Swank (2024)** who concluded that adolescents after finished a 5-week mindfulness intervention resulted in decreased problematic social media use. On the other hand, these findings were incongruent with **Twenge et al., (2022)** and **McCrory et al., (2020)** who revealed that more than half of participants had severe level of social media usage and there was a substantial association between mental health and social media use.

Regarding the distribution of the studied students according to levels of e-cigarette dependence, pre and post intervention. The findings of the current study demonstrated that both groups have moderate dependence on e-cigarettes, pre-intervention, the levels of dependence on e-cigarettes are equal in the study and control groups across all categories (mild, mild to moderate, moderate, and high) with no statistically significant difference.

But post intervention, there was a highly statistically significant difference between the study and control group, noted reduction in the

level of dependence among the study group, with marked improvements across all eFTND scale items, indicating that the behavioral-based nursing intervention sessions were effective in reducing e-cigarette dependence among high school students (**Figure 2**).

This might be due to the effectiveness of behavioral-based nursing interventions on equip e-cigarette dependence through the effectiveness strategies that learned during intervention sessions such as, the motivational interviewing, cognitive-behavioral strategies and teach them relapse-prevention skills (e.g., relaxation techniques) and effective coping strategies to avoid smoking in the face of stressful situations.

These results were consistent with study conducted by **Gardner et al. (2025)** who revealed that students who received the intervention had lower probabilities of using e-cigarettes for 12 months after receiving the interventions, when compared with the control group. Moreover, this result was in line with **Meelarp et al. (2024)** who showed that the mean FTND scores were reduced when compared to the reference group.

Additionally, **Gardner et al. (2024)** found school-based interventions were associated with improvements in knowledge and attitude about e-cigarettes and tobacco and reduce level of e-cigarettes dependency among participants' students. Similar findings

were obtained by **Carrion-Valero et al. (2023)** who noted that the students who received the intervention smoked less or quit smoking more than those in the control group.

Concerning the distribution of the studied students according to perceived stress levels (PSS) pre and post intervention. The results of this study were illustrated with no statistically significant difference between them pre intervention, with the majority falling into moderate stress, followed by severe stress. Post-intervention, the study group had a significant decline in perceived stress levels while the control group remained unchanged (**Figure 3**). This might be due to student at this age (secondary school students) are subjected to a variety of psycho-physiological stressors because of the quick changes in their bodies, as well as the increased pressure to perform well academically and to fit in with their peers.

These results confirm the effectiveness of intervention in perceived stress reduction and effective strategies that taught to the students during sessions to manage their stress levels such as mindfulness, cognitive-behavioral strategies, behavioral strategies, time management, improved coping mechanisms, deep breathing and relaxation exercises.

These findings were convenient with **Ebrahim et al., (2024)** who reported approximately 93% of students experienced moderate to high levels of

stress, while 54.9% of them experienced moderate to concerning levels of anxiety. As well, these results were supported by **Suresh et al. (2024)** who revealed that before the intervention, most of the students had moderate stress level and severe stress level while after the intervention in the intervention group, more than half of them had mild stress, and moderate stress, and none had severe stress due to effectiveness of the intervention given. Like **Meredith & Frazier, (2019)** who observed that most of the participants fell into the moderate and severe level of perceived stress with no statistically significant difference between the experimental and control groups pre intervention while perceived stress was less after the intervention in the experimental group and no change was observed in the control group.

These results were in line with **Golshani et al. (2021)** who concluded that cognitive behavior therapy-based counselling was successful in lowering perceived stress. On the other side this result was contradicted with **Jha and Kraguljac (2021)** who found that most of the e-cigarette users reported higher stress level than non-users. Their findings suggest that high school vaping prevention strategies should focus on stress reduction and encourage healthy coping strategies.

Regarding the relation and correlation coefficient between e-cigarette dependence, and social media usage among the studied

students. The results showed that there were a highly statistically significant relationship and positive correlation between e-cigarette dependence, and social media use (**table 3**). This might be due to several factors, including the potential for social media to normalize e-cigarette use, the exposure to vaping-related content, or the use of social media as a coping mechanism for stress, which might be linked to nicotine dependence.

The current study results were on the same line with **Azagba et al. (2024)** who observed that the higher levels of social media use were associated with higher odds of e-cigarette use. Participants those who used social media for 4+ hours/day or 3–4 h/day had significantly higher odds of e-cigarette use than those who used social media sometimes or never. As well, these results were supported by **Vassey et al. (2022)** who revealed that exposure to e-cigarette content and advertisements on social media platforms, such as TikTok, can also affect e-cigarette use and initiation risk among adolescents.

In confirmation with these results **Zheng et al. (2021)** who reported that youth respondents with high social media use was directly associated with high likelihood of e-cigarette use.

Regarding the relation and correlation coefficient between social media usage, and perceived stress scores among the studied students. The results showed that there were a

highly statistically significant relationship and positive correlation between social media usage, and perceived stress level (**table 3**). This might be because of the connections that fit the stress-vulnerability model, which suggests that adolescents who are under more stress are more likely to utilize unhealthy coping strategies like vaping and excessive digital use. Students who are under stress may turn to social media for distraction, where they come across vaping and decide to adopt it.

These findings were congruent with **Sarialioglu and Oluc (2024)** who detected a positive and significant relationship between social media use/addiction and perceived stress levels. All **Wolfers & Utz (2020)** and **Brailovskaia et al. (2019)** reported positive correlations between social media use and perceived stress. Individuals use social media for coping with stress, but in an ineffective way which further increases stress.

Regarding the relation and correlation coefficient between e-cigarette dependence, and perceived stress level among the studied students. The results showed that there were a highly statistically significant relation and positive correlation between e-cigarette dependence, and perceived stress level (**table 3**). This might be due to stress trigger or exacerbating nicotine dependence, leading individuals to use e-cigarettes as a coping mechanism, potentially

creating a cycle of dependence. Conversely, nicotine dependence itself might contribute to heightened stress levels by disrupting neurotransmitter systems or causing withdrawal symptoms (Ibrahim, et al., 2025).

These results matched with the results of the study conducted by **Ahuja et al. (2025)** and **Mantey et al. (2022)** which revealed that high perceived stress was strongly associated with both current and lifetime e-cigarette use, with each unit increase in stress score raising the likelihood of current use. These findings suggest that students may be using e-cigarettes as a stress coping mechanism. As well, these results were supported by **Jha and Kraguliac (2021)**; **Holliday and Gould (2016)** who found that adolescents who vape at high school are primarily motivated to vape by peer influences and for stress relief. Notably, teens who vape reported higher stress levels than non-vapers.

Conclusion: Behavior-based nursing interventions have a positive effect on reducing e-cigarette dependence, social media usage, and perceived stress among high school students.

Recommendations:

- Conduct further research on social media use, e-cigarette dependence, and youth mental health to better understand both benefits and risks. Explore how emerging technologies can support smoking cessation.

- Implement behavioral-based nursing interventions in secondary schools across Menoufia Governorate and extend them to university students.
- Promote evidence-based smoking cessation methods, including nicotine replacement therapy (NRT), prescription medications, and counseling (e.g., CBT).
- Encourage participation in in-person or online support groups to enhance motivation and accountability.
- Guide students toward healthy alternatives—such as exercise, arts, reading, and hobbies—to manage cravings and stress.
- Reduce excessive social media use through built-in phone features, usage limits, and replacing screen time with meaningful activities and social connections.

Strengths of the study include: the use of a control group for comparability, one-to-one matching of students' baseline and end-line PSS scores using unique codes, and high compliance with behavioral-based nursing sessions. The study also provided data on feasibility, acceptability, and initial efficacy, which can guide future intervention development.

Limitations of the study: Purposive sampling focuses on selecting students with specific characteristics (e.g., using e-cigarette smoking), which may not reflect the broader population of all students.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. No conflict of interest needs to be disclosed.

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Effect of Airway Clearance Techniques on Respiratory Outcomes for Patients with Bronchiectasis Exacerbations

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Abstract

A chronic respiratory disease called bronchiectasis is characterized by aberrant and irreversible bronchial dilatation, a recurring cycle of infection and inflammation, and a reduction in mucociliary clearance. Acute exacerbations are a key feature of bronchiectasis and contribute significantly to its clinical and economic burden. Physiotherapists and nurses should prescribe ACTs as a part of management. **Aim:** Evaluate the effect of airway clearance techniques on respiratory outcomes for patients with bronchiectasis exacerbations. **Design:** A quasi-experimental design was utilized. **Setting:** This study was conducted at Chest Intensive Care Unit at Tanta University Chest Hospital. **Subjects:** A purposive sampling of 120 patients with bronchiectasis exacerbations. The patients were divided into two equal groups, 60 patients in each. **Tools:** **Tool (I):** Bronchiectasis Patient's Assessment. **Tool (II):** Airway Clearance Assessment Tool. **Tool (III):** Modified Borg Dyspnea Scale (MBS). **Result:** statistically significant differences were observed in the daily amount of expectorated sputum between the study and the control group on the 1st and 3rd day where $P = (0.000, 0.001)$ respectively. Also, a difference was observed in the dyspnea level between the study and the control group on 3rd day where $P = 0.000$. **Conclusion:** Airway clearance techniques had positive effect on improving physiological parameters, respiratory outcome, and daily amount of expectorated sputum and decrease severity of dyspnea for patients' bronchiectasis exacerbation. **Recommendations:** Patients should receive structural health education regarding the importance of airway clearance and are encouraged to practice the technique independently as part of routine care. **Key words:** Airway clearance techniques, Bronchiectasis exacerbations, Respiratory outcomes.

Introduction:

A chronic respiratory disease called bronchiectasis is characterized by aberrant and irreversible bronchial dilatation, a recurring cycle of infection, inflammation, and a reduction in mucociliary clearance. **(Chalmers et al., 2023)**. Acute exacerbations are a key feature of bronchiectasis and contribute significantly to its clinical and economic burden. Exacerbations have been shown to accelerate lung function decline and increase both hospitalization rates and mortality in patients with bronchiectasis. Effective management of these exacerbations is essential for reducing disease progression, improving patient outcomes, and minimizing healthcare costs. A recent statistical analysis showed that the hospitalization rate for bronchiectasis exacerbations is approximately 16.5 per 100,000 population in the United States **(Serrano, Castaño, de Gracia, & Polverino, 2023)**. Furthermore, prevalence estimates in the UK might reach 566 instances per 100,000 persons. In a Belgian prospective cohort study, overall mortality in bronchiectasis patients was 20.4% in a 5-year follow-up. **(De Angelis, Johnson, Sutharsan, & Aliberti, 2024)**. Patients with bronchiectasis exacerbations commonly experience hyper secretion of mucus and sputum retention, which contributes to an

increased in breathing problems, a high rate of acute exacerbations, a rapid deterioration in lung function, a poor quality of life, and an elevated mortality rate **(Tian& Wen, 2015)**. Physiotherapists are advised by national and international recommendations to prescribe ACTs as a part of management for patients who are having an exacerbation **(Polverino et al., 2021)**. Moreover, Guidelines from the European Respiratory Society and the British Thoracic Society placed a strong emphasis on active cycle breathing techniques (ACTs) as cornerstone interventions for managing bronchiectasis so that, The frequency and/or length of ACT sessions may need to be increased during exacerbations **(De Angelis et al., 2024)**. Autogenic drainage is one of airway clearance technique (ACT). It is a self-directed airway clearance technique that utilizes controlled breathing to mobilize and clear mucus from the lungs. **(Burnham, Stanford, & Stewart, 2021)**. Active cycle of breathing technique is another type of airway clearance technique (ACT). Patients engage in this therapeutic practice when they have an excess of secretions in their lungs that need to be expectorated or cleansed. **(Allam, Aysha, Mahmoud, Mohamed, & Weheida, 2023)**.

Significance of the study:

Patients with bronchiectasis may experience acute exacerbations of symptoms characterized by acute worsening of dyspnea, cough, and sputum production and activity intolerance (Meneses-Echavez, Guapo, Loaiza-Betancur, Machado, & Bidonde, 2023). It was reported that the prevalence of excessive sputum production and dyspnea is about 78% and 62% among patients with bronchiectasis respectively (Bird & Memon, 2023). Therefore, the nurse has an important challenge to maintain efficient airway clearance among patients with bronchiectasis. So, the present study aimed to evaluate the effect of airway clearance techniques on respiratory outcomes for patients with bronchiectasis exacerbations.

The aim of this study was to:

Evaluate the effect of airway clearance techniques on respiratory outcomes for patients with bronchiectasis exacerbations.

Research hypothesis:

Patients with bronchiectasis exacerbations who undergo airway clearance techniques are expected to maintain better respiratory outcomes evidenced by an improvement in respiratory indicators, increase amount of daily-expectorated sputum and decrease severity of dyspnea.

Respiratory Outcomes in this study:

refer to both objective and subjective measures of pulmonary status. Objective measures include

respiratory assessment; amount of secretion and subjective measures include severity of dyspnea that is evaluated by using dyspnea scale.

Subjects and method:

Design: Quasi experimental design.

Study settings: Chest Intensive Care Unit at Tanta University Chest Hospital which affiliated to Tanta University Hospitals.

Study subjects:

A purposive sampling of 120 patients with bronchiectasis exacerbations. Patients were chosen based on the inclusion criteria (Adult patient aged from 21 to 60 of both gender, diagnosed with bronchiectasis exacerbation, able to communicate and willing to participate in the study). While those with recent trauma and have invasive method of ventilation were excluded.

The patients were divided into two equal groups, 60 patients in each group as following:

Control group: consisted of 60 patients with bronchiectasis exacerbations who received routine chest ICU care by critical care nursing staff.

Study group: consisted of 60 patients with bronchiectasis exacerbations who received airway clearance techniques by the researcher in addition to routine chest ICU care.

Data collection tools:

In the present study, three instruments were used.

Tool I: Bronchiectasis Patient's Assessment Tool

The tool was constructed by the researcher based on a thorough review of the related literature to obtain information relevant to the current study (Allam et al., 2023). It consisted of three parts as follows:

Part (A): Patient's Demographic Characteristics which include:-

Patient's code, age, gender, marital status, education and occupation.

Part (B): Patient's Clinical Data which include: - patient's chief complain, body mass index, weight, height, past medical history, medication history, frequency of hospitalization and smoking history.

Part (C): Hemodynamic Parameters: to assess systolic blood pressure, diastolic blood pressure, heart rate and respiratory rate, body temperature and oxygen saturation.

Tool II: Airway Clearance Assessment

The tool was constructed by the researcher based on a thorough review of the related literature to obtain information relevant to the current study (Patterson, Bradley, & Elborn, 2003; Herrero-Cortina et al., 2023) to assess respiratory indicators and daily amount of expectorated sputum.

Part (A): Respiratory Indicator Assessment Sheet which include: respiratory sounds, respiratory pattern, and respiratory rhythm. The data of this part was described as mean $\pm$ SD.

Part (B) Daily amount of Expectorated Sputum: the expectorated sputum measured at the completion of every session. The total quantity of sputum was estimated independently for each subject by using calibrated milliliter cups.

Tool III: Modified Borg Dyspnea Scale (MBS)

This scale was developed by Wilson & Jones (1989) and adopted by Dangers, Montenij, van der Hoeven, & Scheffer (2018). It represents a numerical rating system of 10 items that measures dyspnea, with each score linked to a descriptive statement.

Scoring system: -

The scores vary between 0 and 10, where 0 represent the absence of breathlessness and 10 denotes extreme dyspnea.

Method**1. Obtaining approval:**

After obtaining official permission to collect data from the Faculty of Nursing after deciding on a location for the study, the researcher contacted the appropriate authorities there to get permission to perform the research.

2. Ethical consideration:

- A. The scientific research committee of approval was sought and granted with the code number (384-2-2024).
- B. No one in the study was ever in danger or discomfort because of the way it was designed.
- C. Protect the privacy of patients and their information.

D. Names were replaced with code numbers.

E. The patient was asked to provide their informed consent once the study's purpose was explained. Everyone who took part in the study was informed of its goals and given the option to stop at any moment.

3. Tools development:

Based on a review of relevant literature, the researcher constructed all instruments used in this study except tool III Modified Borg Dyspnea Scale was developed by Wilson & Jones (1989).& Jones (1989).

4. Pilot study:

A pilot study was carried out by the researcher on (10%) of the subjects (twelve patients) for testing the tools for its clarity, applicability and to identify obstacles that may be encountered with the researcher during data collection.

5. Content validity of the tools

All tools were submitted to a jury of five experts in the field of specialty such as Critical Care and Emergency Nursing, physicians to check content validity and clarity of questionnaire, and necessary modification were done.

6. Reliability of tools:

Tool I & tool II are tested for reliability using Cronbach's α coefficient test and it was 0.88 & 0.89 respectively.

Tool (III) was tested for reliability using Cronbach's α coefficient test and it was 0.82 (Glaab, Chhajed, Vogelmeier, Beeh, & Kirsten, 2020).

7. Duration of data collection:

Data was collected for the current study from the beginning of July 2024 to the end of January 2025.

8. Phases of the study

1. Assessment phase: -

- Assessment was done by the researcher on the first day of admission before starting the routine care for control group and airway clearance techniques for study group using tool I: Part (a) , part (b) and part (c). Also, tool II: Part (a) and part (b). Also, tool III: Modified borg dyspnea scale (MBS) used to assess dyspnea for both the control and study groups.
- During this phase, the baseline data was collected from both groups to compare between control and study groups throughout period of the study. This baseline data guided the implementation of this intervention and provided reference points for post intervention evaluation.

2. Planning phase: -

In this phase, the researcher developed a structural intervention program based on a review of recent literature and evidence-based guidelines related to airway clearance technique. The content was carefully designed to meet the study objective and address the identified patient's needs from the base line assessment.

Expected outcomes:

1. Improve respiratory indicators.
2. Increase daily amount of expectorated sputum.

3. Decrease severity of dyspnea.

3. Implementation phase: -

A- Control group:

Patients received their routine ICU nursing care as provided by intensive care nurses which include oxygenation, nebulization sessions, suctioning and pharmacological treatment.

B- Study group:

- Patients received the structured intervention program of airway clearance techniques in addition to routine care, the program was delivered individually to each patient every day.

- Two techniques were used in this study, and each technique lasted about 15 minutes with rest period of 20 minutes in between.

Nursing measures included the following:

- **Preparation (Paul et al., 2023).**

- **Preparation for the nurse:**

1. Wash hands.
2. Wear personal protective equipment.
3. Prepare the essential equipment (papers, pillows, pulse oximeter for oxygen saturation, cardiac monitor for vital signs, suction device and sputum containers are readily available for mucus expectoration.

- **Preparation of patient:**

Positioning:

Ensure that the patient is seated upright or in semi-flower position, with good back support.

Instruct the patient to blow their nose and if required, use a nasal spray or sinus rinse to clear their upper airways.

- Intervention techniques:-

I. Autogenic drainage: Phases of autogenic drainage: (Żak, Kowalik, & Grabczak, 2023).

1. Unsticking phase: In order to achieve a deep expiration, the patient is instructed to breathe slightly less than the tidal volume and then tense their abdominal muscles to do so.

2. Collecting phase: In order to move a larger volume of air, the patient was instructed to forcefully expire after inspiring within the tidal volume but not beyond his maximal inspiratory capacity.

3. Evacuation phase: The patient was instructed to inhale as much as he could, using his full inspiratory capacity.

11. Active Cycle of breathing techniques (Allam et al., 2023)

1. Breathing control phase: the researcher encourage patient to breathe in through their nose to humidify and warm then between five and seven gradual expirations.

2. Thoracic expansion exercises: the researcher encourage patient to relax their upper chest. Without utilizing your auxiliary muscle, take deep, calm breaths through your nose. Do the preceding steps three or four times.

3. Forced expiration technique (huffing): the researcher encourage patient to place their hands over their

chest to support it. They huffed two or three times and coughed twice as often.

- 4. Evaluation** was done by the researcher for all patients in both groups throughout the two consecutive days (2nd and 3rd days) of intervention and the comparison between control and study group was done according to the baseline data on the first day.

Results:

Table (1) Shows distribution of the studied patients with bronchiectasis exacerbations regarding their socio-demographic characteristics. This table revealed that the majority (83.33% and 86.67) of patients in the control and study groups respectively were in the age group (≥ 50) years with mean $\pm$ SD (57.62 ± 10.200 and 59.10 ± 9.442) respectively. **In relation to gender**, 58.33 and 55.00% of patients in the control and study groups respectively were female. Also, the majority (86.67%) of patients in the control group and 78.33% of patients in the study group were married.

Concerning education, 40.0% of patients in the control group were read and write while 38.33 % of patients in study group were illiterate.

Figure (1) Shows percentage of the studied patients with bronchiectasis exacerbations regarding their occupation. 46.67% in control group were hospitalized twice compared to

48.33% of study group were hospitalized more than twice.

Table (2) Shows distribution of the studied patients with bronchiectasis exacerbations regarding their clinical data.

As for smoking status, the results showed that 60.00% and 65.00% in the control and study group were smokers respectively. **Also**, 41.67% and 46.67% of patients in the control and study groups respectively were overweight (25–<30) respectively.

Table (3) Shows distribution of the studied patients with bronchiectasis exacerbations regarding their diagnosis, chief complaint and past medical history. In this table, 75% of patients in the control group and 78.33% of patients in the study group were diagnosed with COPD. **Regarding the chief complaint**, 100% of patients in the control and study groups complained from shortness of breath. **Also**, 95% and 98.33% of patients in control and study groups respectively experienced productive cough.

Table (4) Shows hemodynamic parameters of the studied patients with bronchiectasis exacerbations throughout days of study. In this table, significance differences were observed among control and study groups regarding heart rate, respiratory rate, temperature and SpO₂ where $P=0.000$.

Table (5) shows the daily amount of expectorated sputum of the studied patients with bronchiectasis exacerbations throughout days of study. There were statistically significant differences within each group regarding amount of sputum, where $P = 0.000$.

Table (6) Illustrates dyspnea level of the studied patients with bronchiectasis exacerbations throughout days of study. Statistically significant difference regarding level of dyspnea were observed within each group where $P = 0.000$.

Table (7): Shows the relation between daily amount of expectorated sputum of the studied patients with bronchiectasis exacerbations and their dyspnea, medication frequency and diagnosis at 3rd day of study. There was a significant relationship between daily amount of expectorated sputum and dyspnea level in both groups where $P = 0.000$ and 0.003 respectively, bronchodilator frequency in the study group where $P = 0.000$ and mucolytic drugs frequency where $P = (0.013, 0.001)$ respectively.

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

Demographic Characteristics	The studied patients (n=120)				χ^2 P
	Control group (n=60)		Study group (n=60)		
	N	%	N	%	
Age (in years)					
1. (21-<30)	1	1.67	1	1.67	0.456 0.928
2. (30-<40)	2	3.33	1	1.67	
3. (40-<50)	7	11.67	6	10.00	
4. (50-<60)	50	83.33	52	86.67	
Range	(29-85)		(29-78)		t=0.683 P=0.410
Mean $\pm$ SD	57.62$\pm$10.200		59.10$\pm$9.442		
Gender					
5. Male	25	41.67	27	45.00	FE 0.854
6. Female	35	58.33	33	55.00	
Marital status					
7. Single	1	1.67	3	5.00	1.834 0.400
8. Married	52	86.67	47	78.33	
9. Widowed	7	11.67	10	16.67	
Education					
10. Illiterate	19	31.67	23	38.33	1.353 0.508
11. Read and write	24	40.00	18	30.00	
12. Secondary/Diploma	17	28.33	19	31.67	

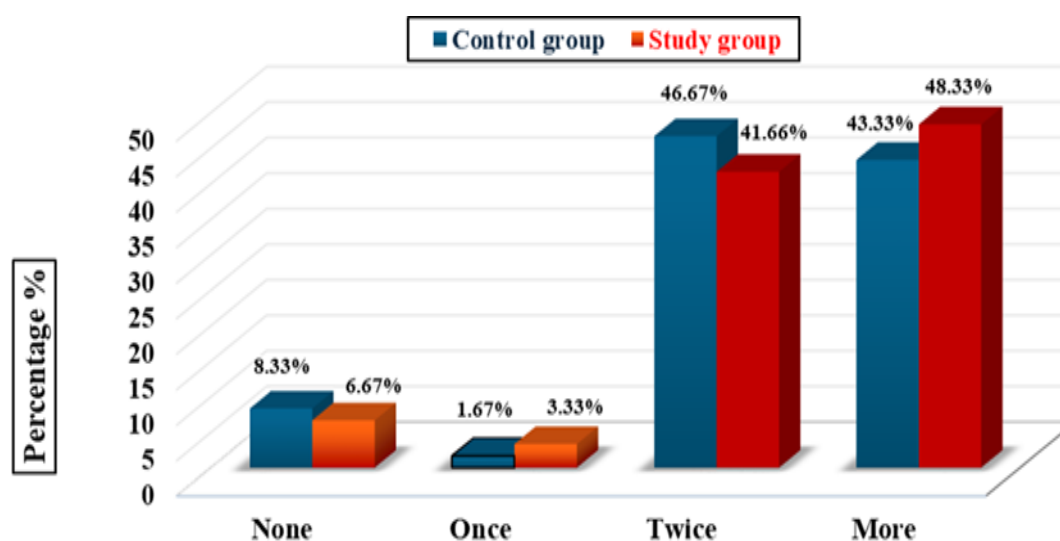
**Figure (1): Percentage of the studied patients with bronchiectasis exacerbations regarding their frequency of hospitalization.**

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

Clinical data	The studied patients (n=120)				χ^2 P
	Control group (n=60)		Study group (n=60)		
	N	%	N	%	
Smoking history					
13. Yes	36	60.00	39	65.00	FE 0.706
14. No	24	40.00	21	35.00	
Weight (in Kg)					
Range	(55-110)		(60-110)		0.646
Mean ± SD	80.62±10.759		82.15±10.124		0.423
Height (in cm)					
Range	(1.53-1.80)		(1.50-1.81)		0.007
Mean ± SD	1.66±0.065		1.66±0.064		0.933
Body mass index					
15. Normal weight (18.5–<25)	11	18.33	4	6.67	5.566 0.135
16. Overweight (25–<30)	25	41.67	28	46.67	
17. Obese (30–<35)	20	33.33	19	31.67	
18. Extreme obese (≥35)	4	6.67	9	15.00	
Range	(21.22-42.44)		(19.59-38.28)		t=0.558
Mean ± SD	29.22±4.402		29.79±3.961		P=0.457

Table (3) Distribution of the studied patients with bronchiectasis exacerbations regarding their diagnosis, chief complain and past medical history.

Clinical data	The studied patients (n=120)				χ^2 P
	Control group (n=60)		Study group (n=60)		
	N	%	N	%	
# Clinical Diagnosis					
19. COPD	45	75.00	47	78.33	0.829
20. Asthma	15	25.00	13	21.67	0.414
# Chief complain					
21. Non-productive cough	3	5.00	1	1.67	1.081 0.298
22. Productive cough	57	95.00	59	98.33	
23. chest pain	36	60.00	37	61.67	
24. Fatigue	35	58.33	35	58.33	
25. Shortness of breath	60	100.00	60	100.00	
# Past medical history					
26. Cardiovascular disorder	27	45.00	26	43.33	0.034 0.854
27. Respiratory diseases	60	100.00	60	100.00	
28. Neurological disorders	1	1.67	1	1.67	
29. Gastrointestinal disorders	5	8.34	6	10.01	
30. Endocrine disease	13	21.67	11	18.33	

Table (4): Assessment of hemodynamic parameters of the studied patients with bronchiectasis exacerbations among the studied groups throughout days of implementation.

Hemodynamic parameters	The studied patients (n=120)							
	Control group (n=60)				Study group (n=60)			
	1 st day	2 nd day	3 rd day	F P	1 st day	2 nd day	3 rd day	F P
1. Blood pressure								
Systolic	(80-170) 121.22±24.428	(85-155) 122.37±15.772	(100-160) 121.42±13.343	0.066 0.936	(80-160) 129.83±24.111	(90-160) 122.17±16.984	(100-150) 119.50±10.958	5.233 0.006*
Diastolic	(50-100) 76.75±14.609	(60-100) 79.25±8.821	(60-90) 76.83±7.247	1.056 0.350	(60-100) 80.83±14.763	(60-100) 77.50±10.189	(60-100) 76.33±7.584	2.588 0.078
2. Heart rate								
	(95-132) 111.13±9.554	(87-120) 100.65±10.472	(72-111) 91.27±10.599	56.755 0.000*	(94-128) 109.85±9.275	(82-120) 95.12±10.187	(69-112) 85.35±10.198	93.201 0.000*
3. Respiratory rate								
	(19-31) 25.63±3.723	(18-28) 21.93±2.755	(17-24) 19.97±1.832	60.067 0.000*	(20-30) 24.78±3.098	(19-26) 20.68±1.751	(16-23) 18.27±1.364	134.505 0.000*
4. Temperature								
	(36.6-39) 37.70±0.705	(36.7-38.2) 37.32±0.416	(36.5-37.9) 37.11±0.289	21.400 0.000*	(36.5-39.0) 37.42±0.641	(36.7-37.5) 37.08±0.137	(36.5-37.5) 37.00±0.146	20.018 0.000*
5. SPO2								
	(90-96) 92.98±1.557	(92-97) 94.57±1.294	(94-98) 96.05±1.523	65.980 0.000*	(88-96) 92.72±1.984	(92-97) 94.87±1.512	(93-99) 96.82±1.097	101.954 0.000*

Table (5): Assessment of daily amount of expectorated sputum of the studied patients with bronchiectasis exacerbations throughout days of study.

Daily amount of sputum (in ml)	The studied patients (n=120)													
	Control group (n=60)						χ^2 P	Study group (n=60)						χ^2 P
	1 st day		2 nd day		3 rd day			1 st day		2 nd day		3 rd day		
	N	%	N	%	N	%		N	%	N	%	N	%	
(<50)	11	18.33	21	35.00	36	60.00	27.408 0.000*	8	13.33	33	55.00	51	85.00	106.801 0.000*
(50-100)	27	45.00	26	43.33	19	31.77		7	11.77	16	36.77	9	15.00	
(>100)	22	36.67	13	21.77	5	8.33		45	75.00	11	18.33	0	0.00	
Range	(30-140)		(30-120)		(20-120)		15.463	(30-160)		(40-130)		(10-90)		220.793 0.000*
Mean $\pm$ SD	86.42 $\pm$ 33.269		70.67 $\pm$ 22.671		56.83 $\pm$ 30.49		0.000*	113.50 $\pm$ 21.674		77.17 $\pm$ 16.374		41.33 $\pm$ 17.989		
Control Vs Study														
t														
P	21.094 0.000*		5.260 0.072		13.182 0.001*									

Table (6): Assessment of dyspnea level of the studied patients with bronchiectasis exacerbations throughout days of study.

Dyspnea level	The studied patients (n=120)													
	Control group (n=60)						χ^2 P	Study group (n=60)						χ^2 P
	1st day		2nd day		3rd day			1st day		2nd day		3rd day		
	N	%	N	%	N	%		N	%	N	%	N	%	
No breathlessness	0	0.00	0	0.00	24	40.00	161.12 0 0.000*	0	0.00	1	1.67	43	71.67	250.230 0.000*
Very slight	0	0.00	4	6.67	11	18.33		0	0.00	5	8.33	12	20.00	
Slight breathlessness	1	1.67	21	35.00	8	13.33		2	3.33	25	41.67	3	5.00	
Moderate	12	20.00	21	35.00	15	25.00		12	20.00	26	43.33	2	3.33	
Somewhat severe	19	31.67	12	20.00	2	3.33		21	35.00	3	5.00	0	0.00	
Severe breathlessness	28	46.67	2	3.33	0	0.00		25	41.67	0	0.00	0	0.00	
Control Vs Study χ^2 P	2.134 0.711		10.934 0.053		21.889 0.000*									

Table (7): Relation between daily amount of expectorated sputum of the studied patients with bronchiectasis exacerbations and their dyspnea, medication frequency and diagnosis at 3rd day of study.

	The studied patients (n=120)			
	Daily amount of expectorated sputum			
	Control group (n=60)	F/t P	Study group (n=60)	F/t P
Dyspnea level				
31. No breathlessness	40.00±23.729	6.168 0.000*	38.60±14.733	5.321 0.003*
32. Very slight	55.45±25.832		42.50±17.123	
33. Slight breathlessness	57.50±27.124		46.67±35.119	
34. Moderate	75.00±35.355		85.00±7.071	
35. Somewhat severe	82.00±29.081		-	
36. Medication frequency				
Bronchodilator				
37. Every/12 hrs.	41.07±20.772	8.775 0.000*	38.93±14.742	0.544 0.583
38. Every/8 hrs.	41.47±24.094		40.00±21.602	
39. Every/6 hrs.	58.57±25.448		-	
40. 5 times/day	78.18±29.703		43.93±20.609	
Mucolytic drugs				
41. Every/24 hrs.	40.59±20.378	4.700 0.013*	37.92±13.507	6.352 0.001*
42. Every/12 hrs.	60.00±32.016		40.00±17.227	
43. Every/8 hrs.	74.00±29.136		60.00±28.284	
Diagnosis				
44. COPD	61.11±31.477	3.706	43.85±18.046	0.320
45. Asthma	44.00±23.845	0.059	40.64±18.106	0.574

Discussion

A chronic respiratory disease called bronchiectasis is characterized by aberrant and irreversible bronchial dilatation, a recurring cycle of infection and inflammation, and a reduction in mucociliary clearance. (Choi and Chalmers, 2023).

Hence, the present study had the aim to investigate the impact of airway clearance techniques on respiratory outcomes for patients with bronchiectasis exacerbations. This section was represented in the following parts:

Part I: Socio-demographic characteristics, clinical data, chief complaints and past medical history.

The current study, revealed that majority of both groups were more than fifty years old with mean $\pm$ SD 57.62 ± 10.200 & 59.10 ± 9.442 . The findings of this study were aligned with those of González-Barcala et al., (2023) who reported that the mean age of bronchiectasis patients across most included studies was 73.4 years. On the other hand, this finding was contradicted by Capsiello, Rossi & Chetta, (2000), who conducted a study about “Prevalence, age distribution and etiology of bronchiectasis”, and found that approximately more than two third of the patients participating within the age groups of less than fifty years old.

On observation of gender, more than half of patients in both groups were female. This might be explained by the relationship between infection, inflammation, and immune function is complicated by sex steroid hormones,

especially estrogens. (Fuseini & Newcomb, 2018). The results were congruent with Chalmers et al., (2023) who showed that two third of participants were female. On the other hand, according to Fong, Low, & Yii, (2022), reported that more than half were male in the study group.

Concerning marital status and educational level, most patients in both groups were married. This may be justified by stress related to family and social responsibilities which may increase the vulnerability to respiratory conditions (Cohen, 2020). Also, the results showed that less than half of patients in the control group were read and write while more than one third of patients in study group were illiterate. (Wang, Chen, Zhang, Li, & Ma, 2023). This outcome was consistent with Lim et al., (2020), who stated that low educational level was more common in subjects with bronchiectasis.

Regarding frequency of hospitalization, less than half of both groups were hospitalized more than twice (Chalmers et al., 2023). As highlighted by Fan et al., (2024), who reported that nearly half of patients were readmitted within one year following an acute exacerbation, with significant predictors including older age, low BMI, colonization by *Pseudomonas aeruginosa*, and extensive radiologic involvement. Also, the result was in the line with Choi & Chalmers, (2022) who showed that nearly half of patients have ≥ 2 exacerbations/year, and $\sim 33\%$ require ≥ 1 hospitalization/year.

In reference to smoking history, less than two-thirds of patients in both groups were smokers. Smoking impairs mucociliary clearance, compromises airway epithelial integrity, and enhances neutrophilic inflammation in bronchiectasis patients lead to precipitate more frequent and severe exacerbations (De la Rosa-Carrillo et al., 2024). The results were aligned with Hegazy, Youssef, Elgharbawy, & Farghaly, (2022), who reported that those with bronchiectasis had significantly higher current cigarette smoking. On the other hand, this finding was contradicted by Gomes et al., (2023) who reported that most subjects in their study had never smoked.

Concerning body mass index, less than half of patients in both groups were overweight. These findings were aligned with those of Gashynova, Suska, & Dmytrychenko, (2020), who reported that half of studied patient is BMI ≥ 25 kg/m. On the other hand, this finding was contradicted by Yang et al., (2021) who reported that underweight status significantly increases the risk of incident non-cystic fibrosis bronchiectasis.

Regarding diagnosis, almost three quarters of patients in the control group and more than three quarters of patients in the study group diagnosed with COPD. The findings were aligned with those of Wang, Lin, & Kao, (2018) who showed that individuals with bronchiectasis–COPD overlap experienced significantly higher rates of acute respiratory events compared to those with COPD alone.

In relation to chief complaints, almost all of patients in both groups complained of shortness of breath and most of them experienced productive cough, and less than two thirds of them complained of chest pain, as exacerbations in bronchiectasis are driven by acute bacterial infection superimposed on chronic airway inflammation. (Polverino, Dimakou, Aliberti, de Soya, & Chalmers, 2022). These findings were supported by Hosseinzadeh, Aslani, Khoramian, & Nikoofal-Sahlabadi, (2021) who revealed that Patients with non-cystic fibrosis bronchiectasis commonly present with chronic productive cough, daily sputum production, dyspnea.

Regarding past medical history, almost all patients had respiratory disease and less than half of them had cardiovascular disorders. The findings were aligned with those of Hosseinzadeh et al., (2021), who reported that one fifth of patients had cardiovascular comorbidities and hypertension.

Part II: Assessment of hemodynamic parameters, daily amount of expectorated sputum and dyspnea level of the studied patients with bronchiectasis exacerbations.

In relation to physiological parameters, there is a significant improvement in the physiological parameter including reduction in heart rate, respiratory rate and body temperature and increase in oxygen saturation among study group than control group patients throughout periods of intervention. As autogenic Drainage

helps to mobilize secretions by controlled breathing at different lung volumes, leading to improved ventilation (Lee, Burge, & Holland2015; McIlwaine, Bradley, Elborn, 2020). This result was supported by Zisi et al., (2022) who found that the active cycle of breathing technique in patients with bronchiectasis and COPD, verifying a higher, beneficial short-term effect on expectorated sputum, physiological parameters Chandrika, Apparao, Chintada, & Jyothi, (2021) who reported highly significant improvement of pulse rate of Autogenic Drainage technique from pre-test to post-test within the groups.

Also, the current study demonstrated a statistically significant reduction in the daily amount of expectorated sputum among patients in the study group throughout the three days of interventions. This reduction reflects the effectiveness of the applied airway clearance technique in mobilizing and eliminating mucus (Alwekhyan, Alshraideh, Yousef, & Hayajneh, 2022). These findings were consistent with Zisi et al., (2022), who revealed that the active cycle of breathing technique led to a measurable decrease in sputum production after one week. On the other hand, this finding was contradicted by Zisi et al., (2022) who showed that active cycle of breathing techniques is effective in increasing the expectorated sputum volume.

As regards dyspnea level, on the 1st day in the control group, less than half of patients had severe breathlessness while less than half of patients in study group

had severe breathlessness compared to on the 3rd day. Also, there were statistically significant differences within each group due to the effect of ACTs in increasing the expectorated sputum volume, reducing viscoelasticity of the secretion and in relieving symptoms such as dyspnea (Zisi et al., 2022). This result was in the same line with Kavitha, & Srihari (2023) who revealed that there was statistically significant improvement in group A (ACBT + postural drainage) compared to group B (conventional chest physiotherapy). On the other hand, this finding was disagreed with Olivier, McDonnell, O'Neill, & Bradley (2022) who reported that no significant changes in dyspnea after airway clearance techniques such as ACBT or Flutter over one week.

Part III: Relation between daily amount of expectorated sputum of the studied patients with bronchiectasis exacerbations and their dyspnea, medication frequency and diagnosis at 3rd day of study. The highest mean score of expectorated sputum was reported in moderate dyspnea level. This is justified that mucus plugging is a key contributor to airflow limitation and increased work of breathing (Polverino et al., 2022). This result was congruent with Fan et al., (2024) who mentioned that excess sputum production is a key contributor to dyspnea and impaired quality of life in patients with chronic airway diseases.

Concerning the relation between daily amount of expectorated sputum of and medication frequency, the highest mean score of expectorated sputum were

reported when patient consumed bronchodilator 5 times/day and the mucolytic drug Every/8 hrs, the reason for this Symptoms such as productive cough, dyspnea, and chest tightness often prompt patients to increase their use of inhaled bronchodilators and mucolytic agents in an attempt to alleviate mucus burden (Polverino et al., 2022). This result was supported with Lee, Kim, Park, Rhee & Yoo, (2023) revealed that frequent sputum production is linked to increased inhaler use and exacerbation-driven antibiotic prescriptions. Conversely, this result disagreed with Martínez-García et al., (2023), who found that not all patients with daily sputum production use more medications.

Conclusions:

Airway clearance techniques had positive effect on improving physiological parameters, respiratory outcome, and daily amount of expectorated sputum and decrease severity of dyspnea level for patients' bronchiectasis exacerbation.

Recommendations:

1. Nurses working in respiratory intensive care units should be trained and encouraged to apply airway clearance techniques, particularly ACBT and Autogenic Drainage, to improve respiratory outcomes and reduce dyspnea.
1. Implementation of airway clearance techniques (ACTs) during routine nursing care for patients with bronchiectasis.

Limitation of the study: -

2. Short follow-up period restricted the ability to assess the long-term effectiveness and sustainability of airway clearance techniques.
3. The study conducted at one Chest Intensive Care Unit at Tanta University Chest Hospital may restrict the external validity of the findings.

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Effect of Utilizing Teaching Styles on Nursing Students' Learning Outcomes

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Abstract

Background: Teaching style significantly affects education quality, especially in nursing. Nursing students' learning outcomes rely on how effectively teachers apply and adapt teaching styles to meet learners' needs. **Aim:** Determine the effect of utilizing teaching styles on nursing students learning outcomes. **Design:** Quasi experimental research design used in the study. **Setting:** the study was conducted at Technical Health Institute at Tanta and Kafr El-Sheikh. **The subject:** consisted of 48 nursing teachers and 400 nursing students. **Tools:** Four tools were used; Tool I: Teaching Styles' Knowledge Structured Questionnaire, Tool II: Teachers' Teaching Styles Practices Observational Checklist, Tool III: Nursing Students' Perception Regarding Teachers' Teaching Styles Questionnaire and Tool IV: Learning Outcomes Structured Questionnaire were used to collect the data. **Results:** pre-program, majority of nursing teachers (91.3%) had low knowledge levels regarding teaching styles, which significantly decreased at immediate post-program, to only (6.3%) and slightly increasing to (16.7%) after 3 months of program. Also, the minority (4.2%) of them had satisfactory level of practice related it. For nursing students, low percent (0.5%) had a high perception of teaching styles pre-program, which increased to the majority (84.0%) after 3 months of program. Additionally, none of them had satisfactory level regarding learning outcomes pre-program, improving to about three-quarters (73.5%) after 3 months of program. **Conclusion:** Implementation of an educational program about teaching styles had a significant improvement in nursing teachers' knowledge, practice and nursing students' perception. **Recommendations:** Provide continuous training programs for nursing teachers' focusing on diverse teaching strategies and effective classroom management techniques.

Keywords: Educational program, learning outcomes, nursing students, nursing teachers, teaching styles

Introduction

Teaching is one of the most respected professions in the world. Teaching is an activity that guides nursing students to learn. The various methods used in teaching are the “means” to achieve the teaching objectives **(Chen, Zhang, & Lee, 2021)**. Teachers not only use appropriate techniques to stimulate and encourage nursing students to think and learn automatically, but also to determine the teaching methods to be adopted depending on the nursing students interest in learning, the content of the abilities and materials, and even the teaching environment **(Ali & Thomas, 2024)**.

Teaching styles are the general principles, educational, and management strategies for classroom instruction. Different teaching styles may suit different subjects, nursing students, and learning objectives **(Andrews, 2024)**. Some of the most common teaching styles are expert, formal authority, personal model, facilitator, and delegator. The expert teaching style; the teacher acting as a knowledge authority. The teacher demonstrates deep subject mastery and provides detailed information, structured content, and high academic expectations. It is effective for teaching complex or technical subjects but may limit student engagement if not balanced with interactive methods **(Ahmed, El-Sayed, & Farag, 2022)**.

The formal authority; the teacher is the main source of information and delivers long lectures or presentations. This style is suitable for students who require memorization of facts, such as history,

but it may not engage nursing students or accommodate their individual needs **(Zhang & Chen, 2021)**. The personal model teaching style; the teacher demonstrating behaviors and skills for students to observe and imitate. The instructor serves as a role model, showing how to think, organize, and perform tasks. It is especially effective in clinical or skill-based settings, such as nursing education, where modeling correct behavior is essential **(Smith & Doe, 2023)**.

The facilitator style; the teacher promotes self-learning and helps nursing students' develop critical thinking skills and retain knowledge through exploration and discovery. **(Brown & Green, 2019)**. The Delegator style; the teacher assigns tasks and projects to nursing students and lets them work in groups or individually. The teacher acts as a consultant and observer, providing feedback and support when needed. This style is well-suited for subjects that require lab work, peer feedback, or creative expression, such as chemistry, biology, debate, or writing, but it may erode the teacher's authority or control **(Smith & Doe, 2023)**. Teachers may switch between styles depending on the situation. Considering different teaching styles is important because everyone has a different learning process. If teachers want to engage nursing students, it is important to consider different approaches that will resonate and help get through to them **(Al-Qahtani, & Al-Mazroa 2023)**. In addition, depending on what the teacher is teaching, different subject matters are better suited for

specific teaching styles. Teachers need to be adaptable and try different teaching styles to find an approach that will reach each of their nursing students' needs and achieve learning outcomes **(Karimi Mirzanezam, 2024)**.

Learning outcomes are measurable statements that define what learners are expected to know, understand, and demonstrate after completing a learning experience. They guide the selection of teaching strategies, learning activities, and assessment methods, ensuring alignment with educational objectives **(Burgess, van Diggele, & Mellis, 2020)**. In nursing education, clearly defined outcomes help students recognize the value of content and the competencies they are expected to achieve. Learning outcomes include several dimensions. Knowledge involves the comprehension of concepts and principles within the discipline. Communication refers to the effective exchange of ideas through speaking, writing, and listening **(Oleson, 2014)**. The student's role emphasizes self-directed learning, goal-setting, and responsibility **(Sajadi, 2021)**. Accountability reflects students' commitment to demonstrating progress and responding to feedback **(Burgess, et al., 2020)**.

Teaching and learning outcomes relate to how structured environments foster engagement and achievement. Organization involves managing time, resources, and information to meet learning goals **(Bastami, Shahrabaki, & Cheraghi, 2022)**. Finally, caring captures empathy, compassion, and ethical behavior, which are foundational

in nursing practice **(Salem & Said 2021)**.

Significance of the study:

Effective learning depends on the teacher's ability to maintain the interest that brought nursing students to the course in the first place. Teachers also must recognize that not all nursing students' are learned by the same styles. Teaching styles help nursing students learn more easily, remember information longer, think more positively, achieve academic goals quickly, and utilize information effectively **(Iqbal, & Arain 2024)**. Mismatched teaching styles can lead to poor performance and outcomes, challenges, and uncomfortable learning experiences. Thus, identifying teachers' teaching styles is essential for providing successful learning outcomes **(Sajadi et al., 2021)**.

Aim of the study

Determine the effect of utilizing teaching styles on nursing students' learning outcomes.

Research hypothesis:

- It is expected that the knowledge and practices of teachers' teaching styles will be improved.
- Nursing students' learning outcomes are expected to be improved after utilizing different teaching styles

Subject and method:

Study design:

Quasi experimental study design was utilized to accomplish the aim of the present study.

Setting:

The study was conducted at Technical Health Institute at Tanta and Kafr El-Sheikh that affiliated to Ministry of

Health and Population including: medical-surgical, obstetric and gynecological, pediatric, psychiatric and mental health, community health nursing, and nursing administration department.

Subjects:

The study subjects were consisted of two groups; all available (N=48) nursing teachers who are worked in the previously mentioned settings and accepted to participate in the study; Tanta Technical Health Institute (n= 17) and Kafr El-shaikh (n= 31).

A convenience sample of nursing students' (n= 384) who are enrolled in the previously mentioned settings. The total study sample was calculated using the Epi. Info. Microsoft to ensure obtaining an adequate and representative size, where N= population size (2243), Z= confidence level at 95% (1.96), d= margin of error proportion (0.05). The sample size was increased to 400 to compensate for missed information and improve quality of data of the study.

Tools

Four tools were used to accomplish the aim of this study including:

Tool 1: Teaching Styles' Knowledge Structured Questionnaire

This tool included two parts namely;

Part (1): Teachers' Personal and work related data teacher's personal characteristics included; age, gender, marital status, educational level, department, years of experience and previous training program

Part (2): Teachers' knowledge questionnaire regarding teaching:

styles: This tool was developed by researcher based on related literature (Grasha 2006, El-Bastwese 2020, Alghamdi 2022). It used to assess teachers' knowledge about teaching styles. It included 60 questions about teaching styles and learning outcomes in form of true and false (24), matching (5), and multiple choice (31).

Scoring system:

Teachers' responses were measured on two points ranged from 0-1, where (one) as correct and (zero) as incorrect responses. The total score was calculated by cut-off points and summing scores of all categories. The total score represented varying levels as follows:

- High knowledge level $\geq 80\%$ (equal to 49-60)
- Moderate knowledge level $60 - < 80\%$ (equal to 36-48)
- Low knowledge level $\leq 60\%$ (equal to 0-35)

Tool II: Teachers' Teaching Styles Practices Observational Checklist

This tool was developed by the researcher based on related literatures (Mohanna 2007, umar 2016, Gafoor 2016, Alhirtani 2020). to assess practices of teachers' teaching styles. It included 56 items. It was divided at five dimensions as following; the expert style (10 items), the formal authority style (11 items), the personal model style (13 items), the facilitator style (13 items), and the delegator style (9 items).

The scoring system:

Teachers' responses were measured on a two point (0-1) where done was scored

as (1), Not done was scored as (0). The total score was calculated by cut off points and summing scores of all categories. The total score represented varying levels as follows:-

- Satisfactory practice $\geq 80\%$.
- Unsatisfactory practice $< 80\%$.

Tool (III): Nursing Students' Perception Regarding Teachers' Teaching Styles Questionnaire.

Part (1): Nursing students' personal characteristics included age, gender, marital status, qualification and place of residence.

Part (2): Nursing students' perception regarding teaching styles:

This tool was developed by the researcher based on related literatures (**Mohanna 2007, Umar 2016, Gafoor 2016, & Alhirtani 2020**) This tool was used to assess nursing students' perception regarding their teachers' teaching styles. It included the same five dimensions as mentioned above in tool II.

Scoring system:

- Nursing students' responses were measured on a five Likert scale ranged from 1 to 5 where strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). The total score was calculated by cut off points and summing scores of all categories. The total score was calculated and classified into:
 - High level of perception $\geq 75\%$
 - Moderate level of perception 60% - 75%
 - Low level of perception $\leq 60\%$

Tool IV: Learning Outcomes Structured Questionnaire. This tool was developed by the researcher based on **Al-Kandari, (2009)** and related literatures **Hesbon (2016) & Razzaque (2021)** this tool was used to assess nursing students' perception regarding their learning outcomes. It included 43 items categorized into seven dimensions as follow; knowledge (8 items), communication (6 items), student role (5 items), accountability (6 items), teaching/learning (5 items), organization (7 items), and caring (6 items).

Scoring system:

Nursing students' responses were measured on a five Likert scale ranged from 1 to 5 where strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). The total score was calculated by cut off points and summing scores of all categories.

The total score was calculated and classified into:

- Satisfactory level $\geq 80\%$
- Unsatisfactory level $< 80\%$

Method

1. An official permission clarifying the purpose of the study was obtained from Dean of the Faculty of Nursing and submitted to the responsible authorities of the selected setting included for Technical Health Institute at Tanta and Kafr El-Sheikh for permission to carry out the study.

2. Ethical consideration:

- a) Approval of the Faculty of Nursing scientific research ethical committee was obtained, (**Code. No: 2023,6,264**).

- b) All participants were informed about the purpose of the study.
 - c) An informed consent was taken from each participant in the study including the right to withdraw at any time.
 - d) The researcher ensured that the nature of the study didn't cause any harm for the entire sample.
 - e) Confidentiality and privacy was taken into consideration regarding data collection.
3. Tools of the study were developed by researcher based on related literature and translated into Arabic language.
4. Tools was tested for its content validity and relevance by jury of seven experts in the area of specialty and their comments was taken into consideration. The seven experts were three assistant professors from Nursing Administration department, Faculty of Nursing, Minofyia University, four experts of Nursing Administration, Faculty of Nursing, Tanta University where two professors and two assistant professors of Nursing Administration, Faculty of Nursing, Tanta University
5. The content validity index value tool (I) = 99.2%, tool (II) = 97.4%, and tool (III) = 97.4%, and tool (IV) = 98.9%
6. A pilot study was carried out on 10% of sample (5) of teachers and (40) of nursing students for testing clarity and sequence of items, applicability then needed correction was done. The time taken for completing each questionnaire was 20-30 minutes.
7. The reliability of tools was tested using Cronbach's Alpha Coefficient Factor, its value was tool (I) =0.970, tool (II) =

0.984, tool (III) = 0.976, and tool (IV) = 0.966.

8. Data collection was done within one academic year, starting from the beginning of October 2023 to the end of April 2024.

9. The educational program was conducted in four phases as follows: assessment phase, planning of the educational program phase, implementation of the educational program phase, and finally evaluation phases.

Phase I: Assessment

Pre-test was conducted to assess teacher's knowledge regarding teaching styles through filling tool (I), teachers' teaching styles practice through filling tool (II). Also, assess nursing students' perception toward teaching styles using and their learning outcomes through filling tool (III, IV).

Phase II: Planning of the educational program

The educational program was developed by the researcher.

Aim of the educational program:

Enhance nursing teachers' knowledge and practices after educational program about teaching styles.

General objectives of the educational program:

The educational program enhances the nursing teachers' knowledge about teaching styles and practice it effectively in their work as possible.

- Content of the educational program:

The nursing intervention program included six sessions for nursing teachers:

- First session: Teaching and learning process, teaching styles concepts, objectives and importance
- Second session: teaching styles characteristics, advantages and disadvantages of each style.
- Third session: Teaching styles approaches and nursing students' learning outcomes.
- Fourth session: Principles and factors affecting teaching styles.
- Fifth session: Teachers' practice regarding expert, formal authority, and personal model teaching styles.
- Sixth session: Teachers' practice regarding facilitator and delegator teaching styles, strategies to improve teaching styles.
- **Preparation of the educational program:**

The educational program included six sessions and was carried out in the previously mentioned setting. The total number of nursing teachers are (n=48) divided into six groups. Each group consisted of nearly eight nursing teachers. The content was presented at six days per group, three day per week. The duration of each session ranged from 30-45 minutes.

- **Teaching - Learning strategies:**
Selection of teaching methods were governed by studying the subject themselves and content of the program. The methods used in teaching the program were interactive lectures, group discussion, brainstorming, role-play, and scenario from work situations.

Teaching aids

PowerPoint Presentation (PPT), data show, and videos were included and utilized as teaching aids in the educational program.

Phase III: Implementation of the educational program

- The educational program started by informing the nursing teachers about objectives of the educational program and building positive relationships to encourage their participation and more involvement in the program.

Phase IV: Evaluation of the educational program

- Post- test to assess nursing teachers' levels of knowledge regarding teaching styles immediately after implementation of the educational program through tool (I).
- Teachers' teaching styles practices observational checklist to assess their levels of actual practice regarding teaching styles three months later using tool (II).
- Assess nursing students' perception regarding teaching styles and learning outcomes three months later using tool (III, IV).

Statistical analysis of the data

The collected data were organized, tabulated and statistically analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, and standard deviation. Significance of the obtained results was judged at the 5% level.

The used tests were

1. Student t-test for normally distributed quantitative variables, to compare between two studied groups.
2. F-test (ANOVA) for normally distributed quantitative variables, to compare between more than two groups.
3. Pearson coefficient to correlate between two normally distributed quantitative variables.
4. Cronbach's Alpha, reliability Statistics was assessed using Cronbach's Alpha test.

Results

Table (1) represents distributions of nursing teachers according to their personal and work related characteristics. The table reveals that nearly half (45.8%) of nursing teachers were at age <40 years with mean score age 43.98 ± 8.22 . All (100%) nursing teachers were female. The majority (87.5%) of them were married. Regarding the educational level, around one-third (35.4%, 33.3%) of nursing teachers had Baccalaureate and Doctorate degree, respectively. Regarding the years of experience, nearly half (47.9%) of nursing teachers had ≥ 25 years of experience and more than one-third (31.3%) of them had 10 - <15 years with mean score 20.56 ± 8.08 . Regarding previous attending training programs, all (100%) nursing teachers attending previous training programs, and the highest percent (75%) of them had attend training about method of teaching training course.

Table (2) Represents distributions of

nursing students' according to their personal characteristics. The table reveals that more than three quarters (79%) of nursing students were at age <20 years, while 21% of them were at ≥ 20 years with mean score age 18.88 ± 0.83 . More than half (54.8%) of nursing students were female, while more than two-fifths (45.3%) of them were males. The majority (91.7%) of them were unmarried. Regarding the academic year, the highest percentage (70.5%) of nursing students enrolled in second year. Regarding the last academic achievement, the highest percent (60.8%) of nursing students had excellence and about one-third (30%) of them had very good degree. Regarding the place of residence, more than half (57%) of nursing students were from rural, while more than two-fifths (43%) of them were from urban area.

Table (3) reveals mean percent score and ranking of nursing teachers' knowledge about each session per, immediate, and after 3 months of educational program. The table showed that there was statistically significant difference between mean score of nursing teachers' knowledge on all sessions pre, immediate, and after 3 months of educational program at $p=0.001$. Pre- educational program, the total mean percent score of nursing teachers' knowledge about teaching styles was 33.16 ± 14.19 . While, it increased to 91.42 ± 11.36 at immediate, and reached to 76.84 ± 16.13 after 3 months of educational program.

Table (4) Illustrates mean percent of

nursing teachers teaching styles practice including pre and after 3 months of educational program. The table showed that there was statistically significant difference between nursing teachers practice on all domains of teaching styles pre and after 3 months of educational program at $p=0.001$. Pre-educational program, the total mean percent score of nursing teachers' practice of teaching styles was 29.04 ± 14.10 . While, it increased to 86.34 ± 11.99 after 3 months of educational program.

Table (5) Illustrates mean score, mean percent and rank of nursing students perception regarding teaching styles including pre and after 3 months of educational program. The table show that there was statistically significant difference between nursing students perception on all domains of teaching styles pre and after 3 months of educational program at $p=0.001$. In addition pre- educational program, the total mean score of nursing students perception regarding teaching styles was 121.1 ± 31.59 with low mean percent (29.04 ± 14.10). While, it increased to 249.4 ± 26.86 with high mean percent (86.34 ± 11.99) after 3 months of educational program.

Table (6) Illustrates mean score, mean percent and rank of nursing students learning outcomes including pre and after 3 months of educational program. The table show that there was statistically significant difference between nursing students learning outcomes domains pre and after 3 months of educational program at

$p=0.001$. In addition pre- educational program, the total mean score of nursing students learning outcomes was (81.65 ± 25.91) with low mean percent (22.47 ± 15.07). While, it increased to 191.8 ± 23.33 with high mean percent (86.49 ± 13.56) after 3 months of educational program.

Figure (1) Illustrates that pre-educational program, majority (91.3%) of nursing teachers had low overall knowledge level which decreased immediately post program to only minor percent (6.3%) of them had low level, with slightly increase only to only (16.7%) of them had low level after 3 months of educational program.

Figure (2) Illustrates that pre-educational program, the minority (4.2%) of nursing teachers had satisfactory level of overall teaching styles practice. While, improved to be more than half (56.3%) of them had satisfactory level after 3 months of educational program.

Figure (3): Illustrates that pre-educational program, low percent (0.5%) of nursing students had high level of total perception regarding teaching styles which changed to be the majority (84.0%) of them had high level after 3 months of educational program

Figure (4): Illustrates that pre-educational program (0.0%) none of nursing students had satisfactory level of learning outcomes. While, improved to be about three quarter (73.5%) of them had satisfactory achievement level after 3 months of educational program.

Figure (5, 6): Revealed that there was statistically significant positive

correlation between nursing teachers' knowledge about teaching styles and their practice at pre and post 3 months of educational program.

Figure (7, 8) Revealed that there was statistically significant positive correlation between nursing students' perception about teaching styles and their learning outcomes at pre and post 3 months of educational program.

Table (1): Distributions of nursing teachers according to their personal and work related characteristics (N = 48)

Part one: Personal data	Teachers (n = 48)	
	No.	%
Age (years)		
<40	22	45.8
40-50	13	27.1
>50	13	27.1
Min. – Max.	30.0 – 57.0	
Mean ± SD.	43.98 ± 8.22	
Gender		
Female	48	100.0
Marital status		
Married	42	87.5
Unmarried	6	12.5
Education level		
Baccalaureate degree	17	35.4
Master degree	15	31.3
Doctorate degree	16	33.3
Years of experience		
10 - <15	15	31.3
15 - <20	7	14.6
20 - <25	3	6.3
≥25	23	47.8
Min. – Max.	10.0 – 33.0	
Mean ± SD.	20.56 ± 8.08	
Attend to previous training programs		
Yes	48	100.0
Training course [#]		
Method of teaching	36	75.0
Educational technology	19	39.6
Communication	12	25.0
Counseling	3	6.3
Administration	8	16.7

SD:

Standard deviation

Table (2): Distributions of nursing students' according to their personal characteristics (N = 400)

Part 1: Nursing students' personal data	Students (n = 400)	
	No.	%
Age (years)		
<20	316	79.0
≥20	84	21.0
Min. – Max.	15.0 – 21.0	
Mean ± SD.	18.88 ± 0.83	
Gender		
Male	181	45.2
Female	219	54.8
Marital status		
Married	33	8.3
Unmarried	367	91.7
Academic year		
First year	118	29.5
Second year	282	70.5
Last academic achievement		
Excellence	243	60.8
Very good	120	30.0
Good	34	8.4
Acceptable	3	0.8
Place of residence		
Rural	228	57.0
Urban	172	43.0

SD: Standard deviation

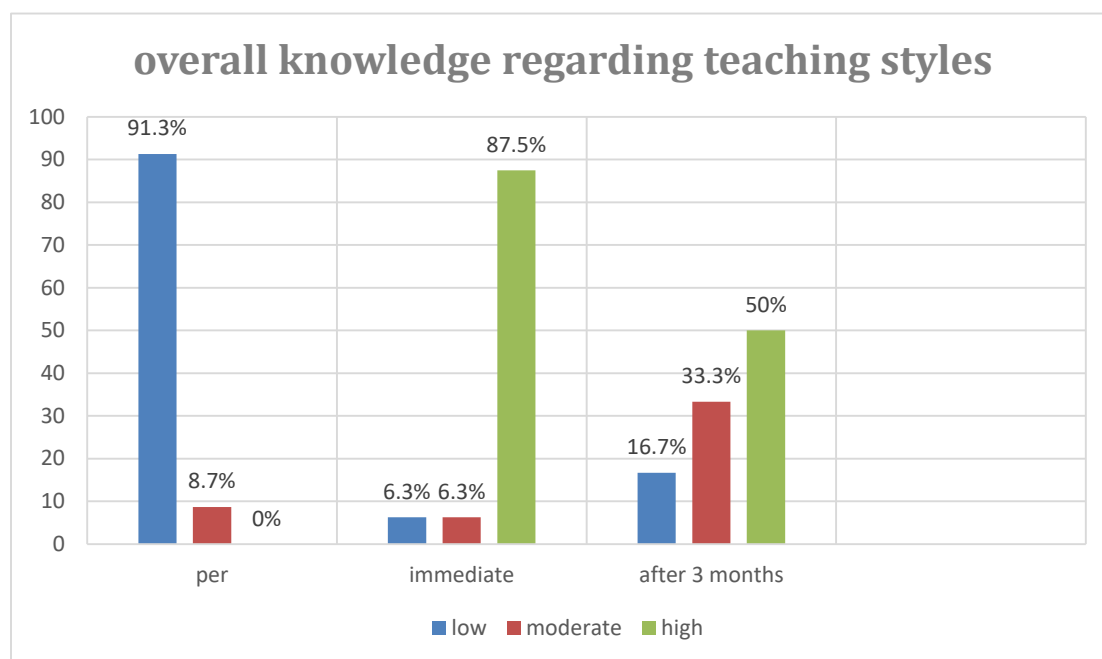


Figure (1): Levels of nursing teachers' overall knowledge regarding teaching styles pre, immediate, and after 3 months of educational program

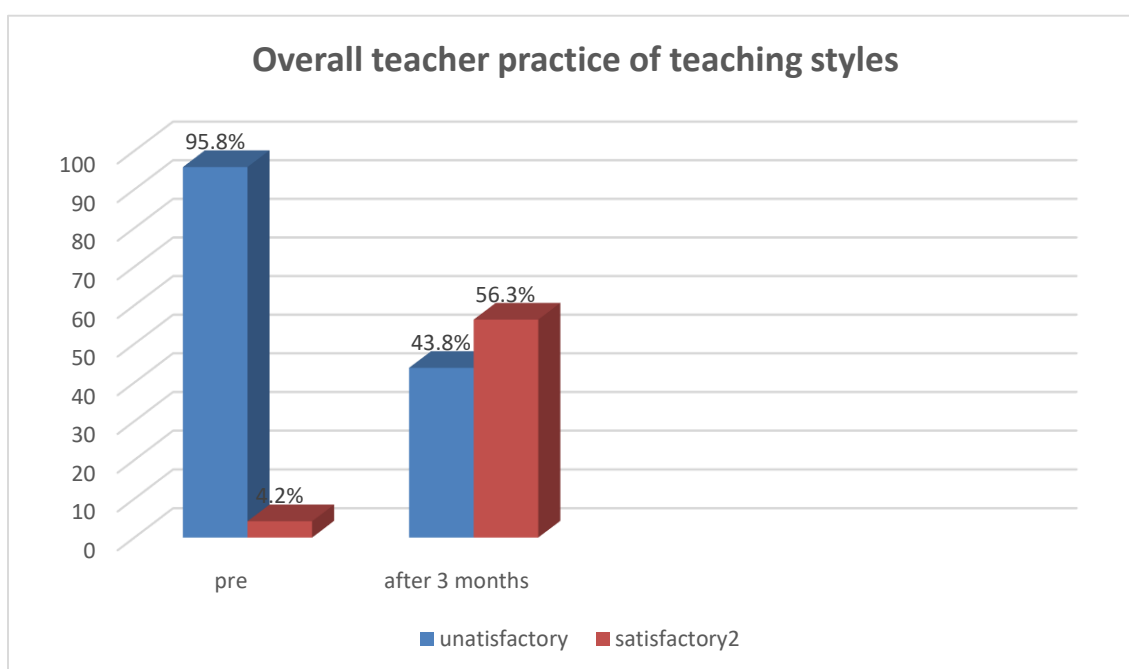


Figure (2): Levels of nursing teachers' overall practice regarding teaching styles pre and after 3 months of educational program (n = 48)

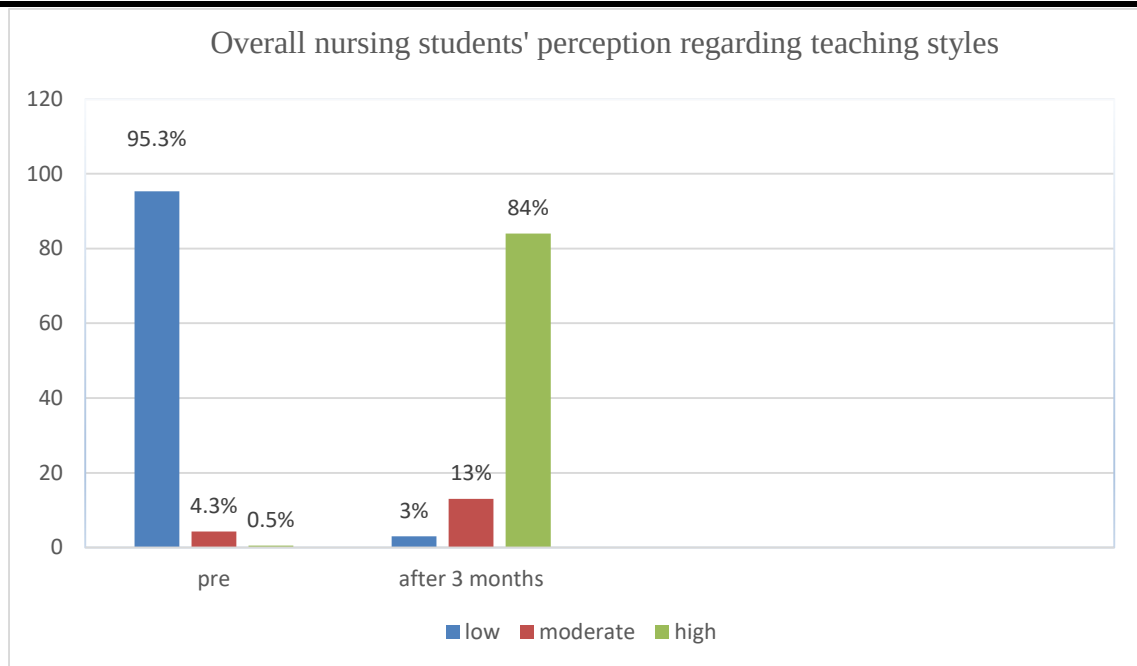


Figure (3): Levels of nursing students' perception regarding overall teaching styles domain pre and after 3 months of educational program (n = 400)

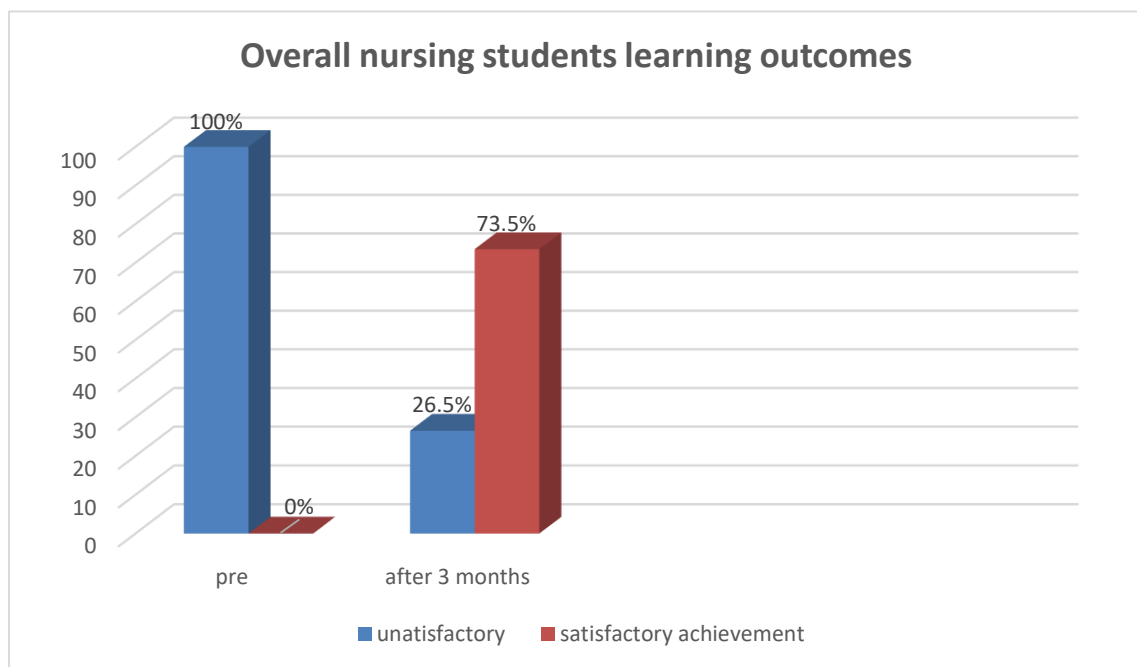


Figure (4): Levels of nursing students' overall learning outcomes pre and after 3 months of educational program

Table (3): Mean percent score and ranking of nursing teachers' knowledge about each sessions per, immediate, and after 3 months of educational program (N =48)

Knowledge of sessions	Pre	Rank	Immediate	Rank	After 3 Months	Rank	F	P
Teaching styles concepts (session 1)								
Total score (0 – 10)								
Min. – Max.	0.0 – 9.0		4.0 – 10.0		3.0 – 10.0			
Mean ± SD.	2.67 ± 2.66		9.15 ± 1.41		8.04 ± 1.96			
Average Score (0–1)	0.27 ± 0.27	6	0.91 ± 0.14	3	0.80 ± 0.20	2	152.606*	<0.001*
% Score (Mean ± SD.)	26.67 ± 26.60		91.46 ± 14.14		80.42 ± 19.57			
Teaching styles characteristics (session 2)								
Total score (0 – 10)								
Min. – Max.	0.0 – 8.0		5.0 – 10.0		2.0 – 10.0			
Mean ± SD.	3.48 ± 2.44		9.29 ± 1.05		8.10 ± 2.23			
Average Score (0–1)	0.35 ± 0.24	2	0.93 ± 0.11	1	0.81 ± 0.22	1	117.779*	<0.001*
% Score (Mean ± SD.)	34.79 ± 24.41		92.92 ± 10.51		81.04 ± 22.34			
Teaching styles approaches and learning outcomes (session 3)								
Total score (0 – 10)								
Min. – Max.	0.0 – 8.0		3.0 – 10.0		3.0 – 10.0			
Mean ± SD.	3.33 ± 2.54		9.23 ± 1.49		7.96 ± 2.12			
Average Score (0–1)	0.33 ± 0.25	4	0.92 ± 0.15	2	0.80 ± 0.21	3	108.854*	<0.001*
% Score (Mean ± SD.)	33.33 ± 25.38		92.29 ± 14.91		79.58 ± 21.23			
Principles and factors affecting teaching styles (session 4)								
Total score (0 – 10)								
Min. – Max.	0.0 – 8.0		2.0 – 10.0		2.0 – 10.0			
Mean ± SD.	3.46 ± 1.54		9.04 ± 1.53		7.63 ± 2.38			
Average Score (0–1)	0.35 ± 0.15	3	0.90 ± 0.15	6	0.76 ± 0.24	5	122.604*	<0.001*
% Score (Mean ± SD.)	34.58 ± 15.43		90.42 ± 15.29		76.25 ± 23.85			
Teachers' practices regarding expert, formal authority and personal model(5)								
Total score (0 – 10)								
Min. – Max.	1.0 – 8.0		4.0 – 10.0		1.0 – 10.0			
Mean ± SD.	3.69 ± 1.93		9.06 ± 1.44		6.67 ± 2.48			
Average Score (0–1)	0.37 ± 0.19	1	0.91 ± 0.14	5	0.67 ± 0.25	6	97.014*	<0.001*
% Score (Mean ± SD.)	36.88 ± 19.26		90.62 ± 14.35		66.67 ± 24.78			
Teachers practice regarding facilitator and delegator teaching styles (session 6)								
Total score (0 – 10)								

Min. – Max.	1.0 – 7.0		5.0 – 10.0		1.0 – 10.0			
Mean ± SD.	3.27 ± 1.45		9.08 ± 1.27		7.71 ± 2.54			
Average Score (0–1)	0.33 ± 0.15	5	0.91 ± 0.13	4	0.77 ± 0.25	4	132.546*	<0.001*
% Score (Mean ± SD.)	32.71 ± 14.55		90.83 ± 12.69		77.08 ± 25.43			
Total score (0 – 60)								
Min. – Max.	6.0 – 38.0		25.0 – 60.0		23.0 – 59.0			
Mean ± SD.	19.90 ± 8.52		54.85 ± 6.81		46.10 ± 9.68		F=	
Average Score (0–1) (Mean ± SD.)	0.33 ± 0.14		0.91 ± 0.11		0.77 ± 0.16		252.3	<0.001*
% Score (Mean ± SD.)	33.16 ± 14.19		91.42 ± 11.36		76.84 ± 16.13		17*	

SD: Standard deviation, F: F test (ANOVA) with repeated measures, p: p value for*:
Statistically significant at $p \leq 0.05$

Table (4): Mean percent score and ranking of nursing teachers' teaching styles practices domains per and after 3 months of educational program (N =48)

Knowledge domain	Pre program		Rank	After 3 month		Rank	t	p
	Mean score	% score		Mean score	% score			
Expert Style	(0 -10)		3			1	4.772*	<0.001*
	0.0 – 10.0	0.38 ± 0.35		0.0 – 10.0	0.74 ± 0.39			
	3.77 ± 3.50	37.71 ± 35.02		7.42 ± 3.85	74.17 ± 38.53			
Formal authority style	(0 -11)		4			5	5.106*	<0.001*
	0.0 – 11.0	0.38 ± 0.34		0.0 – 11.0	0.67 ± 0.34			
	4.15 ± 3.70	37.69 ± 33.60		7.38 ± 3.70	67.05 ± 33.63			
Personal model style	(0 -13)		5			3	6.072*	<0.001*
	0.0 – 13.0	0.37 ± 0.29		0.0 – 13.0	0.70 ± 0.32			
	4.75 ± 3.71	36.54 ± 28.54		9.13 ± 4.10	70.19 ± 31.52			
Facilitator style	(0 -13)		2			2	5.255*	<0.001*
	0.0 – 13.0	0.38 ± 0.36		0.0 – 13.0	0.70 ± 0.35			
	5.0 ± 4.69	38.46 ± 36.11		9.15 ± 4.61	70.35 ± 35.48			
Delegator style	(0 -9)		1			4	4.907*	<0.001*
	0.0 – 9.0	0.39 ± 0.35		0.0 – 9.0	0.68 ± 0.34			
	3.52 ± 3.13	39.12 ± 34.76		6.13 ± 3.02	68.06 ± 33.58			
Total score (0 – 56)	(0 -56)						7.911*	<0.001*
	1.0 – 56.0	0.38 ± 0.23		13.0 – 56.0	0.70 ± 0.21			
	21.19 ± 12.85	29.04 ± 14.10		39.19 ± 11.51	86.34 ± 11.99			

McN: McNemar test

p: p value for comparing between Pre and Post

*: Statistically significant at $p \leq 0.05$

Table (5): Mean score, mean percent and rank of nursing students perception regarding teaching styles (n = 400)

	Pre	Rank	After 3 Months	Rank	t	p
Expert Style						
Total score (10 – 50)						
Min. – Max.	10.0 – 48.0		27.0 – 50.0			
Mean ± SD.	21.82 ± 6.43		45.52 ± 4.81			
Average Score (1 – 5) (Mean ± SD.)	2.18 ± 0.64	4	4.55 ± 0.48	1	54.855*	<0.001*
% Score (Mean ± SD.)	29.54 ± 16.07		88.79 ± 12.01			
Formal authority style						
Total score (11 – 55)						
Min. – Max.	11.0 – 55.0		14.0 – 55.0			
Mean ± SD.	25.65 ± 7.36		47.66 ± 6.95			
Average Score (1 – 5) (Mean ± SD.)	2.33 ± 0.67	1	4.33 ± 0.63	5	38.828*	<0.001*
% Score (Mean ± SD.)	33.28 ± 16.72		83.31 ± 15.79			
Personal model style						
Total score (13 – 65)						
Min. – Max.	13.0 – 52.0		33.0 – 65.0			
Mean ± SD.	28.46 ± 7.75		58.19 ± 6.78			
Average Score (1 – 5) (Mean ± SD.)	2.19 ± 0.60	3	4.48 ± 0.52	3	53.463*	<0.001*
% Score (Mean ± SD.)	29.73 ± 14.90		86.91 ± 13.03			
Facilitator style						
Total score (13 – 65)						
Min. – Max.	13.0 – 65.0		26.0 – 65.0			
Mean ± SD.	24.90 ± 9.18		58.28 ± 6.98			
Average Score (1 – 5) (Mean ± SD.)	1.92 ± 0.71	5	4.48 ± 0.54	2	51.748*	<0.001*
% Score (Mean ± SD.)	22.87 ± 17.66		87.07 ± 13.42			
Delegator style						
Total score (9 – 45)						
Min. – Max.	9.0 – 45.0		15.0 – 45.0			
Mean ± SD.	20.24 ± 6.75		39.76 ± 5.58			
Average Score (1 – 5) (Mean ± SD.)	2.25 ± 0.75	2	4.42 ± 0.62	4	39.208*	<0.001*
% Score (Mean ± SD.)	31.22 ± 18.76		85.43 ± 15.50			
Total score (56 – 280)						
Min. – Max.	56.0 – 229.0		147.0 – 280.0			
Mean ± SD.	121.1 ± 31.59		249.4 ± 26.86		t=	
Average Score (1 – 5) (Mean ± SD.)	2.16 ± 0.56		4.45 ± 0.48		58.402*	<0.001*
% Score (Mean ± SD.)	29.04 ± 14.10		86.34 ± 11.99			

McN: McNemar test

MH: Marginal Homogeneity Test

p: p value for comparing between **Pre** and **Post***: Statistically significant at $p \leq 0.05$

Table (6): mean score, mean percent and rank of nursing students' learning outcomes domains pre, and after 3 months of educational program (n = 400)

	Pre	Rank	After 3 Months	Rank	t	P
Expert Style						
Total score (10 – 50)						
Min. – Max.	10.0 – 48.0		27.0 – 50.0			
Mean ± SD.	21.82 ± 6.43		45.52 ± 4.81			
Average Score (1 – 5) (Mean ± SD.)	2.18 ± 0.64	4	4.55 ± 0.48	1	54.855*	<0.001*
% Score (Mean ± SD.)	29.54 ± 16.07		88.79 ± 12.01			
Formal authority style						
Total score (11 – 55)						
Min. – Max.	11.0 – 55.0		14.0 – 55.0			
Mean ± SD.	25.65 ± 7.36		47.66 ± 6.95			
Average Score (1 – 5) (Mean ± SD.)	2.33 ± 0.67	1	4.33 ± 0.63	5	38.828*	<0.001*
% Score (Mean ± SD.)	33.28 ± 16.72		83.31 ± 15.79			
Personal model style						
Total score (13 – 65)						
Min. – Max.	13.0 – 52.0		33.0 – 65.0			
Mean ± SD.	28.46 ± 7.75		58.19 ± 6.78			
Average Score (1 – 5) (Mean ± SD.)	2.19 ± 0.60	3	4.48 ± 0.52	3	53.463*	<0.001*
% Score (Mean ± SD.)	29.73 ± 14.90		86.91 ± 13.03			
Facilitator style						
Total score (13 – 65)						
Min. – Max.	13.0 – 65.0		26.0 – 65.0			
Mean ± SD.	24.90 ± 9.18		58.28 ± 6.98			
Average Score (1 – 5) (Mean ± SD.)	1.92 ± 0.71	5	4.48 ± 0.54	2	51.748*	<0.001*
% Score (Mean ± SD.)	22.87 ± 17.66		87.07 ± 13.42			
Delegator style						
Total score (9 – 45)						
Min. – Max.	9.0 – 45.0		15.0 – 45.0			
Mean ± SD.	20.24 ± 6.75		39.76 ± 5.58			
Average Score (1 – 5) (Mean ± SD.)	2.25 ± 0.75	2	4.42 ± 0.62	4	39.208*	<0.001*
% Score (Mean ± SD.)	31.22 ± 18.76		85.43 ± 15.50			
Total score (56 – 280)						
Min. – Max.	56.0 – 229.0		147.0 – 280.0			
Mean ± SD.	121.1 ± 31.59		249.4 ± 26.86		t=	
Average Score (1 – 5) (Mean ± SD.)	2.16 ± 0.56		4.45 ± 0.48		58.40	<0.001*
% Score (Mean ± SD.)	29.04 ± 14.10		86.34 ± 11.99		2*	

MH: Marginal Homogeneity Testp: p value for comparing between **Pre** and **Post***: Statistically significant at $p \leq 0.05$

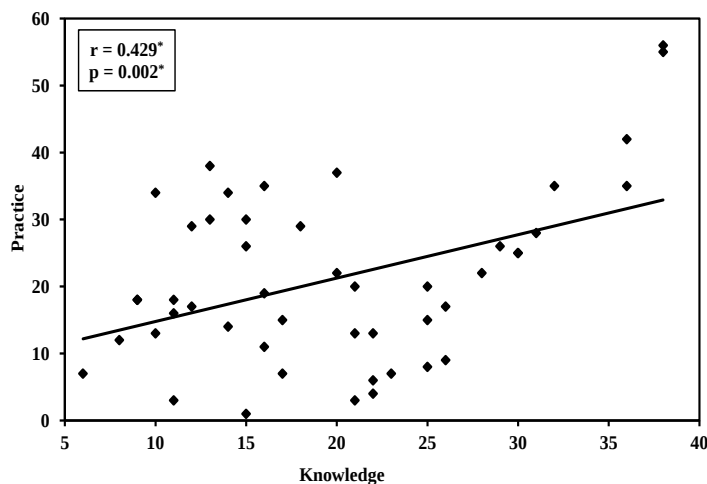


Figure (5) Pre program

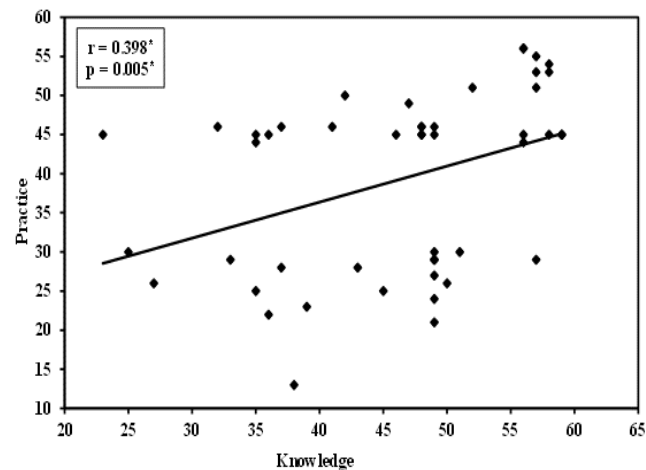


Figure (6) Post 3 months

Figure (5, 6): Correlation between nursing teachers' knowledge about teaching styles and their practice at pre and post 3 months of educational program (n = 48)

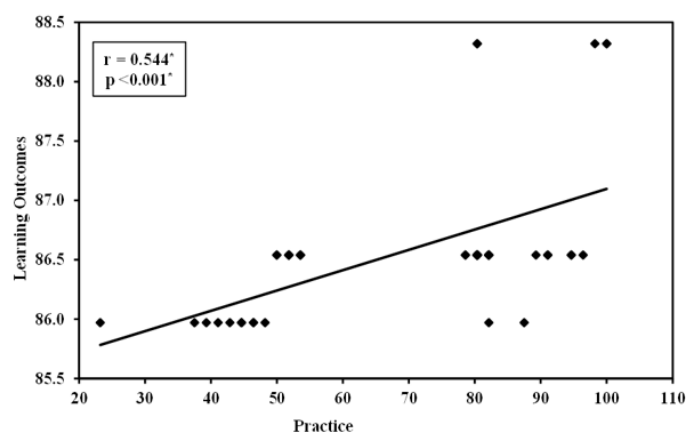
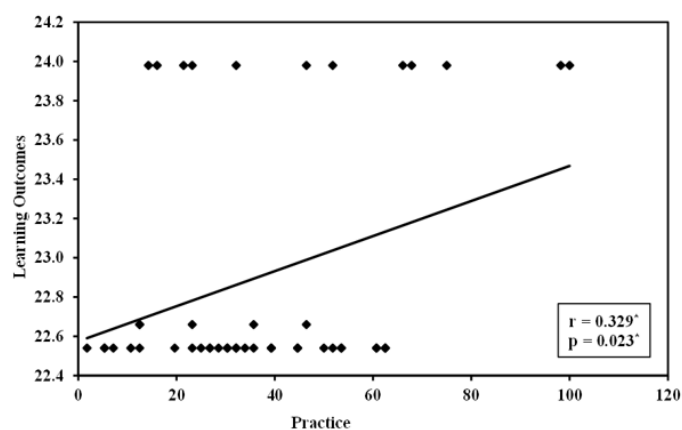


Figure (7, 8): Correlation between nursing teachers' practice and nursing students learning outcomes at pre and after 3 months of educational program (n = 400)

Discussion

Teaching styles play a pivotal role in shaping the educational experience and learning outcomes of nursing students. Effective teaching methods not only enhance knowledge retention but also foster critical thinking, self-directed learning, and clinical competence skills essential for future nursing professionals (**Alotaibi, Alshammari, & Aldossary, 2022**).

The pre-program results of the present study showed that the majority of nursing teachers exhibited low knowledge levels. This may be due to a lack of recent training, limited exposure to updated pedagogical methods, or reliance on traditional teaching practices. These results are consistent with the findings of **Zhao, Hu, and Wang, (2023)**, who emphasized that many nursing educators lack adequate knowledge of modern teaching styles due to infrequent participation in professional development programs. Moreover, **Alshammari et al. (2023)** argued that despite years of teaching experience, educators may demonstrate low theoretical understanding of diverse instructional strategies unless continuous learning is prioritized. Adding to that, the current study results revealed that, immediately after the educational program, there was a significant reduction in the proportion of teachers with low

knowledge levels, indicating that well-designed programs can produce quick gains in knowledge when delivered with clarity, relevance, and interactivity. The result of the current study is in line with the findings of **Ebrahimi, Hassankhani, & Zamanzadeh, (2022)**, who found that targeted faculty development programs significantly improved teaching competencies in a short time frame. Also, aligns with **Ali et al. (2023)**, who found that structured educational programs significantly enhanced nursing educators' pedagogical knowledge and instructional practices.

The current study results revealed that, post three months of the program; a slight increase in the number of teachers with low knowledge levels suggests some decline in retention, highlighting the need for reinforcement strategies such as follow-up workshops or refresher sessions. Also, a statistically significant improvement of mean score for nursing teachers' knowledge on all sessions of teaching styles was detected at immediate and post three months after the program. This indicated that the current educational program was effective in both informing and maintaining knowledge among nursing teachers. According to **Tang and Choi (2021)**, knowledge retention over time can be influenced by continuous engagement and practical

application of new skills.

Regarding nursing teachers' practice of teaching styles, the minority of nursing teachers had satisfactory level regarding overall practice regarding dimensions of teaching styles. This may be due to a lack of theoretical knowledge of nursing teachers, lack of necessary resources, and limited exposure to structured pedagogical training, lack of opportunities for reflective teaching practice, or minimal institutional support to apply varied instructional methods. According to **Altun & Yilmaz (2022)** support this finding, and mention that many nursing teachers enter academia with strong clinical skills but insufficient formal preparation in educational methodologies, which affects their teaching practices.

Furthermore, **Tang and Choi (2021)**, highlighted that in environments where faculty development is not continuous or reinforced, teachers may struggle to adapt their instructional approaches to align with diverse student learning needs. In contrast, **Hussein & Fawzy, & El Sayed, (2021)** argued that even minimal training interventions can significantly enhance teaching practices when they are context-specific and include hands-on activities.

Adding to that, the current study results, more than half of nursing teachers had satisfactory level of

practice about overall teaching styles with statistically significant improvement after three months of the program. This indicated that the training program was effective in enhancing the nursing teachers' skills and knowledge, leading to sustained improvements in their practice.

Such findings align with the conclusions of **Mechtel et al. (2024)**, who emphasized that durable learning strategies, including spaced learning and team-based learning, are effective in promoting long-term knowledge retention in nursing education. Furthermore, **Alotaibi et al. (2023)** highlighted the importance of longitudinal faculty development programs based on competency-based frameworks, such as the Harden teacher's role framework.

Regarding nursing students' perception about teaching styles, pre-program low percentage of nursing students had a high level of overall perception regarding teaching styles. This may be due to limited exposure to varied instructional methods, a dominant reliance on teacher-centered approaches, or a lack of awareness among students about different teaching styles and their impact on learning. Additionally, students may have been accustomed to traditional lecture-based methods, which may not actively engage or foster positive perceptions of the teaching process.

This results are in line with **Altun & Yilmaz (2022)**, who reported that students from conventional academic environments often show limited perception and understanding of interactive or learner-centered teaching styles, also **Kebede et al. (2022)** found that nursing students' limited prior experience with facilitative or participative teaching methods can affect their perceptions and expectations of instructors' roles. Post program, a majority of nursing students had a high level of perception about teaching styles after 3 months of educational program. These results are due to the effectiveness of the educational program in providing nursing students with a clear understanding, enhancing students' awareness and appreciation of diverse teaching styles. The intervention likely exposed students to more engaging, student-centered methods, improving their recognition of how teaching approaches impact their learning experience. This results is reinforced by **Ali et al. (2021)**, who reported that structured educational interventions significantly improve nursing students' ability to evaluate and respond to various instructional approaches. Regarding nursing students' perception of learning outcomes, pre-program, none of nursing students had satisfactory level of overall perception regarding learning

outcomes. This may be due to nursing students may have experienced inconsistencies in instructional quality, unclear or poorly aligned learning objectives, or limited opportunities for feedback and reflection factors that are critical for perceiving positive learning outcomes. Additionally, lack of supportive learning environments characterized by minimal faculty guidance, limited engagement, and inadequate preparatory orientation can further undermine students' perceptions.

This result is supported by **Al-Richards, & Clarke, (2021)**, who found that students often report low satisfaction with learning outcomes when teaching strategies do not promote critical thinking, self-directed learning, and clinical integration. However, **Vázquez-Cano et al. (2022)** argued that students' perceptions can also be influenced by external factors such as stress levels, workload, and assessment methods, regardless of instructional quality.

Adding to that, the current study results about three quarters of them had satisfactory level of learning outcomes after three months of the program with a statistically significant improvement. This indicated that the educational program was effective in enhancing students' awareness and recognition of their own learning gains, likely due

to improved teaching strategies and increased teacher preparedness. The consistent use of structured, student-centered teaching styles may have fostered a more engaging and supportive learning environment, contributing to greater satisfaction and perceived academic achievement.

This result aligns with the findings of **Vázquez-Cano et al. (2022)**, who reported that innovative and interactive teaching methodologies significantly improved students' perceived learning outcomes in higher education. Conversely, **Eldeeb & Shama (2020)** found that without ongoing support and alignment between teaching style and students' learning preferences, short-term improvements in perceived learning may not always translate into long-term academic performance.

Correlation between nursing teachers' knowledge about teaching styles and their practice.

The present study revealed there was a statistically significant correlation was detected among nursing teachers' knowledge about teaching styles and their practice post program, this may be justified by the program enhanced nursing teachers' awareness and understanding of teaching styles that fosters reflective thinking, allowing nursing teachers' to align their instructional approaches with

students' learning needs. Also, may explained by as nursing teachers become more informed about different teaching styles, they are better equipped to implement them effectively, leading to improved classroom interactions and teaching strategies.

This result is in agreement with **Buanz et al. (2024)**, who found that nursing faculty members with higher knowledge of effective teaching strategies scored significantly better in teaching ability, and nursing competence. The authors concluded that pedagogical knowledge enhances educators' confidence and effectiveness in clinical instruction. In contrast, **Lindquist, Engström, & Säljö. (2022)**, argue that while teacher knowledge is foundational, it does not automatically translate into effective practice or positive perceptions. External factors such as organizational culture, institutional constraints, and student diversity often moderate this relationship. And **Hassanzadeh & Mohammadi (2023)**, they found inconsistencies between nurse educators' perceived competence and actual teaching practices, suggesting that perception is not always a reliable predictor of performance. **Correlation between nursing teachers' practice teaching styles and nursing students learning outcomes**

The findings of the current study showed that a statistically significant positive correlation between nursing teachers' teaching style practices and nursing students' learning outcomes both at the pre-program phase and three months post-program. This suggests that improvements in teaching practices were associated with enhanced student learning outcomes over time.

This result is in agreement with **Keerthigha (2023)** who found that teaching styles significantly affect students' learning experiences and their perceptions of instructors. Specifically, student-centered teaching approaches were linked to higher levels of academic motivation and improved learning outcomes.

Conclusion

Based on the findings of the current study, it can be concluded that nursing teachers' had lacking practice of teaching styles but implementing a carefully designed educational program on teaching styles significantly improved their knowledge and practice regarding teaching styles. Also, a statistically significant positive correlation was detected between nursing teachers' knowledge about teaching styles and their practice.

Recommendations

On the line of the findings of the current study the following recommendations are suggested for:

Technical Health Institute administration

- Adopt and integrate student-centered teaching styles into the nursing curriculum to enhance students' motivation, engagement, and learning outcomes.
- Provide continuous training programs for nursing educators focusing on diverse teaching strategies, modern educational technologies, and effective classroom management techniques.

Nursing teachers

- Regular participate in training programs that focus on diverse teaching styles and innovative instructional strategies to enhance their teaching effectiveness.
- Emphasize teaching methods that promote active learning, critical thinking, and student engagement, such as facilitator and delegator styles.

Nursing education

- Integrate teaching styles into curriculum: Include content about effective teaching styles and their impact on learning outcomes in the nursing education curriculum, especially for future nurse educators.
- Conduct regular workshops and

training sessions for nursing faculty to enhance their knowledge and skills in adopting modern, student-centered teaching strategies.

Further research is needed on:

- Expand the study sample to include nursing students from multiple institutions and regions to enhance the generalizability of the findings.
- Investigate the long-term impact of different teaching styles on nursing graduates' professional performance and patient care quality.

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Experiences of Clinical Simulation and Nursing Students' Self-Confidence

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Abstract

Background: Clinical simulation effectively bridge the gap between theoretical knowledge acquired in the classroom and real-world clinical practice, helping nursing students to have sufficient knowledge and practical skills before beginning clinical practice as well as foster their self-confidence. **Aim of the Study:** To assess experiences of clinical simulation and nursing students' self- confidence. **Design:** Descriptive correlational study design was applied. **Setting:** The study was conducted in Faculty of Nursing at Tanta University. **Subjects:** included (N=413) of nursing students were enrolled in second academic year and (N=406) of nursing students were enrolled in the third academic year. **Tools:** Two tools for data collection were used, Clinical Simulation Experience Design Structured Questionnaire and Nursing Students' Self- Confidence with Clinical Simulation Experience Structured Questionnaire. **Results:** Around half (47.3%) of the nursing students had a high level of experience with clinical simulation design. More than half (58.2%) of the nursing students had a high level of overall score for self- confidence with clinical simulation experience. **Conclusion;** There was a positive statistically significant correlation between nursing students' experience with clinical simulation and their confidence with clinical simulation experience. **Recommendation:** Faculty management enhance nursing student's knowledge and skills about how to use clinical simulation sessions through workshops and training programs and ensure the availability of all necessary technologies aids.

Keywords: Clinical simulation, Experience of clinical simulation, Nursing students, Self- confidence.

Introduction

Graduating nurses must have the requisite knowledge and skills since they are the first line of defense when it comes to patient care. The results of any training or educational endeavor could be affected by the fact that nursing students are individual beings with diverse methods of processing knowledge **(Ongor & Uslusoy, 2023)**. Teaching future nurses the skills they'll need to practice at a professional level is the major focus of clinical nursing education programs. One of the most widely used methods of instruction in nursing schools, clinical simulation effectively bridges the gap between theoretical knowledge acquired in the classroom and real-world clinical practice, allowing students to engage in authentic and replicated clinical situation. Using technology, students make independent decisions and see the consequences of their actions without causing harm to real patients and helps students learn new material and improves their outlook on hands-on training **(Alshehri, Jones, & Harrison, 2023)**. Nursing students may get valuable experience via clinical simulation, where they can practice repeated procedures in a controlled setting and make errors without endangering patients **((Dönmez, Alici, Kapucu, & Elçin, 2023)**. Students' self-awareness, in-depth reflection, and nursing competency are all enhanced by

clinical simulation training as part of clinical practice. Therefore, it is essential that nursing students have a solid foundation in both practical nursing skills and clinical simulation from the start of their education **(Lockertsen et al., 2023)**.

Recognizing the components of simulation design may give subsidies for the development of more assertive simulation-based experiences (SBE) in nursing, which is important since simulation design can affect improved learning outcomes **(Oliveria Silva et al., 2023)**. There are five parts to a clinical simulation design framework: objectives / information, support, problem solving, feedback and fidelity. Objectives/ information, is a comprehensive and clear understanding of the purpose and objective of simulation. Support which mean nursing students' feeling supported by the instructor assistance during the simulation. Problem solving skills which provide nursing students with the opportunity to set goal for patient **(Jeffries, 2020)**. Feedback is the most important part of good simulations, and guided reflection is a part of debriefing. Thinking critically about one's experiences is essential for building knowledge. How realistic the virtual world is exactly what we mean when we talk about fidelity **(Cho & Kim, 2023)**. Nursing students may hone their psychomotor, emotional, social,

and cerebral abilities via clinical simulations, which allow them to practice nursing tasks until they achieve mastery. In addition, nursing students may conquer their fears and anxieties and build their talents and self-confidence via clinical simulations **(Salifu, Christmals, & Reitsma, 2022)**. Self-confidence in clinical simulation encompasses three critical domains: learners' confidence in their own abilities, confidence in the skills and knowledge of trainers or instructors, and confidence in the clinical simulation itself. The success of the training as a whole depends on each of these factors, which in turn affect the growth and development of the nursing students **(Jeffries, 2020)**. Learners must have faith in their own talents for clinical simulations to be successful. How well nursing students do in clinical settings is strongly related to how confident they feel in themselves. Having faith in one's own skills, knowledge, and judgments is a sign of being confident in one's capacity to achieve objectives, finish jobs, and overcome obstacles **(Rashwan, 2023)**.

The atmosphere of a classroom is greatly affected by the level of confidence that students have in their trainers or instructors. The training process is more likely to be trusted by nursing students when they see their instructor as competent, skilled, and helpful. Because of the established

level of trust, students are more comfortable speaking up and asking for clarification when they need it. Building a solid relationship between instructors and nursing students enhances the learning process and gives students the confidence to put their knowledge into practice **(Alharbi and Alharbi, 2022)**. Finally, confidence in the clinical simulation itself is crucial for successful training outcomes. The likelihood of nursing students actively participating in a simulation increases when they have faith that it is reflective of real-world situations and has been developed with principles of effective learning in mind **(Alrashidi et al., 2023)**.

Significance of the study:

Nursing students in the critical care, medical surgical, maternity, and pediatric specialties (those in their second and third years of study) benefit greatly from clinical simulation as a teaching tool at Tanta University's Faculty of Nursing. The gap between theory and practice may be filled with high-quality simulations that include realistic settings, sufficient technology, and pertinent clinical difficulties. Instructors may help students feel more comfortable in the simulation, which might increase their readiness to handle the complexity of real world clinical settings and ultimately contribute to better patient care and results **(Alrashidi et al., 2023)**.

In addition, the ability of nursing students to acquire new skills, solve problems, communicate professionally, and think critically is all negatively impacted by their lack of self-confidence when it comes to clinical simulation. This, in turn, affects the quality of care that patients receive. So, this study aimed at assess experiences of clinical simulation and nursing students' self-confidence.

Aim of the Study

Assess experiences of clinical simulation and nursing students' self-confidence.

Research questions:

1. What are the levels of nursing students' experience with clinical simulation?
2. What are the nursing students' self-confidence levels with clinical simulation experience?
3. What is the relation between experiences of clinical simulation and nursing students' self-confidence?

Research design:

A descriptive correlation study design was used in this study.

Setting:

The present study was conducted at the Faculty of Nursing, Tanta University. The faculty began its educational mission under the name of the higher institution of nursing at 1982/ 1983 then converted officially to Faculty of Nursing at 29/4/2000 and added it to the faculties of nursing in Egypt and the faculty is affiliated

to the Ministry of Higher Education and Scientific Research. The faculty had a certificate of accreditation from the National Authority for Education Quality Assurance and Accreditation in 2019 and have renewed the accreditation in 2025, it contains seven departments namely Nursing Administration, Medical-Surgical Nursing, Critical care and Emergency Nursing, Community Health nursing, Pediatric Nursing, Maternal and Newborn Health Nursing and Psychiatric and Mental Health Nursing.

Subjects: -

The study subjects included a convenience sample (819) of second and third nursing students in the academic year 2023-2024 who accepted to participate in the study, male and female students.

Tools of data collection

Three tools were utilized for the collection of data:

Tool I: Clinical Simulation Experience Design Structured Questionnaire: This tool was developed by the researcher and guided by **Omer (2016), Magnetico (2017) and Jeffries (2020)**. It was used to assess nursing students' experience with clinical simulation design. it included two parts as follow:

Part (1): Part 1: Personal and studying related data of nursing students: This part included; age, gender, academic year, place of

residence, working during studying years, previous academic achievement, clinical simulation (course), how many courses and the place of clinical simulation.

Part (2): Clinical Simulation Experience Design Structured Questionnaire:

This part included 30 items divided into the following dimensions: - Objectives and information: included 6 items - Student support: included 7 items. - Problem solving skills: included 6 items - Feedback /Guided Reflection: included 7 items - Fidelity (Realism): included 4 items.

Scoring system:

Nursing students' responses were measured on a five points Likert Scale ranging from (1-5) where strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). They were concluded into 3 points where strongly agree and agree = agree and strongly disagree and disagree = disagree. **The total scores were calculated and summing up scores of all categories based on statistically cut-off points as the following:**

- High experience level with clinical simulation > 75 %
- Moderate experience level with clinical simulation 60 – 75 %
- Low experience level with clinical simulation < 60 %

Tool (II): Nursing Students' Self-Confidence with Clinical Simulation Experience Structured

Questionnaire It was developed by the researcher guided by **Omer (2016), Magnetico (2017) and Souza et al., (2020)**. It was used to assess nursing students' self-confidence with clinical simulation experience. It included 20 items divided into the following dimensions: - Self-confidence in learners' abilities: included 6 items - Confidence in trainers or instructors' skills and knowledge: included 6 items - Confidence in the used clinical simulation: included 6 items.

Scoring system

Nursing students' responses were measured on a five points Likert Scale ranging from (1-5) where strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). They were concluded into 3 points where strongly agree and agree = agree and strongly disagree and disagree = disagree. **The total scores were calculated and summing up scores of all categories based on statistically cut-off points as the following:** High level of Self-confidence > 75%

- Moderate level of Self-confidence 60 – 75 %
- Low level Self-confidence < 60 %

Method

1-Official permission to conduct the study was obtained from dean of faculty to responsible authority of Faculty of Nursing, Tanta university

2- Ethical consideration:

a- Approval of the Faculty of Nursing Scientific Research Ethical Committee was obtained No. (388-2-2024).

b- Nature of the study did not cause any harm or pain to the nursing students

c- The researcher introduced herself to the participant, a full explanation of the aim and method of the study was done to obtain the acceptance and cooperation as well as their informed consent.

d- The right to terminate participation at any time was accepted.

e- A code number was used instead of names.

3- Tools of the study were developed by researcher based on related literatures and translated into Arabic language.

- The face validity value of Clinical Simulation Experience Design Structure Questionnaire was 96.3 and Nursing Students' Self-Confidence with Clinical Simulation Experience Structure Questionnaire was 98.3%

4- A pilot study was conducted on 10% of the nurses (82 nursing students) to test clarity, sequence of items, applicability, relevance of the questions and to determine the needed time to complete the questionnaire

5- Reliability of tools was tested using Cronbach's Alpha Coefficient test. Reliability of clinical simulation experience design structure

questionnaire was = 0.963 and reliability of nursing students' self-confidence with clinical simulation experience structure questionnaire was 0.957

6- Data collection phase: Data collected by the researcher. The researcher met nursing students in small groups after their class to distribute the tool I and tool II. The questionnaires were completed at the presence of the researcher to ascertain all questions were answered.

7- The data was collected over a period of three months during the academic year 2024-2025 started from the beginning of October 2024 until the end of December 2024.

8- The estimated time needed to complete the questionnaire items from subjects for both tools was 20 up to 30 minutes.

Statistical analysis:

The statistical analysis of the data was performed using IBM SPSS software version 20.0 (Armonk, NY: IBM Corp, released 2011). Categorical data were summarized as numbers and percentages. For continuous data, normality was assessed using the Kolmogorov-Smirnov test. Quantitative data were described using range (minimum and maximum), mean and standard deviation. Significance of the obtained results was judged at the 5% level. The correlation between two normally distributed quantitative variables was calculated using

Pearson's correlation coefficient. The Student T-test was used for comparing between two studied categories. While, F-test (ANOVA) was used for comparing between more than two categories.

Results

Table (1): Illustrates personal and studying related data of nursing students. It was found that relatively two-thirds (66.7) of nursing students were less than or equal to 20 years old with mean age scores $20.16 \pm .76$. As well as, more than two thirds (67.2%) of nursing students were female. In addition, more than half (50.4%) of the nursing students were from second year and 57.6% of them were from rural area.

Table (2): display mean scores, standard deviation and rank of clinical simulation experience design dimensions' scores among nursing students. As noticed, objectives and information was ranked as the highest dimension of clinical simulation experience design with mean scores 24.09 ± 3.83 , followed by feedback/guided reflection with mean scores 28.10 ± 4.54 . While, support during clinical simulation dimension was ranked as the lowest dimension of clinical simulation experience design with mean scores 26.79 ± 5.04 .

Figure (1): explain levels of nursing students' experience with overall clinical simulation design (n = 819) It indicates that around half (47.3%) of

the nursing students had a high level of experience with clinical simulation design and about one third (33%) had a moderate level. While, 19.8% of them had a low level experience with clinical simulation design.

Table (3): indicates mean scores, standard deviation and rank of self-confidence' score with clinical simulation experience among nursing students. As observed from this table, confidence in learner's abilities dimension was ranked as the highest dimension with mean scores 49.07 ± 6.62 , followed by confidence in Instructors' skills and knowledge dimension with mean scores 16.24 ± 2.67 . While, confidence in clinical simulation dimension was ranked as the lowest dimension with mean scores 16.13 ± 2.85 .

Figure (2): Explains Levels of the nursing students' overall self-confidence with clinical simulation experience (n = 819)

It indicates that more than half (58.2%) of the nursing students had a high level of overall for self-confidence with clinical simulation experience. While, only 11.7% had a low level of overall score for self-confidence with clinical simulation experience.

Table (4): reveals correlation between nursing students' experience with clinical simulation design and their self-confidence with clinical simulation dimensions. It was evident that there was a statistically

significant correlation between all dimensions of nursing students' experience with clinical simulation design and their self-confidence with clinical simulation experience where $p \leq 0.001$.

Table (5): illustrate correlation between nursing students' experience with clinical simulation design and their self-confidence with clinical simulation experience. This table shows that, a positive statistically significant correlation was found among Nursing students' experience with clinical simulation and their confidence with clinical simulation experience ($r = 0.813$) at ($p < 0.001$).

Table (6): exhibits relation between total score of nursing students' experience with clinical simulation design and personal data. It demonstrated that there was statistically significant relation between total score of clinical simulation experience design and all personal data except age (years), academic year, place of residence and working during studying years.

Table (7): exhibits relation between total score of nursing students' self-confidence with clinical simulation experience and personal data. It demonstrated that there was statistically significant relation between total score of nursing students' self-confidence with clinical simulation experience and all personal data except age (years), academic year, previous achievement

working during studying years, medical surgical and pediatric courses.

Table (1): Personal and studying related data of nursing students (n = 819)

Part 1: Personal data	No.	%
Age (years)		
≤20	546	66.7
>20	273	33.3
Gender		
Male	269	32.8
Female	550	67.2
Min. – Max.	18.0 – 22.0	
Mean ± SD.	20.16 ± 0.76	
Academic year		
Second	413	50.4
Third	406	49.6
Place of residence		
Urban	347	42.4
Rural	472	57.6
Working during studying years		
No	450	54.9
Yes	369	45.1
Previous academic achievement		
Excellent	511	62.4
Very good	250	30.5
Good	50	6.1
Satisfactory	8	1.0
Clinical simulation course		
Critical care nursing	202	24.7
Medical surgical nursing	413	50.4
Maternity and obstetric nursing	202	24.7
Pediatric nursing	204	24.9
How many courses		
1	413	50.4
2	204	24.9
3	202	24.7
Place of simulation		
Satisfactory	675	82.4
Unsatisfactory	144	17.6

SD: Standard deviation

Nursing students have critical care nursing course and maternity and obstetric nursing course at the same semester

Table (2): Mean scores, standard deviation and rank of clinical simulation experience design dimensions' scores among nursing students (N = 819)

Clinical simulation experience design dimensions	Score Range	Total score		Average Score (1 – 5)	Rank
		Min. – Max.	Mean $\pm$ SD.	Mean $\pm$ SD.	
- Objectives and Information	(6 - 30)	13.0 – 30.0	24.09 $\pm$ 3.83	a. 0.64	1
- Support during clinical simulation	(7 - 35)	11.0 – 35.0	26.79 $\pm$ 5.04	a. 0.72	5
- Problem solving skills	(6 - 30)	12.0 – 30.0	23.13 $\pm$ 3.98	3.86 $\pm$ 0.66	4
- Feedback/Guided Reflection	(7 - 35)	11.0 – 35.0	28.10 $\pm$ 4.54	4.01 $\pm$ 0.65	2
- Fidelity (Realism)	(4 - 20)	4.0 – 20.0	15.81 $\pm$ 2.85	3.95 $\pm$ 0.71	3
- Overall Clinical simulation experience design structured	(30-150)	68.0 – 150.0	117.93 $\pm$ 18.26	3.93 $\pm$ 0.61	

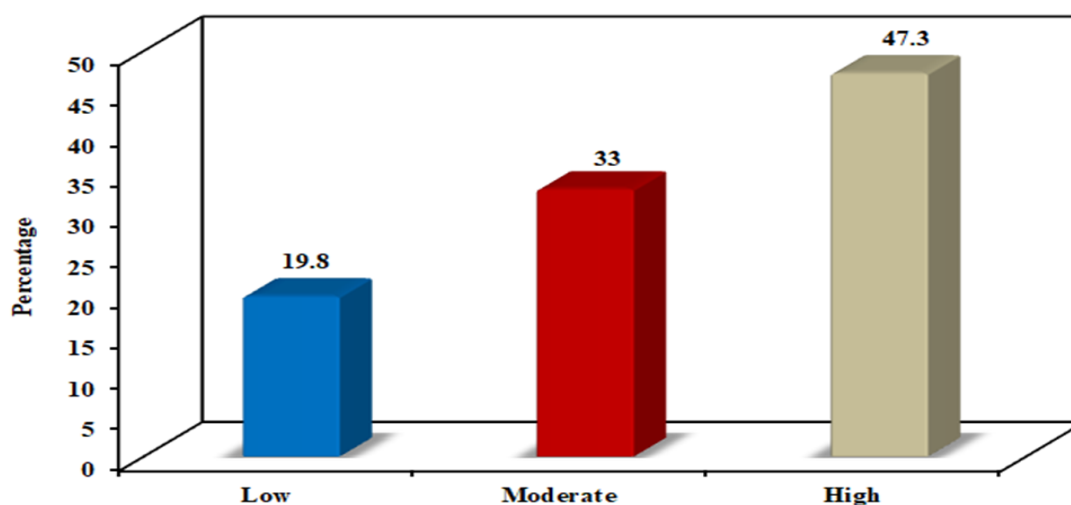


Figure (1): Levels of nursing students' experience with overall clinical simulation design (n=819)

Table (3): Mean scores, standard deviation and rank of self-confidence' score with clinical simulation experience dimensions among nursing students (n:819)

Nursing students' self-confidence with clinical simulation experience structured	Score Range	Total score		Average Score (1 – 5)	Rank
		Min. – Max.	Mean $\pm$ SD.	Mean $\pm$ SD.	
- Confidence in learner's abilities	(12 - 60)	31.0 – 60.0	49.07 $\pm$ 6.62	• 0.55	1
- Confidence in Instructors' skills and knowledge	(4 - 20)	7.0 – 20.0	16.24 $\pm$ 2.67	4.06 $\pm$ 0.67	2
- Confidence in clinical simulation	(4 - 20)	7.0 – 20.0	16.13 $\pm$ 2.85	4.03 $\pm$ 0.71	3
Overall Nursing students' self-confidence with clinical simulation experience	20-100	48.0 – 100.0	81.45 $\pm$ 11.18	4.07 $\pm$ 0.56	

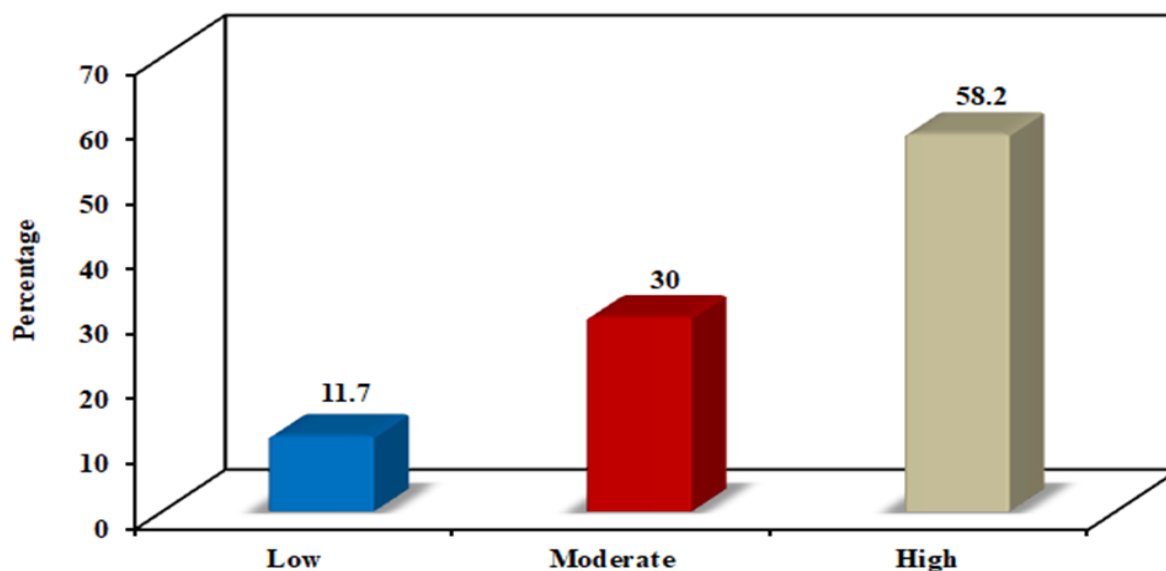
**Figure (2): Levels of the nursing students' overall self-confidence with clinical simulation experience (n = 819)**

Table (4): Correlation between nursing students' experience with clinical simulation design. and their self-confidence with clinical simulation dimensions (n = 819)

Self-confidence dimension	Clinical simulation experience design structured									
	Objectives and information		Student support		Problem solving skills		Feedback /Guided Reflection		Fidelity (Realism)	
	R	P	R	p	r	p	r	P	r	p
- Confidence in learner's abilities	0.670*	<0.001*	0.663*	<0.001*	0.711*	<0.001*	0.722*	<0.001*	0.680*	<0.001*
- Confidence in Instructors' skills and knowledge	0.629*	<0.001*	0.644*	<0.001*	0.653*	<0.001*	0.676*	<0.001*	0.611*	<0.001*
- Confidence in clinical simulation	0.681*	<0.001*	0.674*	<0.001*	0.677*	<0.001*	0.680*	<0.001*	0.641*	<0.001*

r: Pearson coefficient

*: Statistically significant at $p \leq 0.05$ **Table (5): Correlation between nursing students' experience with clinical simulation design and their self-confidence with clinical simulation experience (n = 819)**

Clinical simulation experience design structured vs.	r	P
Self-confidence with clinical simulation experience	0.813*	<0.001*

r: Pearson coefficient

*: Statistically significant at $p \leq 0.05$

Table (6): Relation between total score of nursing students' experience with clinical simulation design and their personal and studying related data (n = 819)

Personal and study related data	N	Clinical simulation experience design	Test of Sig.	P
		Mean $\pm$ SD.		
Gender				
Male	269	123.23 $\pm$ 17.0	t= 6.082*	<0.001*
Female	550	115.33 $\pm$ 18.30		
Age (years)				
≤ 20	546	118.3 $\pm$ 18.54	t= 0.723	0.470
>20	273	117.3 $\pm$ 17.69		
Academic year				
Second	413	118.3 $\pm$ 18.84	t= 0.590	0.555
Third	406	117.5 $\pm$ 17.65		
Place of residence				
Urban	347	118.8 $\pm$ 18.05	t= 1.230	0.219
Rural	472	117.3 $\pm$ 18.40		
Previous achievement				
Excellent	511	118.8 $\pm$ 19.08	F= 2.813*	0.038*
Very good	250	117.2 $\pm$ 16.93		
Good	50	114.8 $\pm$ 13.25		
Satisfactory	8	103.0 $\pm$ 24.58		
Working during studying years				
No	369	118.4 $\pm$ 18.60	t= 0.719	0.472
Yes	450	117.5 $\pm$ 17.98		
Clinical simulation course				
Critical care nursing				
No	617	116.5 $\pm$ 18.68	t= 4.254*	<0.001*
Yes	202	122.3 $\pm$ 16.17		
Medical surgical nursing				
No	406	117.5 $\pm$ 17.65	t= 0.590	0.555
Yes	413	118.3 $\pm$ 18.84		
Maternity and obstetric nursing				
No	617	116.5 $\pm$ 18.68	t= 4.254*	<0.001*
Yes	202	122.3 $\pm$ 16.17		
Pediatric nursing				
No	615	119.6 $\pm$ 18.09	t= 4.647*	<0.001*
Yes	204	112.8 $\pm$ 17.84		
How many courses				
1	413	118.3 $\pm$ 18.84	F= 14.231*	<0.001*
2	204	112.8 $\pm$ 17.84		
3	202	122.3 $\pm$ 16.17		
Place of simulation				
Satisfactory	675	121.5 $\pm$ 16.04	t= 12.322*	<0.001*
Unsatisfactory	144	101.0 $\pm$ 18.56		

SD: Standard deviation

t: Student t-test

F: F for One way ANOVA test

p: p value for comparison between the studied categories

*: Statistically significant at $p \leq 0.05$

Table (7): Relation between total score of nursing students' self-confidence with clinical simulation experience and personal and studying related data (n = 819)

Personal and study related data	N	Nursing Students' Self-Confidence with Clinical Simulation Experience	Test of Sig.	P
		Mean $\pm$ SD.		
Gender				
Male	269	84.37 $\pm$ 10.45	t=5.319*	<0.001*
Female	550	80.02 $\pm$ 11.26		
Age (years)				
≤ 20	546	81.36 $\pm$ 11.74	t=0.354	0.723
>20	273	81.63 $\pm$ 9.99		
Academic year				
Second	413	80.82 $\pm$ 11.81	t=1.629	0.104
Third	406	82.09 $\pm$ 10.48		
Place of residence				
Urban	347	82.55 $\pm$ 10.76	t=2.442*	0.015*
Rural	472	80.64 $\pm$ 11.43		
Previous achievement				
Excellent	511	81.75 $\pm$ 11.79	F=2.130	0.095
Very good	250	81.50 $\pm$ 10.10		
Good	50	79.40 $\pm$ 8.17		
Satisfactory	8	73.25 $\pm$ 16.50		
Working during studying years				
No	369	82.10 $\pm$ 11.47	t=1.506	0.132
Yes	450	80.92 $\pm$ 10.93		
Clinical simulation course				
Critical care nursing				
No	617	80.65 $\pm$ 11.38	t=3.574*	<0.001*
Yes	202	83.87 $\pm$ 10.20		
Medical surgical nursing				
No	406	82.09 $\pm$ 10.48	t=1.629	0.104
Yes	413	80.82 $\pm$ 11.81		
Maternity and obstetric nursing				
No	617	80.65 $\pm$ 11.38	t=3.574*	<0.001*
Yes	202	83.87 $\pm$ 10.20		
Pediatric nursing				
No	615	81.82 $\pm$ 11.39	t=1.659	0.097
Yes	204	80.32 $\pm$ 10.47		
How many courses				
1	413	80.82 $\pm$ 11.81	F=6.516*	0.002*
2	204	80.32 $\pm$ 10.47		
3	202	83.87 $\pm$ 10.20		
Place of simulation				
Satisfactory	675	82.98 $\pm$ 10.16	t=7.659*	<0.001*
Unsatisfactory	144	74.25 $\pm$ 12.85		

SD: Standard deviation

t: Student t-test

F: F for One way ANOVA test

p: p value for comparison between the studied categories

*: Statistically significant at $p \leq 0.05$

Discussion

One effective method of assisting students in reaching their learning goals is the use of clinical simulation. There is less stress and more opportunity to learn and grow in an immersive setting, which is ideal for clinical rotations. simulation-based clinical education is a novel approach to teaching that allows nursing students to practice safe decision-making and clinical skills in simulated real-life scenarios (**Alsadi et al., 2023**). The use of realistic, hands-on experiences in clinical simulation also helps to develop clinical judgment and critical thinking skills. More than that, students who took part in the simulations shown great attitudes toward learning, were more competent, and gained self-assurance in their capacity to use these skills in the actual world (**Bdiri Gabbouj et al., 2024, Kaliyaperumal et al., 2021**). So, this study aimed to assess experiences of clinical simulation and nursing students' self-confidence.

Nursing students' experience with clinical simulation design:

The present study revealed that, around half of the nursing students had a high level of experience with overall clinical simulation design. The results show that nursing students value clinical simulation as an educational tool. More than half of them took at least one course via simulation, which is designed to improve clinical competence in a controlled setting; this might be because of the growing

importance of simulation-based learning in nursing programs. In addition, the objective/information dimension is the most important part of clinical simulations, and nearly half of the nursing students who participated had a high level of experience with it. This helps students learn new skills and improves their learning outcomes.

da Costa Brasil et al. (2018) found similar results, demonstrating that the simulation design components had generally excellent values. Additionally, they demonstrated that the simulations' design was well-organized and understandable. A well-structured scenario enables the student to acquire the necessary skills for clinical practice, and every step of the process, from briefing to debriefing, demonstrated understanding and learning in accordance with the stated purpose. Furthermore, **Nunes et al., (2022)** reported that it is essential to include best practices into the design of clinical simulations in order to establish and track learning goals. According to **García-Mayor et al. (2021)**, students expressed their excitement and appreciation of simulation experiences, which led them to indicate that they had a good time throughout the simulation. The capacity to perform well in clinical situations is also thought to be improved by simulation. In addition, **Ribeiro et al. (2023)** found that undergraduates benefit from clinical simulation. The simulations facilitate

the integration of theory and practice, the enhancement of psychomotor abilities, and the promotion of participant-to-participant contact, in contrast to more conventional forms of teaching. Students' professional performance is supposedly enhanced by the fact that knowledge gained via simulations is less likely to be forgotten.

This finding runs counter to what **Tosterud (2015)** found, which indicated that students preferred the tried-and-true methods of paper and pen over the cutting-edge simulation tools. Additionally, **Costa et al. (2020)** verified that conventional methods of instruction might also inspire contentment and self-assurance in students.

Nursing students' self-confidence with clinical simulation experience

Results showed that with clinical simulation experience, over half of the nursing students surveyed reported high levels of self-confidence. From researcher's viewpoint, students' self-confidence is enhanced by the use of simulation as a primary learning approach, which provides several opportunities for practice in a controlled setting. Interactive, hands-on learning may help students develop a high sense of self-confidence by allowing them to practice what they've learned without putting actual patients in danger.

This finding is in line with **Aldhafeeri and Alosaimi, (2020) & Souza et al., (2020)**, that had shown that the

majority of nursing students felt quite confident and satisfied after participating in clinical simulations. Also, **Carrero-Planells et al., (2021)** observed that student perceptions of CS were good, and they thought it may help them manage the anxiety and tension that comes with clinical rotations. Furthermore, **Alharbi and Alharbi, (2022)** who indicated that after the human patient simulation experience, most nursing students reported feeling satisfied and more confident.

Also, studies conducted by **Cabañero-Martínez et al., (2021)** and **García-Mayor et al., (2021)** found that when nursing students used the simulation approach, their levels of satisfaction and self-confidence were much greater. conversely, **Silva et al., (2022)** not support the present study result and revealed that the majority of nursing students report high levels of stress and anxiety when participating in a simulation, which can affect students' self-confidence and hinder learning.

Correlation between nursing students' experience with clinical simulation design and their self-confidence; Results showed that the more time nursing students spent practicing in simulated clinical settings, the more confident they felt after each session. There was a clear and substantial relationship between the various aspects of nursing students' experience with clinical simulation design and their level of self-confidence when it came to clinical

simulation. In order to boost nursing students' self-confidence during simulation activity, these results highlighted the importance of instructional techniques and design aspects during simulation sessions. In the same line with the current result is **Mohamed and Mohamed (2020)** further highlighted a very substantial association between simulation design and student satisfaction/self-confidence in learning, which is in accordance with the present conclusion. Another important finding from **Alyateem et al., (2024)** this research was showed the importance of SBL in nursing education. All participants agreed that the simulated situations helped them gain confidence, sharpen their clinical skills, and make better decisions.

In this regard, **Olaussen et al. (2020)** found that students' self-confidence during simulation activity management was positively correlated with learning objectives and information components of the simulation design, and that active learning of educational practice is a crucial component to achieve students' satisfaction and self-confidence.

However, a study conducted by **Kada (2013)** in the United States found no statistically significant relationship between the self-confidence of associate degree nursing students and their perception of whether a high fidelity simulator learning experience included the following instructional design components: objectives and

information, support, problem-solving, feedback/guided reflection, and fidelity/realism.

Relation between nursing students' experience and self-confidence with clinical simulation design and their personal and studying related data,

This study found a statistically significant correlation between the following variables: gender, prior accomplishment, clinical simulation (medical surgical course), and the design of nursing students' clinical simulation experiences.

This finding is in line with **Alshutwi et al. (2022)** who demonstrated that the overall score of the simulation scenarios differed considerably by gender and that the simulation efficacy tool changed significantly by demographic variables. In contrast, **Alsadi et al., (2023)** showed no statistically significant difference between male and female students regarding satisfaction in simulation or self-confidence in simulation.

Alsadi et al. (2023) verified that students from various years of the 4-year nursing program did not vary significantly in their satisfaction with simulation learning. According to **Alshutwi et al. (2022)**, The debriefing domain was also positively associated with GPA. Also, **Hung et al. (2021)** supported the use of simulation in preparing undergraduate nursing students to face real-world situations in medical, and surgical management areas and practice in an anxiety-free, safe environment, and reported that

students pursuing critical care nursing had higher satisfaction and self-confidence with the educational practices and simulation design used. As an added bonus, **Saragih et al. (2024)** demonstrated a substantial correlation between the location of the simulation scenario and the score of the simulation experience design. Students' proficiency, self-assurance, and practical knowledge are all enhanced by the use of simulation-based learning, which lessens their fear of failure. It is possible to adapt and enhance simulation-based approaches depending on cultural norms and resource availability. This involves giving careful thought to the level of realism (low, medium, or high) of the simulation and the tools used to convey it (virtual, video, standardized patient, mannequin, etc.).

Nevertheless, the current study's findings were not corroborated by **Mohamed and Mohamed (2020)**, who demonstrated that the demographic data of students, all aspects/. of the simulation design, and students' satisfaction and self-confidence were not significantly different.

Conclusion: Based on the findings of the present study, it was concluded that around half of nursing students had a high level of experience with clinical simulation design. As well as, more than of nursing students had a high level of self-confidence with clinical simulation experience . Moreover, there was a positive statistically

significant correlation was found between nursing students' experience with clinical simulation and their confidence with clinical simulation experience.

Recommendations: The following recommendations were suggested:

- Allocating budget for purchasing equipment and high fidelity patient simulation manikins to adapt to local and international challenges facing nursing education.
- Develop comprehensive training programs for nursing educators in different specialties to learn effectively how to design, practice, and debrief simulation-based experiences for meeting the intended learning outcomes of the nursing syllabus.
- Create a reward system such as recognition and certificates of appreciation for clinical nursing instructors applying clinical simulation to enhance their performance and achieve the required learning outcomes.

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The relation between Job Demands and Work Engagement among Nurses in Intensive Care Unit

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Abstract:

Background The work of a nurse may be emotionally and mentally taxing. Promoting patient safety is an essential responsibility of intensive care unit nurses. These nurses deal with patients who have life-threatening illnesses requiring intricate diagnostic and treatment processes. Healthcare companies are grappling with the difficulty of attracting and retaining skilled personnel, adding to the significant hurdles they already confront. The nursing profession, the standard of nursing care, and the involvement of nurses are becoming more and more of a focus on a worldwide scale. **Aim:** Evaluate Job burden and work engagement among nurses in Intensive care units. **Subjects and Method: Design:** The study's methodology was based on descriptive correlation research. **Setting:** All areas of Tanta Main General Hospital and the Emergency Hospital participated. **Subject:** The study subjects consisted of all nurses (n=390) from the earlier revealed setting. **Tools:** 2 tools were managed for collecting data (1) questionnaire Nurses' work engagement Assessment Scale (2) Nurses' Job demands. **Results:** Over half of nurses had moderate levels of overall job demands. The majority of nurses had low levels of work engagement. There was a statistically significant correlation among nurses overall Job demands and staff nurses overall work engagement. **Conclusion:** Job demands had a significant contribution to staff nurses work engagement. **Recommendation:** Staff nurses and head nurses should participate in frequent training sessions that address job needs and employee engagement. Nurses should not have to complete as much unrelated work, particularly during lengthy shifts, and should be able to focus on helping patients instead of being overwhelmed by paperwork.

Keywords: Job demands, Intensive care unit, Work engagement.

Introduction

Nursing is highly stressful and challenging profession. The global concerns are increasing toward factors that interfere with nursing professions. Shortage of nurses, increasing job demands, increasing patients' health needs and demands, and the health issues are among the main concerns that nurses are challenged with nowadays and for the next few years (**Alshammari, & Torres, S.et al., 2020**)

When caring for patients, nurses must take into account their mental, physical, financial, and emotional needs as well as the specifics of each patient's shift. It is well-established in the literature that such expectations constitute occupational stresses.

Nursing job demands refer to the characteristics of the job that need sustained nurses' cognitive and emotional effort as well as nurses' skills to achieve high quality of care. Where it may turn into job stressors when nurses' work requires high effort and abilities and nurses cannot recover from these stressors. The specifics of a nurse's workday are very context and patient condition dependent. In order to meet the needs of their patients, nurses must take a comprehensive view that considers not just the physical but also the mental, emotional, and work-related aspects of each patient's condition (**Al-Oweidat et al., 2023**).

Quantitative demand, often known as workload, is the quantity of work that people believe they are required to do

in a short era of time, measured in terms of how quickly they work. On the one hand, nurses must carry out their duties and offer high-quality nursing care; on the other, they face significant challenges in coping with the stress that comes with their work (**Gopinath et al., 2022**).

A job's physical demands include things like the amount of physical effort needed to complete tasks, the quality of working conditions, and any mandatory overtime that may be in place. There are a variety of physical challenges on nurses, including working in a workplace with a high nurse-to-patient ratio and inadequate resources (**Gopinath et al., 2020**).

The emotional component of work and the frequency with which one must deal with emotionally taxing events as a result of one's employment are what are known as emotional job demands. It is the frequency one is exposed to emotionally demanding situations and to those aspects of the job that require sustained emotional effort because of (extensive) contacts with others and patients. Emotional demands at the workplace consist of the aspects of work which require constant emotional input from the nurses mostly as a result of interactions with patients.

Many people who work in healthcare settings work irregular hours, including nights, weekends, and part-time. As a result of all these expectations, nurse managers have refocused their efforts on managing organizational and human issues that might have an impact on

nurses' work stress and demands, both in the short and long term. Burnout, presenteeism, poor treatment quality, turnover, discontent, and nurses' participation in their work are some of the negative outcomes that may occur when job demands surpass nurses' adaptive capability **(Fogliatto et al., 2024)**.

When nurses are emotionally and intellectually invested in their profession, they form strong bonds with their coworkers and managers. Physical, mental, emotional, and behavioral engagement are all signs of an engaged nurse. Putting one's body into an activity shows one's enthusiasm and drives to complete it. An individual's level of cognitive engagement can be described as the amount of mental effort they put into a positive arrangement, which involves the provision of emotionally connected personal resources. These resources can include beliefs, feelings of personal meaning, and connections to people, situations, or contexts within the context of their work. Affect oriented toward a number of work-focused goals related to the current temporal experience is shown by emotionally engaged nurses. Behavioral engagement is a psychological state of intention to behave in a manner that positively affects performance **(Albuqami et al., 2023)**.

Behaviorally engaged nurses are willing to put in extra effort, work harder for their team and organization and to do more than is expected. Where,

nurses' work engagement reduces nurses' absenteeism and turnover, improves nurses' morale, increases safety and nurses' motivation in intensive care units.

Critical decision-making, assisting patients in life-threatening situations, and dealing with emotionally taxing encounters are all part of an intensive care nurse's job description. As a result, nurses are exposed to work stress with negative consequences including dissatisfaction that affect their engagement in work. The likelihood of errors is increased when disengaged nurses hurry through routine procedures. Additionally, they are unable to connect with their peers in a timely manner and are struggling with empathy, exhaustion and fatigue, which impedes their capacity to concentrate on the task at hand and address the patient's requirements **(DiClementi et al., 2020)**.

Significance of the study:

Intensive care nurses must be able to make split-second choices, assist patients in severe condition, and deal with emotionally taxing encounters on the job. As a result, nurses are exposed to work stress with negative consequences including dissatisfaction that affect their engagement in work. Where, disengaged nurse streams through routine processes which increases the chances for errors. They also fail to communicate with their peers in a timely manner and suffer from compassion fatigue and burnout

which affects their ability to focus on the task at hand and respond to the patient's needs. So, this study needs to be addressed to assess nursing job demands and its relation to nurses' work engagement (**Rathnayake et al., 2022**).

Aim of the Study

Assess Job strains and work engagement between nurses in ICU.

Research Question:

What is the correlation among job load and work engagement between nurses in ICU?

Subjects and Method

Study design:

Descriptive correlation research design was utilized in this study.

Study setting:

The study was accompanied in ICU at Tanta Main University Hospital and Emergency Hospital. At emergency hospital include trauma & emergency, anesthesia. Tanta Main University Hospital contains medical, neurological, cardiac, ophthalmology, chest, neonatal and pediatric.

Subjects:

All registered nurses (n=390) working at the aforementioned facility who were accessible during data collection were included in the research: Trauma of Emergency (n=35), Medical ICU(n=53) Anesthesia, ICU(n=60), ICU(n=25), Ophthalmology Anesthesia, Neurological ICU (n=52), Cardiac ICU (n=20), Chest ICU(n=16), Neonatal ICU (n=89) and Pediatric ICU (n=40).

Tools

To achieve the aim of study, the following tools were used.

Tool I: Nurses' Job Demands Questionnaire

To evaluate the scope of nurses' responsibilities, the researcher created this instrument using Al Homayan (2013) and other current relevant literature as a reference. It was separated into the following 2 sections: **Part 1:** Demographic information on nurses, including their years of experience, age, marital status, department, education level, sex, and number of children.

- **Part 2: Job Demands Assessment:** Assessing levels of nurses' job demands. It contains thirty-five elements classified into 4 subscales:
- Quantitative or workload demands: included 7 items (1-7).
- Physical demands: included 15 items (8-23).
- Emotional demands: included 6 items (24-30).
- Work shift demands: included 4 items (31-35).

Scoring system:

Three criteria were used to evaluate the nurses' replies. The Likert Scale included three possible responses: (1) disagree, (2) neutral, and (3) agree. After tallying up all the categories into levels according to the cutoff point, the final scores were determined statistically in the following way:

-A high level of job requirements, 75% or more.

- Job demands range from 60% to less than 75%.

-The job demands are low, less than 60%.

Tool II: Nurses' Work Engagement Scale

The researcher modified this instrument to evaluate the work engagement of nurses, following its development by Tiwari (2019). It was composed of 41 items, which were categorized into four subscales as follows:

- Physical work engagement: included 10 items (1-11).

-Cognitive work engagement: included 7items (12-19).

-Emotional work engagement: included 12items (20-32).

-Behavioral work engagement: included 8items (33-41).

Scoring system:

Nurses' responses were measured on three points Likert Scale ranged from 1-3 where (1) disagree (2) neutral (3) agree. The total score was statistically calculated by summing all categories into levels according to cutoff point as follows:

-High Level of work engagement $\geq 75\%$.

-Moderate level of work engagement 60 percent - <75 percent.

-Low level of work engagement <60 percent.

Method:

1. The research was getting official approval from Tanta University Hospitals' administration before being

presented to the relevant authorities in the chosen locations.

2.Ethical consideration:

a- Agreement of the ethical committee at Faculty of Nursing was gotten (24).

b) The research itself was neither painful or harmful to the nurses.

c-After giving nurses information about the study's purpose, nature, confidentiality, and withdrawal procedures, the nurses gave their agreement to participate.

d-When gathering information, precautions were taken to ensure confidentiality and privacy.

3. A panel of five subject-matter experts will review the Arabic translations of Tools I and II to ensure that the questionnaires are clear and that the material is genuine. The five specialists were 2 professors and an assistant professor from Tanta University's Faculty of Nursing who taught all courses in Nursing Service Administration.

-The authorities' reactions were exemplified in 4 points rating scale ranging from (1-4);4=strongly relevant, 3= relevant, 2=little relevant, and 1= not relevant. Necessary modification was done including clarification, omission of certain items and adding others and simplifying work related words.

5-A pilot study was executed on a sample (10%) of the nurses (n=39) nurses, and Whilst data was being collected, they were left out of the main research sample. Prior to beginning data collecting, pilot research was

conducted following the expert's recommendation. The goals of the pilot research were to ascertain how long it would take to finish the questionnaire and to check for issues with item sequence, clarity, application, and relevance. The researcher made adjustments to the tool based on input from the pilot trial. The staff nurses predicted that it would take twenty to thirty minutes to complete the questionnaire.

6- Data was gathered from nursing staff using the Nurse Job Demands and Nurses Work Engagement surveys.

7- Phase of data collection: the researcher gathered the data from the staff nurses. During normal business hours, the researcher visited with the nurses who were to fill out the survey at several locations. For the sake of accuracy, the individuals made note of their responses as the researcher watched. Over the course of six months, the data was gathered.

Statistical analysis:

Statistical Package for the Social Sciences, version SPSS, was used to organize, analyze, and tabulate the acquired data.

(16). Range, for quantitative data, standard deviation and mean were determined. For qualitative data, comparison between two groups and more was done using chi-square test. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at $p < 0.05$ for interpretation of results of tests of significance.

Data was fed and analyzed by the computer using IBM SPSS software package version 20. (New York: IBM Corp., Armonk) Quantitative and qualitative data were characterized by percentages and counts. median, Mean, standard deviation, and range (maximum and minimum) were utilized to characterize quantitative data. We used a 5 percent threshold of significance to evaluate the data.

Results

Table (1): Shows personal characteristic of nurses containing their years of experience, age, department, marital status, educational qualification, gender as well as number of children. The table presented that high (71.8%) of nurses had age < 25 years with mean age (26.37 ± 6.30). The majority (83.3 percent) of nurses had less than 5 years of experience with mean 3.16 ± 1.82. Nearly to quarter (22.8%) of nurses worked in neonatal intensive care units. Nurses (15.4%), (13.6%), (13.3%), (10.3%), (9.0), (6.4%), (5.1%), (4.1), were working in Emergency Medical, Neurological, Pediatric general medical, Cardiac Care Unit, Ophthalmology Anesthesia, Chest, General Medical respectively. Nearly two thirds (64.9%) of nurses were married and (100%) of nurses were female as well as (63.84%) had one child. Around half (45.9%) of them had bachelor science of nursing, (34.6%) had nursing technical institute and (12.1%) had diploma in nursing and only (7.4%) of them had master's degree in nursing.

Table (2): Shows nurses' overall level of job demands. The highest percentage (64.9%) of nurses had high level of quantitative or work load of job demands dimension. high percent (66.4%) of nurses had moderate level in work shift Job demands dimension. Equal high percentage (78.2%) of nurses had low level of physical and emotional dimension of job demands.

Figure (1): The figure shows levels of overall nurse's job demands. More than half of nurses had moderate levels of overall job demands. While more than 1 third of nurses had low level of job demands.

Table (3): Shows nurses' overall level of work engagement. Majority (95.4%,85.4%) of nurses had low levels in emotional work engagement and physical work engagement respectively. More than three quarters (75.6%) of nurses had low level in behavioral work engagement. While more than half (53.3%) of nurses had low level in cognitive work engagement.

Figure (2): Shows levels of nurses' overall work engagement. The common of nurses (98.5%) had low level of work engagement. While the minority (1.5%) had moderate level of work engagement.

Table (4): Show up the correlation among overall nurses' job demands and over all of nurses' work engagement. There was statistically significance correlation between physical work engagement and quantitative and emotional job demands at $p \leq 0.05$.

There was statistically significance correlation between cognitive work engagement and quantitative and emotional job demands at p less than or equal 0.05. engagement. There was statistically significant relation among their qualifications and years of experiences and staff nurses work engagement levels at ($p \leq 0.05^*$).

Table (1): Nurses ' personal characteristics (n = 390)

Personal characteristics	No.	%
Age		
<25	280	71.8
25–<30	42	10.8
30–<35	23	5.9
≥35	45	11.5
Min. – Max.	20.0 – 56.0	
Mean ± SD.	26.37 ± 6.30	
Years of experience		
<5	325	83.3
≥5	65	16.7
Min. – Max.	1.0 – 9.0	
Mean ± SD.	3.16 ± 1.82	
Department (ICU)		
Emergency Anesthesia ICU	60	15.4
Emergency Medical ICU	53	13.6
Neonatal ICU	89	22.8
Pediatric ICU	40	10.3
Neurological ICU	52	13.3
Cardiac Care Unit	25	6.4
Ophthalmology Anesthesia ICU	20	5.1
Chest ICU	16	4.1
General Medical ICU	35	9.0
Marital status		
Divorced	21	5.4
Married	253	64.9
Single	116	29.7
Educational qualification		
Bachelor science of nursing	179	45.9
Nursing Technical Institute	135	34.6
Technical Secondary School Diploma in Nursing	47	12.1
Master's degree	29	7.4
Gender		
Female	390	100.0
Male	0	0
Number of children		
1	249	63.8
2	94	24.1
3	32	8.2
4	14	3.6
5	1	0.3
Min. – Max.	1.0 – 5.0	
Mean ± SD.	1.52 ± 0.81	

Table (2): Over all Nurses' levels of job demands (n = 390)

dimension of job demands	High Level of job demands ($\geq 75\%$)		Moderate level of job demands (60% - <75%)		Low level of job demands (<60%)	
	No.	%	No.	%	No.	%
Quantitative or workload demands	253	64.9	112	28.7	25	6.4
Physical demands	0	0.0	85	21.8	305	78.2
Emotional demands	7	1.8	78	20.0	305	78.2
Work shift demands	21	5.4	259	66.4	110	28.2

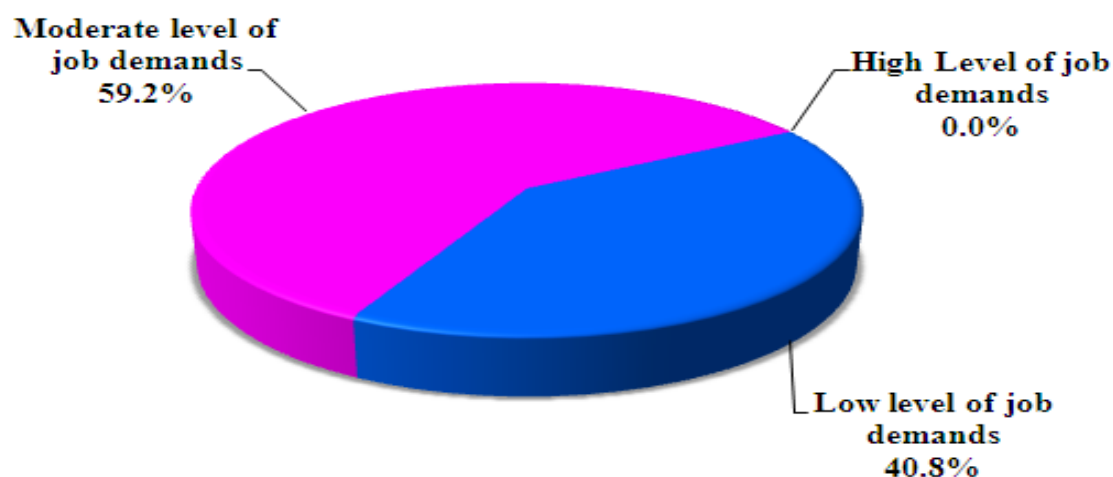
**Figure (1): Levels of overall nurses' job demands**

Table (3): Over all nurses' levels of work engagement (n = 390)

Subscales work engagement scale	Low level of work engagement (<60%)		Moderate level of work engagement (60% - <75%)		High Level of work engagement ($\geq 75\%$)	
	No.	%	No.	%	No.	%
Physical work engagement	333	85.4	56	14.4	1	0.3
Cognitive work engagement	208	53.3	158	40.5	24	6.2
Emotional work engagement	372	95.4	17	4.4	1	0.3
Behavioral work engagement	295	75.6	92	23.6	3	0.8

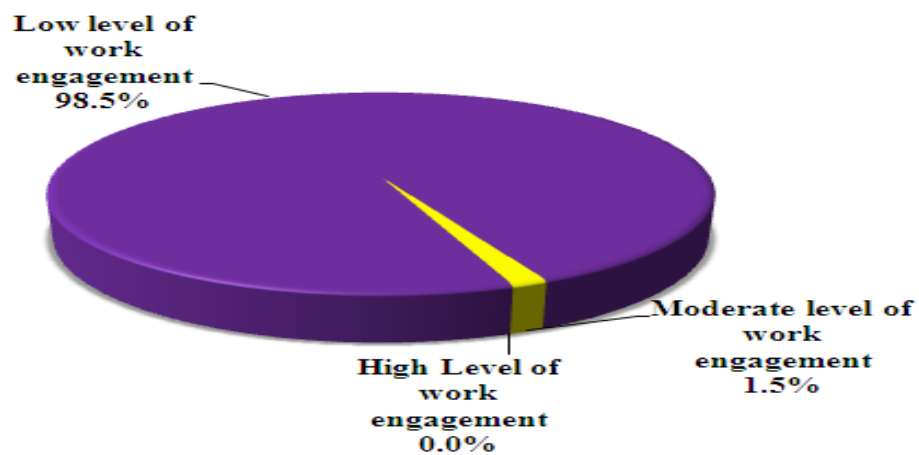
**Figure (2): Levels of overall nurses' work engagement (n = 390)**

Table (4): Correlation between nurses' job demands questionnaire and nurses' work engagement scale (n = 390)

Job demand		Quantitative	Physical	Emotional	Night shift	Overall work engagement
Physical work engagement	R	0.135*	0.054	0.148*	0.049	0.184*
	P	0.007*	0.291	0.003*	0.331	<0.001*
Cognitive work engagement	R	0.212*	-0.016	0.154*	0.146*	0.220*
	P	<0.001*	0.753	0.002*	0.004*	<0.001*
Emotional work engagement	R	-0.088	0.011	-0.085	-0.089	-0.108*
	P	0.083	0.821	0.095	0.078	0.034*
Behavioral work engagement	R	0.024	0.022	-0.037	0.034	0.019
	P	0.643	0.661	0.461	0.509	0.702
Overall job demands	R	0.117*	0.035	0.068	0.050	0.128*
	P	0.021*	0.490	0.183	0.328	0.011*

Discussion

Intensive care units are a highly stressful environment intensive care is a complex and difficult unit to high number of health care workers, especially nurses. Working in ICU cause fatigue and work stress that cause negative organizational impacts such as job dissatisfaction, decreased work performance, rapid turnover, deteriorated quality of service provision and work disengagement among nurses.

Finding of current study showed that that more than half of nurses had a moderate level of overall job demands. These findings may be interpreted due to that two thirds of nurses are young and had years of experience less than five years that can make them unable to deal with Job demands in ICUs. Additionally, the stressful nature of the intensive care unit work environment as well as nurses exposed to workload during work shifts considered as a stressor for nurses that increase job demands. The same result was found by **Kan and Suar (2018)** who informed that the level of job demands for the nurses in the ICUs was moderate. Also, **Elewa and El Banan (2020)** on their study reported that there is a high level of job demands in ICUs. In contrary the current study results disagreed with **Shamkh et al. (2021)** who confirmed that about three quarters of nurses have a low level of job demands among nurses.

Present study staff nurses showed the majority of nurses had low level of

overall work engagement. These findings may be interpreted due to that two thirds of nurses are young and have had years of experience, less than five years that can make them unable to deal and engaged with working in ICUs and also may be due to job demands including workload and work shift demands. These findings supported by **Alhozi et al. (2021)** According to their survey, most intensive care unit nurses describe feeling overwhelmed by their workload and always under pressure to satisfy patient requests.

The findings of the presents study exposed statistically significance correlation among overall job burden and overall work engagement. This means that job demands have an effect on staff nurses work engagement. In line with the result of this study, **Canadas et al. (2020)** whose study the relationships among nurses' perceived over-qualification, work engagement and job stressors. They found a significant and positive relationship among job demands and engagement.

According to the outcomes of this study, a correlation among workload and engagement exists. According to **Yamada et al. (2019)**, nurses' capacity to stay engaged is often hindered by variables such as an increasing workload and a poor work environment.

Conclusion

Overall, the job demands were moderate for over half of the nurses. And most nurses weren't really invested in what they did for a living. Among

critical care unit nurses, there was a statistically significant correlation among job demands and work engagement.

Recommendations

The current results lead us to propose the following changes:

Hospital management

Make sure that nurses have access to ongoing education and training programs that address the challenges they face on the job and provide strategies for overcoming them.

- Make available tools to meet the challenges of the job.
 - Head nurses and staff nurses should participate in regular training programs that focus on the importance of physical, mental, emotional, and behavioral involvement in the workplace.
 - Establishing an ideal work setting that encourages and supports staff nurses, allowing them to reach their full potential and beyond.
- Nursing group meetings should be held on a regular basis by head nurses in order to express, revitalize, and encourage social and peer engagement.
- Create supportive working conditions to encourage nurses' trust, empathy and mutual regard.
 - Organize nursing group to enhance verbalizing, vitalizing and supporting peer and social interactions.
 - Develop more comprehensive program's staff nurses, offer help as well as support to improve their concentration,

contribution and vitality in working, in order to increase their work engagement. Both undergraduate and postgraduate nursing education programs must modify their curricula to emphasize competencies in emotional intelligence and work engagement.

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Effect of Implementing Nursing Interventions on Clinical Outcomes for Critically Ill Patient Undergoing Total Parenteral Nutrition

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Abstract

Background: Total parenteral nutrition (TPN) represents an essential modality of nutritional support for critically ill patients who are unable to utilize the gastrointestinal tract. However, its associated complications necessitate the implementation of structured nursing interventions to enhance patient safety and optimize clinical outcomes. **Aim:** This study designed to assess the impact of nursing interventions on critically ill patients receiving TPN. **Design:** A quasi-experimental research design was employed. **Setting:** The study was executed in the Surgical ICU at the Emergency Hospital of Tanta University, which operates under the Ministry of Higher Education and Scientific Research. **Subjects:** A purposive sample of 60 adult critically ill patients was recruited and equally placed into two groups, with 30 participants in each. **Tools:** Data collection was facilitated through three instruments: (I) critically ill patient assessment tool, (II) nutritional assessment tool, and (III) TPN clinical outcomes assessment tool. **Results:** The main findings demonstrated that 56.67% of patients in the intervention group regained full consciousness, in contrast to 30% of those in the control group. Hemodynamic parameters were observed, with normal temperature ($37.81 \pm 1.69^{\circ}\text{C}$), lower respiratory rate (16.07 ± 4.59), and improved oxygen saturation ($93.67 \pm 6.72\%$). Moreover, the study group also had fewer metabolic complications, including hypoglycemia (13.33% versus 43.33%). Catheter-related infections (e.g., drainage: 16.67% versus 53.33% in control group). **Conclusion:** Structured nursing interventions proved effective role in reducing TPN-associated complications and improving patients' clinical outcomes. **Recommendations:** It is recommended to incorporate nursing interventions as a standard component of care for critically ill patients having TPN is essential to enhance patient safety and optimize clinical outcomes.

Keywords: Clinical Outcomes, Critically ill patients, Nursing interventions, Total Parenteral Nutrition.

Introduction

Critically ill patients are highly prone to nutritional deficiencies as a result of severe catabolic responses triggered by stress, proinflammatory cytokines, and hormonal changes. Within ten days of admission, they may undergo a reduction in 10–25% of their body protein reserves, a condition that is strongly correlated with adverse clinical outcomes. **(Domnech –Briz et al., 2023)**

Total parenteral nutrition (TPN) represents a specialized nutritional formulation delivered through a central venous catheter (CVC). **(Mrkobrada et al., 2022)**. It ideally should be started within 3 to 7 days of ICU admission and must be considered when all strategies for enteral nutrition have failed to avoid severe malnutrition. **(Gostyńska, Stawny, Dettlaff, & Jelińska, 2019)**

TPN is indicated in digestive tract cancers and chemotherapy-related malabsorption. It is also used in severe food intolerance, bowel obstruction, or high-output fistulas, in cases of postoperative leaks, severe vomiting, or diarrhea. It is essential in hypercatabolic states like sepsis, trauma, burns, or inflammatory bowel disease (IBD). **(Lee, 2023)**.

Total Parenteral Nutrition is a compounded formulation consisting of macronutrients—lipid emulsions,

dextrose, and amino acids—along with micronutrients, including vitamins, electrolytes, minerals, and trace elements. Its composition should be customized by clinicians to meet the specific metabolic and nutritional requirements of each patient, thereby ensuring adequate caloric intake and preventing deficiency of essential fatty acids. Notably, deficiency of essential fatty acids can occur within three weeks of receiving fat-free TPN administration. Lipids typically account for 25% to 30% of the total caloric content. **(Baker, French, 2024)**

It has been reported that approximately 25% to 50% of patients receiving TPN experience adverse effects and long-term complications related either to central venous access or to TPN itself. The most frequently encountered complications include catheter-related events, metabolic disturbances, hepatic dysfunction, metabolic bone disease, thrombosis, dehydration, electrolyte imbalances, and infections **(Martina, 2023)**

Nurses bear responsibility for evaluating the patient's nutritional status by obtaining a comprehensive nutritional history, which includes current dietary habits, recent weight changes, and any evidence of pre-existing malnutrition. They should evaluate clinical signs of malnutrition,

such as muscle wasting, loss of subcutaneous fat, and the presence of edema, as well as the documentation of baseline anthropometric measurements such as height, weight, and body mass index (BMI). (Abd El-Raheem, 2021).

Significance of the study

Total Parenteral Nutrition is complicated interventions that necessitate appropriate care. It is associated with many complications that may affect patient outcome as central venous access affect 5% to 10% of individuals receiving TPN.(Mikail, 2022).

Hepatic complications affecting 15% to 40% of patients receiving TPN infusion. Hepatic complications include liver dysfunction, increased ammonia levels, and painful hepatomegaly. Metabolic bone disease is a problem that can arise in long-term TPN use. Approximately 40% of the patient's receiving long-term TPN infusion experience metabolic bone diseases such as osteomalacia and osteoporosis. (Zafirovska, Zafirovski, & Rotovnik Kozjek, 2023).

About 30% of critically ill patients receiving TPN by usual method without any Interventions, aseptic technique, and flushing CVC, the nurses are not aware of components of TPN, the correct method of

preparation, administration and how to terminate it. The nurse may giving medications through line of TPN this lead to severe complication, draw sample or measuring CVP from the same line that give false results (Mahgoub, AbdEl hafez,& Abdelal, 2019).

The aim of the study is:

To determine the impact of executing targeted nursing interventions on clinical outcomes among critically ill patients receiving TPN.

Research hypothesis

Clinical outcomes of patients who receive TPN are expected to be improved as (reducing the rate of catheter-related adverse events, particularly infections, occlusion and disconnection, decreasing the rate of fluid and electrolyte complication and improving nutritional status) than control group who are not exposed.

Subjects and method:

Research design:

Our study was executed via a quasi-experimental research design.

Setting:

The study was executed at Surgical Intensive Care Unit (ICU) of Emergency Tanta University Hospitals. The unit consisted of three rooms, each containing four beds, with a total capacity of 12 beds.

Subjects:

A purposive sample of 60 adult individuals who fulfill the criteria for inclusion was recruited from the aforementioned setting, with the sample size determined using the Epi Info 7 statistical program total population. The participants were equally assigned into two groups, comprising 30 participants each, as follows:

Control group: - comprised 30 adult participants who received routine ICU care implemented by critical care nursing staff when giving TPN such as administering TPN formula according to doctor order.
Study group: - consisted of 30 adult participants who received nursing interventions which was implemented by the researcher. In addition to the routine ICU care.

The inclusion criteria were as follow:

- Participants from 21 years and 60.
- Including both male and female participants.
- Newly admitted participants who had initiated TPN within the first 24 hours.
- Admitted patients where the GI tract is expected to be non-functioning for greater than 5-7 days.
- Patients unable to absorb nutrients or need bowel rest.

The exclusion criteria were as follow:

- Patients with BMI < 18.5 on admission
- Patients suffering from cardiovascular instabilities
- Pregnant and lactating females

Tools of data collections:

Data collection was carried out using three tools, as follows:

Tool I: Critically Ill Patients' Assessment Tool.

This tool was designed by the investigators adhering to a comprehensive review of the relevant literature. (Brown, Ballal, & Al-Haddad, (2021); Mahran, Tolba, Abbas, & Thabet, (2023). It encompassed of two parts, as follows:

Part a: Patients' Demographic Data:

It comprised information on the patient's age and gender.

Part b: Patients' Clinical Data:

This section encompassed the current diagnosis and past medical record.

Tool II: Nutritional Assessment Tool

The researcher developed this tool grounded in a comprehensive analysis of the pertinent literature. (Casadei,Kiel, 2019;OsunaPadilla, Hernández Cárdenas, RodríguezMoguel & Rodríguez Llamazares, 2022; Kesari & Noel, 2022). It was composed of three parts, as follows:

Part (a): Anthropometric measurement

This part included assessment of weight, height, BMI, measurement of skinfold thickness and mid-arm circumference.

Part (b): Laboratory Investigations:

This part included assessment of complete blood count, liver function test, random blood glucose test and C - reactive protein.

Part c: Fluid Volume Balance Assessment

This part included assessment of intake and output, integrity of skin and mucus membrane and central venous pressure (CVP).

Scoring system

- For numerical data: mean scores and stander deviation (SD) of the previous items were calculated.
- For descriptive date: score 1 was used if the item was present and score 0 was used if the item wasn't presen

Tool III: Total Parenteral Nutrition Clinical Outcomes Assessment Tool

This tool was constructed by the investigators following a review of the up to date relevant published research. (Pitiriga et al., 2020; Chung, & Berger, 2023) It encompassed three parts, as follows:

Part (a): Central Venous Catheter Infection Assessment

This section involved the assessment of signs and symptoms of CVC

infection, including redness, swelling or warmth at the catheter insertion site, yellow or green discharge, and pain or discomfort at CVC insertion site, fever and elevated White Blood Cells.

Scoring system

- Score 0: was used if the item was not present.
- Score 1: was used if the item was present

Part (b): Mechanical Complications of Central Venous Catheter

This part included assessment of catheter malposition, blocking, thrombosis, or disconnection

Scoring system

- Score 0: was used if the item was not present.
- Score 1: was used if the item was present

Part(c): Complications related Total Parenteral Nutrition Administration (Martin, 2023). This part consisted of:

- Metabolic adverse events linked with carbohydrate administration, as hypoglycemia and hyperglycemia.
- Complications related to electrolyte imbalances as hypokalemia, Hyponatremia, Hypophosphatemia, Hypocalcaemia, and Hypomagnesaemia
- Assessment of signs and symptoms of fat embolism—including headache, cyanosis, skin flushing, and dyspnea—

which represents a rare but serious complication of infusion.

Method

Administrative process:

Documented approval to execute the study was secured from the Faculty of Nursing, Tanta University, and presented to the Director of the Surgical ICU at the Emergency Hospital, Tanta University Hospitals.

2-Ethical Consideration:-

A-Authorization of the Scientific Research Ethics Committee of Faculty of Nursing was secured with code number (352\12\2023).

B- The nature of the study did not pose any risk or cause harm to the participants.

C- Maintenance of confidentiality and protection of privacy was assured.

D- Participants retained the right to decline participation or withdraw from the study at any point.

E- Participants or participants' first degree relatives' written informed consent was secured from all participants after a thorough explanation of the study's objectives. Participants were fully informed of the study's purpose and their right to withdraw at any time."

3-Tool development

All tools utilized in this study (Tool I, Tool II, and Tool III) were designed by the researcher based on a comprehensive review of the pertinent

literature." with the exception of the Glasgow Coma Scale (GCS) component.

4- Pilot study:

A pilot study was executed on 6 participants (10% of the sample) admitted to the Surgical ICU of the Emergency Hospital at Tanta University to evaluate the clarity, feasibility, relevance, and applicability of the study tools. Grounded on the findings, necessary modifications were made prior to conducting the main study. The participants enrolled in the pilot study were omitted from the final study sample.

5- Validity of the tools

The content validity of the developed tools was assessed for clarity and applicability by nine experts in Critical Care Nursing, Critical Care Medicine, and Biostatistics. Based on their recommendations, the necessary revisions were made to ensure validity.

6-Reliability

The reliability of the developed tools was assessed via Cronbach's alpha test, yielding a reliability coefficient of 0.95.

7. Data collection

Data collection was executed over an interval of eight months, from first of April 2024 to the end of November 2024.

8-Patients who fulfilled the criteria for inclusion immediately on admission

were assessed and placed into two equal groups of 30 participants each. To prevent data contamination, the researcher began with the control group patients first.

9- The present study was executed via four phases which included:

Phase(1) Assessment phase:-

An initial assessment was conducted on the first day, all participants in the aforementioned setting were assessed to identify those fulfilling the study's inclusion and exclusion criteria, and baseline data were collected using Tool I, Parts A and B.

Phase (2) Planning phase:-

This phase was developed grounded on the evaluation results and a review of the literature, with priorities and expected outcome criteria established to guide patient care planning.

Expected outcome criteria include:

- Maintain optimal nutritional condition, as indicated by stable weight or BMI and improved serum albumin levels.
- Decrease CVC related mechanical complications
- Maintain optimal level of fluid balance
- Ensure blood glucose levels remain within the normal range
- Ensure electrolyte levels are maintained within normal limits.

Phase (III) Implementation phase:-

Control group: had conventional hospital care implemented by CCN team such as administering TPN formula according to doctors' order.

Study Group: had TPN Interventions which were implemented for study group, it was applied by researcher from admission till two weeks from beginning of TPN administration in addition to the routine ICU nursing care for TPN administration.

Nursing Interventions for administration of TPN (Mahgoub, AbdEl hafez,& Abdelal, 2019;Martin, 2023).

It include the following steps

1-Nursing Interventions for preparing TPN Formula

- Total Parenteral Nutrition bags should be kept in the refrigerator.
- Each bag should "be retrieved from refrigeration 1–2 hours prior to infusion.
- Inspect formula color, consistency, presence of clots and expiry date.
- Inspect each TPN bag before administration to ensure it is free of leaks; any bag showing a leak should not be utilized owing to the elevated probability of microbial contamination.

2- Nursing Preparation of CVC for TPN administration

- Clean CVC and its insertion site using chlorhexidine 2% in alcohol 70% solution. If the participants is allergic

to chlorhexidine, 10% povidone-iodine in 70% alcohol can be applied as an alternative.

- Change catheter dressings via a sterile approach daily during the first week, and thereafter every 48 hours or as needed, such as when blood is observed beneath the dressing or the dressing becomes loose.

- Apply CVC dressings using a semi-permeable, transparent dressing according to available.

- The catheter insertion site should be examined and documented during each shift for indicators of infection, including redness, inflammation, and discharge

- Line of central line must be labeled for TPN only.

3-Administration of TPN

- Administer TPN via an infusion pump equipped with occlusion and air-in-line alarms to minimize the probability of embolism.

- Cover TPN bags with a light-protective sleeve should be used during infusion to prevent degradation of vitamins.

- Discard TPN bags 24 hours after the infusion has commenced, a new bag should be initiated even if some of the previous solution remains.

- Initiate TPN at a flow rate of 60–80 mL/hour and gradually raise the frequency to prevent hyperglycemia.

- Avoid drawing blood or giving medications or monitoring CVP through TPN line

- Maintain strict sterile technique when administering TPN, including using sterile gloves, a sterile IV set, a needle-free connector, 10 mL of 0.9% sodium chloride for infusion, and 70% alcohol or alcohol/chlorhexidine wipes, in accordance with the TPN bags and the patient's prescription chart.

4-Interventions for monitoring patients during TPN for preventing TPN complications.

- Monitor fluid intake and output to ensure accurate maintenance of fluid balance.

- Observe for signs of overhydration, comprising coughing, dyspnea, jugular vein distension, and crackles, and compare intake versus output to identify fluid deficits or excesses.

- Evaluate for signs and symptoms of electrolyte imbalances, such as alteration in degree of consciousness, muscle tremors, seizures, and cardiac abnormalities including ST-segment changes, U-waves, or ventricular dysrhythmias.

- Monitor blood glucose levels and assess for hypoglycemia (e.g., clammy skin, agitation, tremors), which may happen if TPN infusion is decreased or stopped, and for hyperglycemia (e.g.,

thirst, polyuria, glycosuria), commonly observed at TPN initiation.

- Evaluate for signs of essential fatty acid deficiency, including dry, scaly skin, easy bruising, thrombocytopenia, and impaired wound healing, and measure serum triglyceride levels.
- Evaluate for complications related to amino acid deficiency.
- Flush the TPN port with 10 mL of 0.9% sodium chloride after TPN discontinuation; for central lines, aspirate before flushing to decrease the probability of occlusion.
- Ensure accurate operation of the infusion pump.
- Avoid abrupt cessation of TPN; reduce the infusion rate by 50% for 1–2 hours before discontinuation.

5. Evaluation phase

Evaluation of participants in both the control and study groups was executed three times: upon admission, at the end of the first week, and at the end of the second week, using Tool II and Tool III. This assessment designed to determine the impact of executing nursing interventions on the clinical results of critically ill participants receiving TPN, with comparisons made among the control and study groups.

Results

Table (1): Reveals distribution of the studied critically ill participants

regarding their socio-demographic characteristics.

In terms of age, it was recorded that the mean age of patient in the control group was 45.67 ± 11.140 years, while it was 37.00 ± 8.816 years in the study group. **In link to gender**, more than half of the participants were male, comprising 53.33% of the control group and 56.67% of the study group. No statistical significant differences were found among the control and the study group with regard to ages and gender where $p > 0.05$ for each.

Table (2): Shows distribution of the studied critically ill participants in terms of their clinical data.

Concerning current diagnosis, this table showed that 40.00% and 36.67% of the control and study group had acute intestinal obstruction, respectively. **Regarding past medical history**, 43.33% of the control group relative to 30.00% of the study group had GIT disorders. No statistical significant differences were observed among the study and control groups with regard to current diagnosis and past medical where $p > 0.05$ for each.

Table (3): Shows mean scores of anthropometric measurements of the studied critically ill participants during periods of nursing intervention

This table exhibited that the control group had a significant decline in

nutritional parameters over time, including reductions in body weight, BMI, skin fold thickness, and mid-arm circumference with $P < 0.05$. In contrast, the study group maintained stable values in weight, BMI, and skin fold thickness ($P > 0.05$), with a significant improvement in mid-arm circumference by at the end of the second week with $P = 0.002$.

Table (4): Presents mean scores of liver functions tests of the studied critically ill patients during periods of nursing intervention

This table highlighted that a significant improvements of mean albumin levels (3.74 ± 0.88 and 4.19 ± 1.34) within the study group at the end of the first week and at the end of the second week with $p = 0.005$, respectively. In contrast no statistical significant changes in mean albumin levels (3.62 ± 0.79 and 3.44 ± 1.06) within the control group at the end of the first week and at the end of the second week with $p = 0.201$, respectively.

Concerning total protein levels, significant improvements were noted in the mean total protein levels (5.75 ± 0.80 , 6.14 ± 1.00 , 6.56 ± 1.30) within the study group during the interval of the study with $p = 0.014$, respectively. Conversely no statistical significant changes in the total mean protein levels (6.15 ± 1.33 , 5.70 ± 1.47 , 5.24 ± 1.59) within the control group

On the first day of, at the end of the first week, and at the end of the second week with ($p 0.059$), respectively.

Table (5): Shows distribution of the studied critically ill participants in terms of Fluid volume assessment during periods of nursing intervention.

This table concluded that fifth (20.00%) of the control group relative to 26.67% of the study group were hypervolemic during the first day of admission. Moreover, hypervolemia category was higher (33.33% and 36.67%) in the control group compared to 23.33% and 20.00% in the study group at the end of first week and second week, respectively.

Additionally, there were statistical significant raise in CVP levels over time in both groups. In control group, mean CVP levels increased from 5.43 ± 0.31 during the first day of admission to 16.23 ± 1.55 by the end of the second week with $P = 0.002$. While, in the study group, slight elevation of CVP levels from 8.21 ± 0.18 during the first day of admission to 13.03 ± 1.14 by the end of the second week with $P = 0.001$.

Table (6): Shows distribution of the studied critically ill participants in terms of signs and symptoms of CVC infection during periods of nursing intervention.

This table described that an equal proportion of 26.67% in the control group relative to 30.00% in the study group. had swelling and redness at CVC insertion site during the first day of admission. Also, two thirds (66.67%) of the control group relative to 33.33% and 30.00% of the study group had swelling and redness at CVC insertion site at the end of second week, respectively.

Additionally, Yellowish or greenish drainage appeared in (53.33%) of control patients by the second week with ($P=0.000$), relative to only (16.67%) in the study group with ($P=0.036$). Furthermore, an equal fraction of the control and study group (16.67%, 10.00 % and 23.33%) had warmth and pain at CVC insertion site and fever during the first day of admission. While, 80.00 %, 53.33% and 63.33% of the control group compared to 33.33%, 20.00% and 33.33% of the study group had warmth and pain at CVC insertion site and fever at the end of second week, respectively.

Table (7): Shows distribution of the studied critically ill patients regarding mechanical complications of CVC during periods of nursing intervention.

In regard to mechanical complications of CVC, this table described that neither of the control

group nor the study group had catheter malposition, blocked catheter, disconnection of catheter and bleeding during the first day of admission. However, higher percent of the control group (56.67%, 53.33%, 40.00%, and 30.00%) compared to (20.00%, 13.33%, 16.67%, and 10.00%) of the study group had catheter malposition, blocked catheter, disconnection of catheter and bleeding at the end of the second week ,respectively.

Additionally, there was a statistically significant increase in catheter malposition, blocked catheter, bleeding in the control group overtime with ($p<0.05$). In the study group, significant changes were observed in blocked catheter and bleeding only ($p<0.05$), while catheter malposition and disconnection didn't reach statistical significance.

Table (8): Illustrate distribution of the studied critically ill participants in terms complications related to TPN administration during periods of nursing intervention.

These results described that an equal fraction (10.00%) of the control group and the study groups had hypoglycemia during the first day of admission. However, by the end of the second week, the hypoglycemia increased to 43.33% in the control group, while it persisted low in the study group (13.33%). Hyperglycemia

affected exceeding half (53.33%) of the control group by the second week compared only 10.00% of the study group.

Concerning electrolyte imbalances, nearly one-third (26.67% and 30.00%) of the control group had hypokalemia and hyponatremia on admission, increasing to (30.00% and 46.67%) by the end of second week, respectively. While the study group showed lower rates of hypokalemia and hyponatremia (20.00% and 10.00%), respectively.

Hypophosphatemia was also equal at baseline (10.00%) but increased to around one-third in both groups by the second week (33.33% in the control and 30.00% in the study group).

Additionally, equal proportions (20.00% and (16.67%) of both groups had hypocalcaemia and hypomagnesaemia during the first day of admission, respectively. While, exceeding half of the control group (53.33% and 60.00%) compared to only (20.00% and 26.67%) of the study group developed hypocalcaemia and hypomagnesaemia by the end of second week, respectively.

With regard to fat embolism manifestations, an equal proportion of participants in both the control and study groups (6.67%) presented with headache and dyspnea on admission. By the end of the second week, the

incidence increased in the control group to (16.67%) for headache and (26.67%) for dyspnea, while it decreased in the study group to (3.33% and 13.33%) for headache and dyspnea, respectively. Also, similar proportions (13.33%) in the control group compared to 10.00% of the study group presented with cyanosis and skin flushing during admission. By the end of the second week, cyanosis and skin flushing were reported in (16.67%) of the control group relative to (13.33% and 3.33%) of the study group, respectively.

Table (1): Distribution of the studied critically ill participants in terms of their socio-demographic characteristics

Characteristics	The studied participants (n=60)				χ^2 P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
Age (in years)					1.818 0.238
46. (21-<30)	2	6.67	7	23.33	
47. (30-<40)	4	13.33	9	30.00	
48. (40-<50)	12	40.00	10	33.33	
49. (50-<60)	6	20.00	4	13.33	
50. (≥ 60)	6	20.00	0	0.00	
Range	(23-63)		(23-55)		t=1.341
Mean $\pm$ SD	45.67 $\pm$ 11.140		37.00 $\pm$ 8.816		P=0.211
Gender					
51. Male	16	53.33	17	56.67	FE
52. Female	14	46.67	13	43.33	0.606

* Significant at level $P < 0.05$.**Table (2): Distribution of the studied critically ill participants in terms their clinical data**

Clinical data	The studied participants (n=60)				χ^2 P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
Diagnosis					46.226 0.694
2. GIT cancer	9	30.00	10	33.33	
3. Acute intestinal obstruction	12	40.00	11	36.67	
4. Gastric ulcer	4	13.33	4	13.33	
5. GERD	3	10.00	4	13.33	
6. Acute pancreatitis	2	6.67	1	3.33	
# Past medical history					3.439 0.487
7. None	11	36.67	13	32.50	
8. DM	7	23.33	3	10.00	
9. Hypertension	2	6.67	0	0.00	
10. Respiratory diseases	2	6.67	1	3.33	
11. Hepatic disorder	2	6.67	1	3.33	
12. GIT disorder	13	43.33	12	30.00	

More than one answer was chosen

* Significant at level $P < 0.05$.

Table (3): Mean scores of anthropometric measurements of the studied critically ill participants during periods of nursing intervention

Items	The studied participants (n=60)							
	Range							
	Mean $\pm$ SD							
	Control group (n=30)			F P	Study group (n=30)			F P
	First day of Admission	End 1 st week	End 2 nd week		First day of admission	End 1 st week	End 2 nd week	
1- Weight (in kg)	(61-110) 79.47 $\pm$ 11.88	(63-100) 76.08 $\pm$ 10.64	(55-120) 68.17 $\pm$ 10.03	8.53 0.000*	(60-90) 71.03 $\pm$ 7.42	(60-91) 71.12 $\pm$ 7.25	(56-93) 71.32 $\pm$ 8.15	0.01 0.989
2- Height (in cm)	(155-190) 173.03 $\pm$ 12.33	(155-190) 173.03 $\pm$ 12.33	(155-190) 173.03 $\pm$ 12.33	0.00 1.00	(150-195) 169.67 $\pm$ 10.77	(150-195) 169.67 $\pm$ 10.77	(150-195) 169.67 $\pm$ 10.77	0.00 1.00
3- BMI	(21.45-38.51) 26.72 $\pm$ 4.36	(19.45-35.01) 25.61 $\pm$ 4.01	(17.44-33.26) 23.02 $\pm$ 4.28	6.07 0.003*	(22.16-28.89) 24.74 $\pm$ 2.21	(20.68-29.33) 24.81 $\pm$ 2.57	(18.52-29.78) 24.93 $\pm$ 3.23	0.04 0.962
4- Skin fold thickness	(13.6-36.4) 24.07 $\pm$ 6.48	(11.6-32.1) 22.47 $\pm$ 6.34	(7.1-29.6) 19.03 $\pm$ 6.12	5.00 0.009*	(11.6-30.7) 19.83 $\pm$ 5.74	(13.6-30.2) 20.71 $\pm$ 5.56	(13.8-31.5) 21.49 $\pm$ 5.80	0.64 0.532
5- Mid arm circumference	(20-45) 25.43 $\pm$ 5.62	(20-40) 24.07 $\pm$ 4.79	(18-38) 21.82 $\pm$ 5.22	3.67 0.030*	(21-28) 24.23 $\pm$ 1.74	(22-30) 25.57 $\pm$ 2.30	(19-33) 27.07 $\pm$ 4.41	6.52 .002*

* Statistically significant at level $P < 0.05$

Table (4): Mean scores of liver functions tests of the studied critically ill participants during periods of nursing intervention

Items	The studied participants (n=60)							
	Range							
	Mean ± SD							
	Control group (n=30)			F P	Study group (n=30)			F P
First day of admission	End 1 st week	End 2 nd week	First day of Admission		End 1 st week	End 2 nd week		
Liver function test								
a. Albumin	(2.5-6) 3.87±0.90	(2-5) 3.62±0.79	(1.5-5) 3.44±1.06	1.63 0.201	(2-5.5) 3.30±0.79	(2-6) 3.74±0.88	(1.5-5.4) 4.19±1.34	5.64 0.005*
b.Total protein	(3.5-9) 6.15±1.33	(3-8) 5.70±1.47	(2.5-7.2) 5.24±1.59	2.92 0.059	(4.3-7) 5.75±0.80	(4-7.9) 6.14±1.00	(3.5-8) 6.56±1.30	4.47 0.014*

* Significant at level $P < 0.05$

Table (5) Distribution of the studied critically ill participants in terms of Fluid volume assessment during periods of nursing intervention

Fluid volume Assessment	The studied participants (n=60)													χ^2 P
	Control group (n=30)						χ^2 P	Study group (n=30)						
	First day of Admission		End 1 st week		End 2 nd week			First day of Admission		End 1 st week		End 2 nd week		
	N	%	N	%	N	%		N	%	N	%	N	%	
- Euvoemia	22	73.33	18	60.00	16	53.33	22.57 0.000*	21	70.00	22	73.33	24	80.00	33.021 0.000*
- Hyper volemia	6	20.00	10	33.33	11	36.67		8	26.67	7	23.33	6	20.00	
- Hypo volemia	2	6.67	2	6.67	3	10.00		1	3.33	1	3.33	0	0.00	
CVP														
Range	(4-10)		(3-22)		(2-25)		F=9.01	(5-9)		(4-20)		(6-17)		F=9.35
Mean ± SD	5.43±0.31		14.00±1.49		16.23±1.55		P=0.002*	8.21±0.18		15.77±1.63		13.03±1.14		P=0.001*

* Significant at level P<0.05

Table (6): Distribution of the studied critically ill participants in terms of present signs and symptoms of CVC infection during periods of nursing intervention.

Signs and symptoms	The studied participants (n=60)													
	Control group (n=30)						χ^2 P	Study group (n=30)						χ^2 P
	First day of Admission		End 1 st week		End 2 nd week			First day of Admission		End 1 st week		End 2 nd week		
	N	%	N	%	N	%		N	%	N	%	N	%	
1. Swelling at insertion site	8	26.67	13	43.33	20	66.67	13.68 0.001*	9	30.00	11	36.67	10	33.33	14.26 0.001*
2. Redness at insertion site	8	26.67	18	60.00	20	66.67	18.45 0.000*	9	30.00	11	36.67	9	30.00	24.57 0.000*
3. Yellowish/greenish drainage at the insertion site	0	0.00	7	23.33	16	53.33	26.800 0.000*	0	0.00	2	6.67	5	16.67	6.65 0.036*
4. Warmth at the insertion site	5	16.67	15	50.00	24	80.00	18.085 0.000*	5	16.67	12	40.00	10	33.33	18.44 0.000*
5. Pain/discomfort at the insertion site	3	10.00	13	43.33	16	53.33	6.457 0.040*	3	10.00	8	26.67	6	20.00	22.35 0.000*
6. Fever	7	23.33	17	56.67	19	63.33	30.581 0.000*	7	23.33	9	30.00	10	33.33	17.12 0.000*

* Significant at level $P < 0.05$.

Table (7): Distribution of the studied critically ill participants in terms of mechanical complications of CVC during periods of nursing intervention.

Mechanical Complications	The studied participants (n=60)													
	Control group (n=30)						χ^2 P	Study group (n=30)						χ^2 P
	First day of admission		End 1 st week		End 2 nd week			First day of Admission		End 1 st week		End 2 nd week		
	N	%	N	%	N	%		N	%	N	%	N	%	
- Catheter malposition	0	0.00	11	36.67	17	56.67	20.45 0.000*	0	0.00	5	16.67	6	20.00	5.75 0.056
- Blocked catheter	0	0.00	19	63.33	16	53.33	19.57 0.000*	0	0.00	7	23.33	4	13.33	21.61 0.000*
- Disconnection of catheter	0	0.00	9	30.00	12	40.00	15.92 0.000*	0	0.00	5	16.67	5	16.67	1.21 0.546
- Bleeding	0	0.00	8	26.67	9	30.00	13.17 0.001*	0	0.00	4	13.33	3	10.00	19.52 0.000*

* Significant at level $P < 0.05$.

Table (8): Distribution of the studied critically ill participants in terms of complications related TPN administration during periods of nursing intervention.

Complications	The studied participants (n=60)													
	Control group (n=30)						χ^2 P	Study group (n=30)						χ^2 P
	First day of admission		End 1 st week		End 2 nd week			First day of Admission		End 1 st week		End 2 nd week		
Metabolic complications related to carbohydrate administration														
E. Hypoglycemia	3	10.00	10	33.33	13	43.33	6.42 0.040	3	10.00	3	10.00	4	13.33	3.99 0.136
F. Hyperglycemia	7	23.33	12	40.00	16	53.33	5.85 0.054	6	20.00	7	23.33	3	10.00	16.80 0.000*
Complication related to electrolyte imbalances														
1. Hypokalemia	8	26.67	13	43.33	9	30.00	5.95 0.051	5	16.67	10	33.33	6	20.00	10.73 0.005*
2. Hyponatremia	9	30.00	12	40.00	14	46.67	1.79 0.407	6	20.00	9	30.00	3	10.00	10.73 0.005*
3. Hypophosphatemia	3	10.00	8	26.67	10	33.33	15.87 0.000*	3	10.00	10	33.33	9	30.00	1.08 0.580
4. Hypocalcaemia	6	20.00	14	46.67	16	53.33	10.72 0.005*	6	20.00	10	33.33	6	20.00	11.23 0.004*
5. Hypomagnesaemia	5	16.67	16	53.33	18	60.00	17.38 0.000*	5	16.67	10	33.33	8	26.67	1.08 0.580
Manifestation of fat embolism														
1. Headache	2	6.67	8	26.67	5	16.67	10.24 0.006*	2	6.67	5	16.67	1	3.33	13.88 0.001*
2. Cyanosis	4	13.33	7	23.33	5	16.67	8.74 0.013*	3	10.00	3	10.00	4	13.33	2.13 0.343

3. Skin Flushing	4	13.33	6	20.00	5	16.67	24.11 0.000*	3	10.00	1	3.33	1	3.33	7.37 0.025*
4. Dyspnea	2	6.67	10	33.33	8	26.67	26.07 0.000*	2	6.67	8	26.67	4	13.33	6.94 0.031*

* Significant at level $P < 0.05$.

Discussion

The objective of our study was to determine the impact of nursing interventions on the clinical outcomes of critically ill patients receiving TPN. Total Parenteral Nutrition is a critical intervention in controlling of critically ill participants who are incapable of achieving adequate nutrition via the gastrointestinal tract. Total Parenteral Nutrition involves the administration of essential macronutrients, micronutrients, and electrolytes administered introduced straight into the circulatory system through a CVC, providing comprehensive nutritional support. This approach is crucial for maintaining metabolic homeostasis, preventing malnutrition, and promoting recovery during severe illness or after major surgeries, where gastrointestinal function is compromised (Martínez,Díaz, & Figueroa, 2019; Rajagopalan, & Prabhakar, (2022).

Regarding age, it was observed that the mean age of the control group was (45.67±11.140) years, while it was (37.00±8.816) years in the study

group. This data may be attributed to some participants in the sample may have required TPN due to clinical indications such as gastrointestinal surgery, obstruction, severe malnutrition, or inability to tolerate oral or enteral nutrition. These conditions are common among hospitalized or critically ill patients and may explain why TPN was necessary for them. This result was in line with **Mahgoub, AbdElhafez, & Abdelal, (2019)**, who conducted study about "Effect of Implementing Total Parenteral Nutrition Nursing Guidelines on Adult Critically Ill Patients' Outcomes." and reported a mean age of the control group was (43.6±14.2) years, while it was (38.4±15.4) years in the study group. study." and reported a mean age was 44.10±16.6 years in the study group.

Conversely, this result was contradicted by **de Cáceres et al., (2023)**, who carried study about "Caloric adequacy of parenteral nutrition and its influence on the clinical outcome of hospitalized. patients" and observed that the mean

age (72.00 ± 13.7) are more likely to receive total parenteral nutrition (TPN) due to severe malnutrition, diminished metabolic reserves, increased nutritional needs and swallowing difficulties making early nutritional intervention critical to prevent further clinical deterioration.

In relation to gender, our study revealed that over half of the participants were male. This study may be due to the fact that certain critical illnesses or surgical conditions requiring TPN such as gastrointestinal disorders or trauma are more common among males in this age group. Additionally, previous research suggests that males tend to be more frequently admitted to intensive care units, increasing their likelihood of receiving TPN during hospitalization. **(Johnson, Williams, & Davis, (2020).** This finding was parallel to **Yang, Qiu, Lv, & Li, (2024)**, who stated that more than half of studied patients were male and carried study about " A study of pharmacists-joint total parenteral nutrition in haematopoietic cell transplantation in accord with diagnosis related groups: A retrospective clinical research ". While, this result is inconsistent with **Baskar, Schoeneich, & Grewal, (2025)**, who stated that more than half of studied patients were females and conducted study about " In-hospital

Outcomes Between Total Parenteral Nutrition and Enteral Feeding in Esophageal and Gastric Cancer: A Nationwide Analysis ".

Pertaining to current diagnosis, this study demonstrated that the most prevalent relevant diagnosis in the studied sample was acute intestinal obstruction. This may be explained by the fact that acute intestinal obstruction is one of the most frequent emergency gastrointestinal states which need surgical intervention and nutritional support, particularly in cases where enteral or oral feeding is impracticable

This finding was supported by **Fragkos, Sebeopos-Rogers, & Rahman, (2020)**, who conducted study about "When is parenteral nutrition indicated in the hospitalized, acutely ill patient" and reported that common primary diagnosis among the participants was acute intestinal obstruction. More over this finding was inconsistent with **Comeche et al., (2019)**, who carried study about " Parenteral Nutrition in Patients with Inflammatory Bowel Disease Systematic Review, Meta-Analysis and Meta-Regression" and reported that majority of the studied sample had inflammatory bowel disease.

In terms of past medical history, our study showed that GIT disorders was the most frequent past medical record

in the studied groups this may be explained by the digestive system cannot safely or adequately process nutrition. This finding was justified by **Parkman et al., (2023)**, who concluded study about "Characteristics and outcomes of patients with gastroparesis using enteral and/or exclusive parenteral nutrition" and reported that the presence of prior GIT disorders further highlights the importance of nutritional assessment and support in these patients.

On the other hand, this finding was in congruent with study about "Total parenteral nutrition in patients with kidney disease." which shown that majority of studied patients had kidney diseases reported by **Portz& Kurashima, (2024)**.

As for anthropometric measurements, the current study exhibited that, the study group maintained stable values in weight, BMI, and skin fold thickness with a significant improvement in mid-arm circumference and no statistical significant changes of body height. The stability in weight, BMI, and skinfold thickness, along with improved mid-arm circumference explained by a key role of researcher in maintaining the nutritional status of the study group by preventing weight and muscle loss and provide adequate protein and energy intake. Such

consistent nutritional delivery and close follow up helped maintain nutritional status more effectively than in the control group. No significant change in body height was expected, as height is a fixed parameter in adults and is not influenced by short-term nutritional interventions.

These findings were similar to **Tran et al., (2023)** who conducted a study about "A Case of Abnormal Liver Function Tests in a Patient Receiving Total Parenteral Nutrition" and found that protein supplementation when meeting target intake is associated with better muscle outcomes and nutritional status in ICU settings.

In terms of liver function tests, the results of our study demonstrate a significant enhancement in albumin levels and total protein levels within the study group over the two-week follow-up period. These data suggest that TPN is pivotal in enhancing albumin and total protein levels by supplying essential amino acids needed for hepatic protein synthesis, maintaining nitrogen balance, and preventing muscle catabolism, which are vital in enhancing the nutritional status of critically ill participants under strict intervention and observation **Tong et al., (2022)**.

These results were agreed with the study about "The impact of preoperative total parenteral nutrition

on the surgical complications of Crohn's disease: A retrospective cohort study " conducted by **Tong et al., (2022)**, which attributed these a significant improvements to the provision of essential nutrients that support protein synthesis and overall metabolic function.

However, these findings incongruent with **Traiki et al., (2023)**, who concluded study about " The impact of preoperative total parenteral nutrition on the surgical complications of Crohn's disease." and argued that changes in serum albumin levels are not reliable indicators of nutritional effects in critically ill patients and found that while parenteral nutrition could improve nutritional status, albumin levels did not consistently reflect improvements in clinical outcomes.

Pertaining to fluid volume assessment, the results indicated a notable better fluid balance and more stable CVP in the study relative to control groups. This difference may be due to the controlled and calculated administration of fluids by the researcher during TPN administration, the use of fluid charts in the study group which helped prevent both hypervolemia and hypovolemia. Conversely, in routine care fluid might be administered without individualized calculations, increasing

the risk of fluid volume overload or dehydration.

The current study agreed with **Mahgoub, Abdelhafez, & Abdelal, (2019)**. Who carried study about " Effect of Implementing Total Parenteral Nutrition Nursing Guidelines on Adult Critically Ill Patients' Outcomes". which emphasized the importance of precision in fluid management for critically ill patients. They found that controlled fluid therapy helped mitigate fluid overload or deficit, leading to better outcomes in terms of fluid balance and CVP regulation.

Concerning the signs and symptoms of CVC insertion site infection, the results suggested that the study group experienced fewer and less severe complications at the insertion site. This could be due to the more rigorous and standardized TPN protocols followed in the study group, which often involve strict central line care practices, including sterile handling, daily monitoring, and proper catheter maintenance. These practices are essential in preventing local inflammation, drainage, and systemic symptoms such as fever, redness or swelling.

These findings aligned with **Huang, & Wu, (2025)**, who concluded study about "The Impact of Bundled Nursing Interventions on Preventing Central

Venous Catheter-Related Bloodstream Infections." and emphasized that strict infection control measures, including proper catheter care and hygiene, significantly reduce the incidence of infection and related complications at the CVC insertion site.

These findings were inconsistent with **Pitiriga, Bakalis, Kampos, Papadimitriou, & Tsakris, (2022)**, who carried study about "Duration of central venous catheter placement and central line-associated bloodstream infections after the adoption of prevention bundles: A two-year retrospective study and emphasized that prolonged catheter duration remains a significant risk factor, even when proper care is provided.

In relation to mechanical complications linked with CVC, the data of our study suggested that the study group experienced fewer and less severe mechanical complications such as malposition, blockage, disconnection and bleeding. This result could be explained by intervention or care protocol provided by researcher to the study group which minimizing risks. These interventions include securement device, routine flushing, and regular integrity assessments.

These findings agreed with study about "Monitoring and Complications of Total Parenteral Nutrition. In

Transfusion Practice in Clinical Neurosciences." conducted by **Wanchoo, (2022)**, which demonstrated that standardized catheter care protocols including securement and flushing practices significantly reduced the incidence of mechanical complications in critically ill patients.

However, These findings were inconsistent with **Reitzel, Rosenblatt, Chaftari, & Raad, (2019)**, who carried a study about "Epidemiology of infectious and noninfectious catheter complications in patients receiving home parenteral nutrition: A systematic review and meta-analysis" and suggested that despite interventions in patients having parenteral nutrition aimed at reducing mechanical complications, such risks including catheter malposition, bleeding and occlusion remain significant and require ongoing attention.

As for metabolic complications related to carbohydrates administration, these results suggested that significant progression over time in the control group, while the study group demonstrated better glycemic control. This reduction in the study group could be attributed to interventions implemented by researcher which produces a precise adjustment of carbohydrate

concentration and infusion rates, as well as strict monitoring protocols. Early detection of blood glucose fluctuations and timely interventions in the study group likely played a key role in minimizing these metabolic complications.

These findings aligned with **Lopez-Delgado et al., (2023)**, who conducted study about " Parenteral nutrition: current use, complications, and nutrition delivery in critically ill patients", which found no statistically significant complications when PN managed properly. This emphasizes the Patients on TPN are susceptible to significant glucose fluctuations, requiring careful insulin adjustment and continuous monitoring, lower starting doses and frequent adjustments per individual needs.

Concerning complications related to electrolyte imbalances, The current findings revealed that electrolyte-related complications were significantly lower in the study group proportional to the control group. This improvement may be explained by close screening of serum electrolyte levels in the study group by the investigator. Early correction of deficits and prevention strategies, as part of the intervention protocol, likely contributed to maintaining electrolyte balance and preventing associated complications.

These results were in the agreement with **Reddi, (2023)** who carried study about "TPN. In Fluid, Electrolyte and Acid-Base Disorders: Clinical Evaluation and Management " which emphasized the importance of monitoring and intervention in preventing refeeding syndrome, which can also complicate TPN therapy.

In relation to fat embolism, a noticeable reduction in fat embolism-related manifestations was observed in the study group. This improvement can be due to the optimized administration of intravenous lipids, including adjusting infusion rates and lipid formulations, which may have minimized lipid overload and embolism risks. Furthermore, frequent monitoring and supportive nursing care could have helped in early identification and management of these complications, thus reducing their incidence in the study group.

These findings was congruent with similar study about "The modern approach to total parenteral nutrition: Multidirectional therapy perspectives with a focus on the physicochemical stability of the lipid fraction." which reported that noticeable reduction in fat embolism among studied patients may be linked to improved lipid emulsion stability and carefully titrated and administered slowly that prevent metabolic complications,

including fat overload syndrome and embolic events reported by **Sobol, Chiczewski, & Wątróbska-Świetlikowska, (2025),**

Conclusion

The data of our study concluded that:

1- Implementing nursing interventions for patients receiving TPN is an effective strategy for maintaining nutritional status.

2-Applying nursing interventions for critically ill patients maintained hemodynamic parameters such as heart rate, respiratory rate, systolic, diastolic, and mean arterial blood pressure, and saturation of peripheral oxygen (SpO₂) within normal range.

3-Nursing interventions contributed to maintaining normal hematological parameters such as white blood cells (WBC), red blood cells (RBC), hemoglobin, hematocrit, and platelets.

4-The critical role of nursing interventions reduced rate of catheter-related infections and mechanical adverse events relative to the control group through the application of strict infection control measures and continuous patient assessment.

5-Applying nursing interventions for critically ill patients reduced complications rate, promoting faster recovery, and enhancing patient outcomes in intensive care settings.

Recommendations:

In light of the findings of the current study, it is recommended that:

1-Critically ill patients undergoing TPN should undergo regular nutritional assessment from admission to discharge to promptly identify and manage any nutritional deficits.

2-Continuous monitoring of metabolic parameters and electrolyte levels is essential to detect and correct any imbalances early.

3-Critical care nurses should strictly follow standardized nursing protocols for TPN administration to ensure patient safety and effective nutritional management.

4-Continuous monitoring of vital signs, hemodynamic parameters, and hematological indices should be integrated into daily nursing care to detect any clinical deterioration early.

5- Replicating the study with a larger sample size and extended follow-up could validate the findings and enhance their generalizability.

6-Prolonged follow-up studies are recommended to evaluate the sustained effect of nursing interventions and TPN protocols on patient results and quality of life.

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Mothers' Knowledge and Practices Regarding their Children Suffering from Idiopathic Constipation

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Abstract

Background: Idiopathic constipation is a common pediatric gastrointestinal disorder that affects children worldwide and rarely leads to life threatening complications, but can cause physical, emotional and social problems. **Aim:** the study aimed to assess knowledge and practices of mothers regarding their children suffering from idiopathic constipation. **Research design:** A descriptive research design was utilized. **Subjects:** Purposive sample of sixty children with idiopathic constipation and their mothers was involved. **Setting:** the study was conducted at pediatric surgical outpatient clinics at Tanta University Hospital. **Tools:** Two tools were utilized: **I-** Knowledge of children suffering from idiopathic constipation and their mother's structured interview schedule, **II-** observational checklist of children practice and their mother's reported practices. **Results:** All mothers and their children had low knowledge, and all of them had unsatisfactory practice regarding idiopathic constipation. **Conclusion:** Based on the results of the present study, it was concluded that, all mothers had low knowledge and unsatisfactory practice regarding to their children idiopathic constipation. **Recommendation:** Educational instructions must be designed for mothers to raise their performance regarding to idiopathic constipation.

Keywords: *constipation, idiopathic, knowledge, practices.*

Introduction:

Idiopathic constipation is a common pediatric gastrointestinal disorder that affects children worldwide. Idiopathic constipation is defined as constipation without an organic etiology. The etiology of it not fully understood and is likely multifactorial and characterized by difficult, painful defecation, incomplete or infrequent bowel movement. Idiopathic constipation is a diagnosis of exclusion, meaning that it's diagnosed when other possible causes of constipation, such as medical conditions, medications, or structural abnormalities in the digestive system have been ruled out (**Farooq, Hussain, Ayoub, Sumeena, 2024; Cox, Nambiar, Lui, & Cameron, 2020; Allen, Setya, & Lawrence, 2024**).

Idiopathic constipation affects 3% of children presenting to pediatric clinics and 25% of children presenting to gastroenterology clinics suffer from constipation. It is thought that 7% - 29.6% of children worldwide have constipation. It is reported that 3% of preschool and 1- 34% of school children have constipation. Many cases of constipation go unreported or undiagnosed, so the true prevalence may be higher (**Tran, & Sintusek, 2023; Al-Assal, Abd El-Gawad, Yadak, & Elzoghby, 2024**).

According to continents, Africa had a highest prevalence of constipation (31.4%), followed by America (12.1%), Europe (8.3%), and Asia (6.2%).with significantly more American and European children being affected than Asian ones. Additionally, geographical region, diet, and exposure to traumatic life events were linked to idiopathic constipation in children (**Tran, & Sintusek, 2023**).

Although the exact cause remains unclear, contributing factors include dietary habits, withholding behavior, and psychological stress. Additionally, toilet training difficulties can exacerbate the condition (**Yacob, & DiLorenzo, 2020; Paul, Broad, & Spray, 2021**).

Children with idiopathic constipation may experience physical discomfort that affects their ability to engage in daily activities. Constipation and fecal incontinence also have a negative psychological impact on children, leading to feeling of embarrassment, frustration, and low self-esteem (**Rajindrajith, Devanarayana, & Benninga, 2022**).

Significance of the study

Idiopathic constipation is a common problem in childhood, with estimated prevalence of 30% worldwide. Constipation in children is very common with a reported frequency of

up to 30%, the majority of cases 95% are due to idiopathic constipation. Constipation is often associated with infrequent, painful defecation and abdominal pain causes significant distress to the child and family and has a significant impact on health care costs (Mutyala, Sanders, & Bates, 2020).

Aim of the study was to:

Assess knowledge and practices of mothers regarding their children suffering from idiopathic constipation.

Research question:

What is the level of knowledge of mothers and their children regarding idiopathic constipation?

What is the level of practices followed by mothers in managing their children's idiopathic constipation?

Research design: A descriptive research design was utilized.

Setting: the study was conducted at pediatric surgical outpatient clinics at Tanta University Hospital.

Subjects:

Purposive sample of 60 children with idiopathic constipation and their mothers was involved.

Inclusion criteria of children:

-Both sexes

- Age from 5-10 years

-Rome IV criteria for constipation:

Two or more of the following

Two or fewer defecations per week, painful or hard bowel motion, large

fecal mass, one fecal incontinence per week and excessive stool retention.

Exclusion criteria:

- Organic causes of constipation as Hirschsprung's disease, anorectal malformation, and spina bifida.

- Post surgery of the gastrointestinal tract.

Tools for data collection:

Tool I: Knowledge of children suffering from idiopathic constipation and their mothers' structured Interview Schedule:

It was developed by the researcher after reviewing the related literature review to assess knowledge of children and their mothers about idiopathic constipation. It consisted of three parts:

Part (1): Bio-socio-demographic characteristics of mothers and their children consisted of the following:

a. Characteristics of mothers as age, educational level, occupation, marital status, number of children, and residence.

b. Characteristics of children as age, sex, birth order.

Part (2): Child past medical history:

It included; bowel habits, dietetic history, onset and duration of constipation symptoms.

Part (3): Knowledge of children and their mothers about idiopathic constipation:

It was designed by the researcher and was revised by the thesis supervisors as meaning, causes, signs, symptoms, eating habits, daily fluid intake, management and complications of constipation.

Knowledge of children and their mothers was scored as following:

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

Total score of children and their mothers' knowledge was classified as:

- Less than 60% was considered low level of knowledge.
- From 60 to less than 75 % was considered moderate level of knowledge.
- From 75 to 100 % was considered high level of knowledge.

Tool II: Observational checklist of children practice and reported practices of their mothers about bowel management

It was adapted by the researcher after review literature to assess practice of children and reported practices of their mothers about bowel management, it included:

Children practice as (e.g. performing diaphragmatic breathing exercises/ belly exercise)

Mothers reported practice as (e.g. monitoring daily fluid intake, and bowel habit training as proper posture, frequency, duration and positive reinforcement).

Abdominal massage therapy technique: It was developed by Mohamed et al in 2024, adapted and modified by the researcher after reviewing the related literature. It included; Applying slow circular clockwise movement along the line of the colon, apply constant moderate pressure to the abdomen for 1 minute and begin massage from the ascending colon toward the sigmoid colon.

Children practice and their mother's reported practice were scored as following:

- Done correctly and completely was scored (2).
- Done correctly and incompletely was scored (1)
- Incorrectly or not done was scored (0).

Total score was calculated as the followings:

- From 70% - 100% was considered satisfactory practice.
- Less than 70% was considered unsatisfactory practice.

Methods

1-Administrative process:

An official permission for data collection was obtained from the dean of the Faculty of Nursing, Tanta

University directed to the hospital administrative authorities of the previously mentioned setting after explanation the aim of the study to get their cooperation and acceptance for carrying out this study.

2- Ethical considerations:

Approval from the ethical committee to conduct the present study, code No.251\5\2023.

Confidentiality and privacy were taken into consideration regarding data collection.

Informed consents were obtained from children's mothers to participate in this study after explaining the aim and benefits of the current study.

The researcher emphasized that participation in the study is voluntary and they have the right to withdraw at any time.

The nature of the study didn't cause any harm or pain to the entire sample.

3- Tools development: Two tools were developed by the researcher to collect needed data.

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, comprehensiveness, and applicability. The content validity index = 94 %.

5- Reliability of the tools:

Cronbach's Alpha Reliability Analysis was used. For: Tool (I) was 0.811.

Tool (II) was 0.943 that indicated high reliability.

6- Pilot study:

A pilot study was carried out on 10% of the study sample to evaluate the clarity, applicability and feasibility of the research tools and the necessary modifications were done. Pilot study was excluded from the study.

7- Statistical analysis:

The collected data were organized, tabulated, and statistically analyzed using SPSS software. For quantitative data, numbers and percentage were used. Mean and standard deviation was calculated.

Results

Table (1) illustrates the percentage distribution of studied mothers based on bio-socio-demographic characteristics. It was found that the ages ranged from 23 to 45 years, with a mean of 32.47 ± 5.905 years, less than half of them were from 20-<30 years. Regarding to educational level, less than half of mothers (43.33%) had secondary education and less than one quarter (23.33) had university education. Concerning their occupation, more than three quarters were housewives (76.67%). Regarding marital status, the majority were married (81.67%). Concerning number of children, nearly half of the mothers (48.33%) had two children and two

thirds of them (66.67%) resided in rural areas.

Table (2) presents the percentage distribution of studied children in terms of socio-demographic characteristics and past medical history. It was found that, children's ages ranged from 5 to 10 years with a mean age of 6.98 ± 1.589 years. Regarding to gender, two third of them (66.67%) were male. Concerning birth order, nearly half of them (48.33%) were first-born. Regarding bowel habits, most of children (96.67%) experienced bowel movements two times or less per week. Dietetic history, the majority of them (81.67%) consumed small amounts of fruits and vegetables and less than one quarter (13.33) consumed fast foods. Two thirds of them (66.67%) were classified as chronic onset for constipation symptoms, and more than half of them (56.67%) had been experiencing symptoms for 1–3 years.

Figure (1) illustrates the percentage distribution of the studied children and their mothers regarding their total knowledge level about idiopathic constipation. It was noticed that all of mothers and their children (100%) had low knowledge regarding idiopathic constipation.

Figure (2) presents the distribution of studied mothers according to total practice level. It was found that, all of

mothers (100%) had unsatisfactory practice regarding idiopathic constipation.

Table (3) shows the relationship between total knowledge level and total practice level of studied mothers. It was found that, all mothers (100%) had low knowledge and unsatisfactory practice levels.

Table (4) presents the correlation analysis between total knowledge level and total practice level of studied mothers. It was noticed that, there was a statistically significant positive correlation between knowledge and practice ($P = 0.035$),

Table (5) shows the relationships between bio-socio-demographic characteristics of studied mothers, total knowledge and practice scores. Regarding to age, significant differences were observed in knowledge scores across age groups ($P < 0.05$), mothers aged 30–<40 years consistently scored highest. Regarding to educational level, education showed a strong and statistically significant association in knowledge scores ($p=0.000$). Mothers with higher education levels consistently achieved the highest knowledge and employed mothers scored significantly higher than housewives in knowledge scores ($P<0.05$).

Table (1) Percentage distribution of studied mothers regarding bio-socio-demographic characteristics.

Bio-socio-demographic data of studied mothers	(no=60)	
	No	%
Age (in years)		
20-<30	27	45.00
30-<40	22	36.67
40-50	11	18.33
Range	(23-45)	
Mean $\pm$ SD	32.47$\pm$5.905	
Educational level		
Illiterate , read and write	4	6.67
Primary education	16	26.67
Secondary education	26	43.33
University education	14	23.33
Occupation		
Housewives	46	76.67
Employee	14	23.33
Marital status		
Married	49	81.66
Divorced	7	11.67
Widow	4	6.67
Number of children		
One	11	18.33
Two	29	48.33
Three	16	26.67
More	4	6.67
Residence		
Urban	20	33.33
Rural	40	66.67

Table (2) Percentage distribution of studied children regarding socio-demographic characteristics and medical history.

Socio-demographic data and past medical history of studied children.	(no=60)	
	No	%
Age (in years)		
5	13	21.67
6	14	23.33
7	11	18.33
8	10	16.67
9	7	11.67
10	5	8.33
Range	(5-10)	
Mean $\pm$ SD	6.98$\pm$1.589	
Gender		
Female	20	33.33
Male	40	66.67
Birth order		
First	29	48.33
Second	18	30.00
Third	9	15.00
More	4	6.67
Bowel habits		
2-3 times/day	1	1.66
3 times/a week	1	1.66
2 times or less/week	58	96.67
Dietetic history		
Small amount of fruits and vegetables	49	81.67
Adequate amount of fruits and vegetables	3	5.00
Fast food	8	13.33
Onset of constipation symptoms		
Acute	20	33.33
Chronic	40	66.67
Duration of constipation symptoms		
3 months	8	13.33
6-12 months	15	25.00
1-3 years	34	56.67
More than 3 years	3	5.00

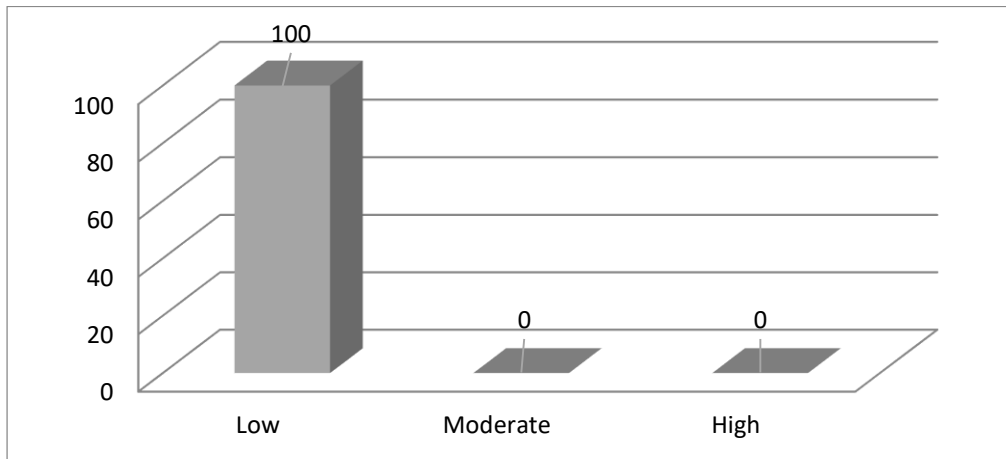


Figure (1) Percentage distribution of studied children and their mothers regarding total knowledge level about idiopathic constipation.

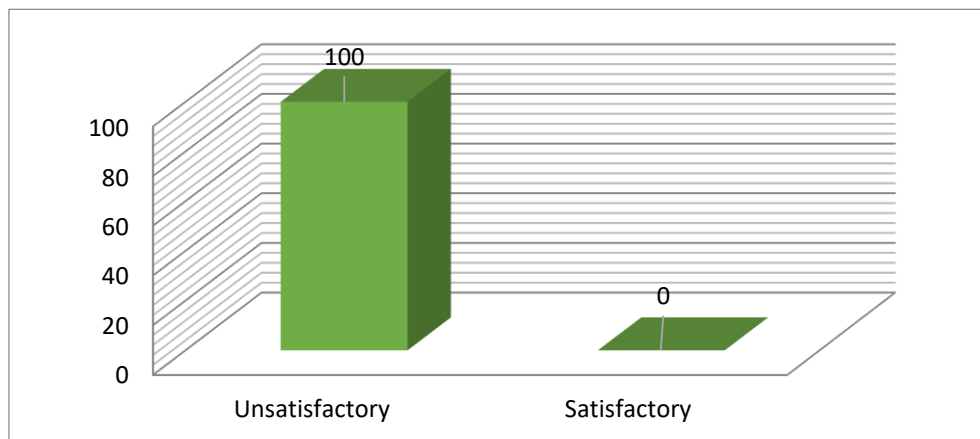


Figure (2) Distribution of studied mothers according to total practice level.

Table (3): Relation between total knowledge of studied mothers and total practice level.

Total knowledge level	The studied mothers (no=60)			
	Total practice level			
	Unsatisfactory		Satisfactory	
	No	%	No	%
Low	60	100.00	0	0.00
Moderate	0	0.00	0	0.00
High	0	0.00	0	0.00

Table (4): Correlation between total knowledge of studied mothers and total practice level.

Total knowledge level	Total practice level	
	R	P
	0.273	0.035*

Table (5): Relations between bio-socio-demographic characteristics of studied mothers, their knowledge and practice score

Characteristics	Total knowledge score	Total practice score
Age (in years)		
20-<30	6.45±0.86	15.82±3.20
30-<40	7.07±1.84	19.41±6.08
40-50	5.55±1.70	18.45±6.79
F/t	4.036	2.788
P	0.023*	0.070
Educational level		
Illiterate, read and write	3.00±0.82	17.00±1.63
Primary education	5.56±0.51	15.81±3.04
Secondary education	6.62±0.50	17.77±4.51
University education	8.64±0.93	20.86±8.53
F/t	102.063	2.283
P	0.000*	0.089
Occupation		
Housewives	6.13±1.42	16.96±4.29
Employees	8.00±1.30	21.07±7.77
T	19.219	6.528
P	0.000*	0.013*

Discussion

Childhood idiopathic constipation is a major global health condition with no underlying medical, genetic, anatomic, or physiological causes with a worldwide prevalence ranging from 0.5% to 32%. The etiology of this disorder is multifactorial and the final common pathway of developing constipation is believed to be due to complex interactions between physiologic, psychological, social, cultural, and behavioral factors

Flankegard, Morelius, & Rytterstrom, (2022).

The gold standard treatment is family lifestyle adjustment combined with pharmacological interventions. Childhood constipation poses a significant effect on families in terms of worrying, social isolation, economic constraint, and burden on national healthcare systems. Early diagnosis and appropriate treatment are vital, as many children carry

their defecation disorder into adulthood **Casias, & Newton, (2021)**. The current study revealed that, less than half of the studied mothers' age was from 20-<30 years. Younger mothers may have less parenting experience, limited knowledge about their children nutrition, or lower confidence in managing health-related issues. These factors may contribute to inadequate fiber or fluid intake, or insufficient attention to early signs of constipation.

This result was in agreement with **Alfahhad, Assiri, Alajlan, Alshahrani, & Aljarbou, (2024)** who conducted a study entitled "Prevalence of functional constipation among children and adolescents in Saudi Arabia: a cross-sectional study" reported that, young maternal age below the age of 20 years is often correlated with a variety of challenges that might impact child health.

The present study indicated that, two thirds of mothers were residing in rural areas. This may be due to limited access to medical services and communicating with the surrounding environments and healthcare resources may contribute to constipation. This result was in agreement with **Alfahhad, Assiri, Alajlan, Alshahrani, & Aljarbou, (2024)** who reported that, constipation was significantly more prevalent in rural

areas than in urban areas 54.6% versus 34.6%.

The present study revealed that, the majority of children had poor dietary habits consuming minimal amounts of fruits and vegetables, and less than one quarter of them consumed fast foods. This is because dietary fibers promote smoother bowel movements by enhancing motility. Fast foods sluggish bowel movement; increase the risk of stool retention which also plays a role in regularity.

These results were supported by **Saad, Mostafa, Elke'iy, (2021)** who studied "knowledge, attitude and practice of mothers towards childhood constipation" and conducted that, 60% of studied children have lacked intake of all nutrients in diet mainly fibers as reported by their parents, whether urban or rural on the incidence of constipation.

The present study revealed that, most of children had infrequent bowel movements two or fewer times per week. This often due to stool staying in the colon too long, withholding behavior, or dietary and lifestyle factors. This result was in accordance with **Saqib, Kazi, Chib, (2024)** who conducted study entitled "functional constipation in children: socio-demographic and risk factors analysis from a tertiary care teaching hospital of northern India" conducted that,

nearly half of the children reported stool frequency 2 times or less per week.

The result of the present study revealed that, all mothers had low knowledge. This may be due to insufficient health teaching programs that were provided to families by health facilities and social stigma that some mothers had preventing them from asking any question about their children health status. The findings were in agreement with **Vipin, Kamal, (2017)** who conducted “A Study to Evaluate the Effectiveness of Planned Teaching Program on Knowledge about the Prevention and Management of Constipation among the Mothers of Infants in Alur Village” and illustrated that, over all pre test knowledge mean was $6.95 \pm SD 2.32$ and mean percentage was 23.16%.

The present study revealed that, all mothers had unsatisfactory practice regarding idiopathic constipation. This could be explained in the light lack of mother's perception toward their children status, decrease the health teaching programs provided to families by health facilities about care of constipated children This result was in agreement with **Mohamed, (2025)** who noted that, less than half (40%) of the mothers showed inadequate nutritional practices regarding constipation.

The present study found a statistically significant relationship between mothers' knowledge level and their practice level. All of mothers had low knowledge and unsatisfactory practice levels. This result was in agreement with **Salih, Alghamdi, Al-Muaibid, (2022)** who studied “Parents' knowledge, attitude, and practice towards childhood constipation in Al Baha-Saudi Arabia” and illustrated that, after assessing the relationship of knowledge level with practices related to childhood constipation, the majority of the parents who had good knowledge had demonstrated good practices related to 65%, and similarly who had poor knowledge had poor practices 67.1%, which showed a statistically significant association.

Similarly, **DCunha, Rai, Rao & D'Souza, (2023)** who studied “Understanding Childhood Constipation through the Prism of the Caretaker” and revealed that, knowledge and practice concerning childhood constipation are connected to each others. Mothers with greater knowledge had better practice scores ($P = 0.020$).

The study revealed a statistically significant positive correlation between total maternal knowledge and practice levels, indicating that low level of knowledge was modestly associated with unsatisfactory levels of

practices. This result was in accordance with **Al Khashram et al., (2024)** who studied “Exploring Community Perspectives on Functional Pediatric Habitual Constipation” revealed a statistically significant positive correlation between the knowledge scores and practice scores. As the knowledge scores increased, the participants tended to demonstrate better practice scores ($p < 0.001$).

Regarding to educational level, mothers with university education consistently achieved the highest knowledge and practice scores. Mothers with university education are more likely to have better health literacy, which enhances their ability to access, understand, and apply health-related information. As a result, educated mothers are more likely to understand medical advice, recognize symptoms, follow treatment plans, and implement dietary and behavioral interventions. This result was aligned with **Madkour, Hussein, Abd-Elkodoos, (2023)** who demonstrated that, there was a statistically significant positive relationship between mothers' education and overall knowledge scores ($P = .000$). Similarly, **Khayyat et al., (2024)** who illustrated that, there was a significant difference in knowledge scores ($p=0.001$). Postgraduate participants

exhibited the highest median knowledge score of 9.0.

Furthermore, **Fazil, Monoto, Tan, Azhari, (2025)** who studied “Assessing parental knowledge and worry about childhood constipation among malaysian parents” illustrated that, parental knowledge was higher in parents with tertiary level of education (Median = 8.00) compared to parents with up to secondary level education (Median = 7.00, $p = 0.007$).

The present study indicated that, mothers with three children achieved the highest knowledge and practice scores. Mothers with three or more children often gain practical experience and cumulative exposure to common childhood health issues. This experience enhances both their knowledge and their ability to apply it in real life situations. This result was in agreement with **Al Khashram et al., (2024)** who indicated that, participants who had three or more children exhibited significantly higher knowledge scores than those with only one child ($p = 0.001$).

Conclusion:

Based on the results of the present study, it was concluded that, all of mothers had low knowledge and unsatisfactory practices regarding to their children idiopathic constipation.

Recommendations The following suggestions are recommended based on the present findings:

1. Continuous educational programs must be designed for mothers to raise their knowledge and practices regarding to idiopathic constipation.
 2. Booklets and brochures about children idiopathic constipation should be available in pediatric surgical outpatient clinics.
 3. Retention strategies, Telehealth tools (e.g., follow-up calls, short video tutorials or SMS reminders) could support remote education in underserved areas.
- Further researches should be conducted about idiopathic constipation to help in early diagnosis and management and preventing the complications.

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Assessment of Nurses' Knowledge and Practice regarding Management of Infants with Congenital Clubfoot

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Abstract

Background: Clubfoot is one of the most common congenital musculoskeletal deformities. It is defined as a deformity characterized by complex mal-alignment of the foot involving soft and bony structures in the hind-foot, mid-foot, and forefoot. Nurses play a crucial role in the treatment of clubfoot because they offer comprehensive care and assistance for infants. **The aim of the study** was to assess nurses' knowledge and practice regarding management of infants with congenital clubfoot. **Design:** descriptive research design was utilized. **Subjects and Method:** A convenience sampling of 50 nurses who were working in pediatric orthopedic outpatient clinics of Tanta Main University Hospital. **Tools:** two tools were used to collect data: **Tool I:** Nurses' knowledge structured interview regarding infant congenital clubfoot. **Tool II:** Practice observational checklist regarding infant congenital clubfoot cast care. **The results:** Nearly three quarters of the studied nurses had low level of knowledge about congenital clubfoot, while all of them had unsatisfactory practice level regarding care of infant congenital clubfoot. **Conclusion:** Nurses had low level of knowledge and unsatisfactory level of practice regarding infant congenital clubfoot. **Recommendations:** Implementing continuous educational program about infant congenital clubfoot to increase nurses' knowledge and practice.

Keywords: Congenital, Clubfoot, Knowledge, Nurses, Practices, Infants.

Introduction

Clubfoot is one of the most common congenital musculoskeletal deformities that affect the foot's bones and muscles. One or both of the newborn's feet may have a deformity. Clubfoot is a complex, congenital deformity of the foot that if left untreated, can limit the infant's mobility by making it difficult and painful to walk. It is characterized by complex misalignment of the foot involving soft and bony structures in the hind foot, mid foot, and forefoot (**do Amaral., et al . 2024**).

Congenital clubfoot is thought to affect 1 to 4.5 per 1,000 live births globally, with a 2:1 male to female ratio, with about 50 percent of cases being bilateral. Every year, there are about 200,000 children born with clubfoot globally, 80% of whom are in low- and middle-income countries. The etiology of congenital clubfoot is still unknown, but it is believed to be multifactorial with a combination of environmental and genetic factors (**Maghfuri et al., 2024**). Clubfoot is typically diagnosed during pregnancy through screening or at birth. Ultrasonography can detect clubfoot as early as 12 weeks of gestation. Clubfoot deformity results in pain, walking difficulties, and the inability to wear regular shoes if treatment is not received. Excellent treatment outcomes depend on early detection of clubfoot, accurate assessment, and early management. A functional, pain-free foot with high mobility and no calluses is what clubfoot treatment aims to attain and maintain. The majority of clubfeet can be corrected in

about six to eight weeks with proper gentle manipulations and casting (**Panza et al., 2023**).

Common complications in infants with cast are most likely to have pain or discomfort at the cast site, skin breakdown, pressure sores, skin inflammation, edema, and stiff joints. Casting also has the dangers of impaired circulation, muscular atrophy, and loss of range of motion. The foundation of the treatment is the critical interpretation of the functional anatomy of the feet in order to gradually correct the position of the legs through casting and manipulation (**Manousaki, 2022**).

The Ponseti method is widely recognized as the gold standard for clubfoot treatment, which has been described as highly suitable for use in resource-limited environments. In order to extend the constricted posteromedial structures and reestablish the anatomical links between the bones, weekly serial manipulation and casting are required until the foot has been clinically and radiologically repaired. The Ponseti technique significantly decreased the need for substantial surgery, making it the most effective treatment for clubfoot (**Rodriguez et al., 2023**).

Nurses are essential in the treatment of clubfoot, because they provide complete care and assistance. Nursing care for infants with clubfoot focuses on assessing, managing, and supporting the infant's physical, emotional, and developmental needs, as well as educating parents about the condition and treatment plan. The primary goal is to promote optimal foot alignment and prevent complications while offering emotional support to the family

(Bent, 2023).

Nursing assessment of an infant with clubfoot includes an extensive evaluation of the infant's physical state with an emphasis on the severity of the deformity and any possible complications. The nurse examines the feet first, noting if they are inwardly turned, downwardly turned, or affecting one or both feet **(Sutanto, Siregar, & Winanto, (2025).** The flexibility of the deformity and any related stiffness is assessed by looking at joint mobility and muscle tone around the foot and ankle **(Laliotis et al., 2022).**

To make sure the illness doesn't affect general well-being, the nurse should monitor growth and developmental milestones. Parents are also informed about the significance of adhering to follow-up care and treatment alternatives like bracing, casting, or surgery. This collaborative approach helps ensure the best outcomes for the infant. **(Shahbaz A, Sarwar W, & Javed A (2024).**

Serial casting is frequently used in the first stage of treatment, in which the infant's foot is gradually manipulated into the proper position and secured by casts. The skin integrity, circulation, and sensation distal to the cast are all vitally monitored by nurses. They should look for symptoms of skin deterioration, edema, or temperature and color changes that may indicate compromised circulation. To avoid skin irritation and infection, parents must be taught how important it is to keep the cast clean and dry **(Rehman., et al.**

2025).

Parents should receive instruction from nurses on how to properly use the brace, including how long and how often to wear it. These may vary depending on the treatment plan. To monitor the infant's reaction to the brace and make any necessary adjustments, follow-up sessions are required regularly **(Ghida et al., 2022).** A parent-based exercise program that is exactly as successful as the foot abduction brace and has a greater compliance rate is recommended as an alternative. After the last cast is removed, the parents will be instructed to start exercise for their infants as a routine at home until they are four years old without needing braces **(Sheta et al., 2022).**

Nurses should give the infant nutritional support and make sure the infant is eating healthy and developing normally. Alternative techniques could be required if the infant is wearing braces or casts, since they might have trouble with specific feeding positions. Nurses should advocate for family-centered care, involving parents in decision-making and encouraging their active participation in the child's care. This method improves the child's general well-being **(Corbu et al., 2022).** Working together as a multidisciplinary team to provide coordinated treatment for infants with clubfoot, nurses collaborate closely with physical therapists, orthopedic experts, and other medical specialists. For the best results, teamwork is crucial **(Teklay et al., 2021).**

Better child care, better results, and greater job satisfaction for nurses can result from educational interventions that improve

nurses' knowledge, skills, and general competence. Continuous education helps them stay updated on advancements in healthcare, ensuring they provide evidence-based and quality care. Furthermore, continuous education encourages a culture of professional development and flexibility among nurses (Agarwal et al., 2025).

Significance of the study

Clubfoot is encountered in about one per thousand live births, varying from one race to another. It affects approximately 150,000–200,000 newborns all over the world each year (Jack & Fitzgerald, 2022).

Nurses in Egypt face several challenges when providing clubfoot care, particularly in implementing the Ponseti method, which is the gold standard for treatment. Systemic problems, a lack of resources, and deficiencies in healthcare personnel's knowledge and training are the causes of these challenges. Education and training enable nurses to provide evidence-based care, make informed clinical decisions, and implement clinical guidelines effectively (Wang et al., 2024). So, the aim of the study was to assess nurses' knowledge regarding management of infants with congenital clubfoot

Subjects and method

Design: A descriptive research design was used to conduct this study.

Setting: The study was conducted at pediatric orthopedic outpatient clinics of the Main Tanta University Hospital's. **Subjects:** convenience

sampling of 50 bedside nurses who are working in orthopedic outpatient clinics and manage orthopedic problems.

Tools of data collection

Tool I: knowledge structured questionnaire: The researcher developed it following a review of current relevant literatures (Memon et al., 2023) & (Rondonuwu, Gessal & Kalangi, 2023) to assess nurses' knowledge regarding infant clubfoot and congenital clubfoot care measures. It consisted of two parts: **Part (1):** Socio-demographic characteristics of the studied nurses such as age, level of education, years of experience at the pediatric orthopedic outpatient clinic, and previous attendance of training program regarding congenital clubfoot care. **Part (2):** Nurses' knowledge regarding infant congenital clubfoot and ponseti method and management.

Nurses' knowledge was included; definition, etiology, signs and symptoms, complications, diagnosis, and management of clubfoot.

Scoring system

Nurses' knowledge was scored as following:

- Correct complete answer that was given a score (1)
- Incorrect, missed or didn't know was given (0)

Total score of nurses' knowledge was calculated as following:

- 80-100 % was regarded as high level knowledge.
- 60- <80% was regarded moderate level knowledge
- less than 60% was considered as low level knowledge

- The total score of the studied nurse's knowledge was 15 grades

Tool II: Observational checklist about nurses' practice regarding infant congenital clubfoot cast care:

The check list was adopted and based on the identified guidelines care (Miedzybrodzka, 2023). It was used to assess nurses' practices through direct observation

It was composed of two main sub items, which were: assisting in cast application (11 items), cast care (7 items).

The scoring system for each step of nurses' practice was scored as following:

- Done correct and complete was scored (1)
- Done incorrect or not done was scored (0)
- The sum of all items was (18)

Nurses' practice score was categorized as follows:

- Practice that scored below 80% was considered unsatisfactory
- 80–100% was considered satisfactory level of practice.

Method

1. The study was officially approved for conduct by the Dean of Tanta University's Faculty of Nursing.
2. Ethical and legal considerations:
 - Ethical approval was obtained from Scientific Research Ethical Committee at Tanta University, Faculty of Nursing to conduct the study with code No.: (28-7-21).
- There was no harm or injury to the entire sample as a result of the study.

- Confidentiality and privacy were taken into account when collecting the data.

- Nurses' participation in the study is voluntary, and they are able to withdraw at any time.

3. Content validity had been confirmed by a jury of five experts in the field of Pediatric Nursing before conducting the study.

4. A Pilot study was carried out on 10% of nurses to test feasibility and clarity of tools, which was excluded from the study. Accordingly necessary modification was done. The pilot study was excluded from the study.

5. Cronbach's alpha for knowledge score was 0.81 (high reliability). It was 0.84 for practice score that is indicate good reliability

6. The aim of the study was explained to the studied nurses.

7. The researcher met studied nurses to establish their trust and cooperation by out lining the study's aim.

8. The researcher interviewed the studied nurses at the previously mentioned setting 3 days per week in the morning shift and every interview took about 20 minutes

9. The knowledge questionnaire was translated into Arabic language by researchers and filled by participated nurses in the presence of researcher to clarify any point to them.

10. The researcher observed pediatric nurses while applying care to infant with congenital clubfoot.

11. The data was collected over period of eight months; from from September 2021 to April 2022

12. Statistical analysis

The collected data was arranged, tabulated,

and statistically analyzed using the SPSS statistical software, version 26. For the quantitative data, the range, mean, and standard deviation were calculated. Utilizing the Chi-square test (χ^2), qualitative data was compared. The means of two variables within a group were compared using the paired samples t-test. For comparing means for variables over three intervention periods in a group or for more than two variables, the analysis of variance (ANOVA) F-value was calculated. The correlation between the variables was evaluated using R, the Pearson-Spearman correlation coefficient. A significance level of $P < 0.05$ was applied in order to assess the results of the significance tests (*). A highly significant at $P < 0.01$ was also used to interpret the results of the significance tests. (**). (White S E. 2019).

13. Results

Table (1): demonstrates percentage distribution of nurses' socioeconomic characteristics; it was found that 38% of the nurses were between the ages of 20 and less than 30 years, and 44% of them were graduated from technical institute. As regards years of experience in orthopedic field, it was observed that more than half of nurses (52 %) had years of experience less than 5 years. Unfortunately, more than half of nurses (56%) did not participate in any congenital clubfoot-related conferences or training courses.

Table (2): shows the percentage distribution of nurses' knowledge about infant congenital clubfoot; It was found that 44% of studied nurses reported

correct and complete answers related to definition of congenital clubfoot, while about third of them (40%) reported correct and complete answers regarding causes of congenital clubfoot. Regarding the diagnosis, it was observed that more than half of them (56 %) had not correct or don't know answers. Concerning consequences of neglected clubfoot 68% had not correct or don't know answers. At the same time, about 32%, 48% reported correct and complete answers regards management and recent management of congenital clubfoot respectively. In addition to 44 % and about third of them (34%) reported correct and complete answers relating to numbers of the cast, elements to be checked after casting respectively. Concerning signs of infection in the cast site about 56% of them reported correct and complete answers. It was observed that 78% of them not correct or don't know answers regarding follow up with doctor.

Table (3): illustrates percentage distribution of studied nurses' total knowledge level regarding infant congenital clubfoot. It was clarified that approximately three quarters (64%) of nurses had low levels of total knowledge, 32% had moderate levels of knowledge, and only 4% had high levels of knowledge.

Table (4): illustrates percentage distribution of studied nurses' total practice level regarding infant congenital clubfoot. According to the table, 100% of the nurses had unsatisfactory practice levels regarding care of infant congenital clubfoot.

Table (5): shows correlation between the nurses' total knowledge and practice scores for congenital clubfoot in infants; it was

found that there was a positive statistically significant correlation between total knowledge score and total practice score of studied nurses regarding infant congenital clubfoot whereas $p=(0.062)$ and $r=(0.247)$

Table (6): shows correlation between the socio-demographic characteristics of nurses and their total knowledge and practice. It was found that the age, knowledge, and practice of nurses were negatively correlated. However, the years of experience, level of education, and practice and knowledge of nurses were found to be positively correlated. Nurses with higher levels of education and more years of experience showed strong practice and knowledge.

Table (I): Percentage distribution of the studied nurses regarding their socio-demographic characteristics.

Socio-demographic characteristics	(n=50)	
	N	%
Age in Years		
Less than 20 years	11	22.0
20: <30	19	38.0
30: 40	9	18.0
More than 40 years	11	22.0
Level of education		
Diploma degree	16	32.0
Technical institute	22	44.0
Bachelor degree	12	24.0
Years of experience in nursing		
Less than one year	9	18.0
1: <5 years	17	34.0
5: <10 years	11	22.0
More than 10 years	13	26.0
Years of experience in orthopedic field		
Less than one year	12	24.0
1: <5 years	26	52.0
5: <10 years	5	10.0
More than 10 years	7	14.0
Training program regarding congenital clubfoot care.		
Yes	22	44.0
No	28	56.0

***Statistically significant difference at $P < 0.05$**

Table (2): Percentage distribution of nurses' knowledge regarding infant congenital clubfoot

Knowledge regarding infant congenital clubfoot	(n=50)			
	Not correct or Don't know		Correct and complete	
	No.	%	No.	%
Definition	28	56.0	22	44.0
Causes	30	60.0	20	40.0
Symptoms	33	66.0	17	34.0
Diagnoses	28	56.0	22	44.0
Consequences of neglected clubfoot	34	68.0	16	32.0
Management	36	72.0	14	28.0
Recent management	26	52.0	24	48.0
Time of management	29	58.0	21	42.0
Method of treating clubfoot	20	40.0	30	60.0
Number of times to change the cast	34	68.0	16	32.0
Numbers of the cast	28	56.0	22	44.0
Elements to be checked after casting	33	66.0	17	34.0
Signs of infection in the cast site	22	44.0	28	56.0
Number of times of clubfoot exercises	37	74.0	13	26.0
Follow up with doctor	39	78.0	11	22.0

Table (3): Percentage distribution of the total score of nurses' knowledge

Knowledge	(n=50)	
	N o.	%
High knowledge	2	4.0
Moderate knowledge	16	32.0
Low knowledge	32	64.0

*Statistically significant difference at $P < 0.05$

Table (4): Percentage distribution total scores of nurses' practice

Variable	(n=50)	
	No.	%
Cast application		
Unsatisfactory	50	100
Satisfactory	0	0
Cast care		
Unsatisfactory	50	100
Satisfactory	0	0
Total practice		
Unsatisfactory	50	100
Satisfactory	0	0

***Statistically significant difference at $P < 0.05$**

Table (5): Correlation between total scores of nurses' knowledge and practice for infant with congenital clubfoot

Total knowledge	Total practice	
	r	p-value
	0.247	0.062

***Statistically significant difference at $P < 0.05$**

Table (6): Correlation between total nurses' knowledge, practice and socio demographic characteristics

Socio demographic	Total nurses' knowledge		Total nurses' practice	
	r	P	r	P
Age	0.213	0.138	0.135	0.327
Level of education	0.217	0.130	0.231	0.136
Years of experience in nursing	0.324	0.022*	0.029	0.876
Years of experience in orthopedic field	0.411	0.003*	0.231	0.136
Training	0.058	0.691	0.103	0.475

*Statistically significant difference at $P < 0.05$

Discussion

Congenital clubfoot is a complex deformity that is readily apparent at birth and affects the muscles, ligaments, bones, and joints of the developing foot and ankle. Approximately 200,000 children are born with clubfoot each year. Globally, 80% of who are in low- and middle-income countries. The causes of clubfoot are still unknown, but factors that lead to clubfoot are environmental, genetic, an abnormal position in the uterus, and anatomical factors **Wang et al., (2021)**.

The majority of clubfeet can be corrected in about six to eight weeks with proper gentle manipulations and casting. The most common method of clubfoot

treatment is the Ponseti approach, which has been described as highly suitable for use in resource-limited environments. **Kiani et al., (2023)**.

Understanding nurses' current knowledge and practice is crucial for improving infant outcomes and ensuring that infant with congenital clubfoot receive the best possible care **Anaraki et al., (2025)**. So this study aimed to assess nurses' knowledge and practice regarding management of infants with congenital clubfoot.

Similar to the current findings, **Rastogi & Agarwal (2021)**, found that almost half of the nurses in their study had technical institute degrees. According to **Cady et al. (2022)**, Two-thirds of them had a nursing bachelor's degree, which contradicted these findings. According to **Kumari et al. (2023)**, Majority of the nurses that participated in the study had

nursing degrees from universities, while the fewest had master's and diploma degrees.

As regards studied nurses' total knowledge level about congenital clubfoot the present finding revealed that, about three quarters of nurses had low level of knowledge. This may be attributed to slightly less than half of them are graduated from technical institute and more than half of them didn't attend any conference or training courses related to congenital clubfoot care, in addition to work over load and absence of motivation for nurses to improve their knowledge. **Pavone et al., (2022)** who was consistent with current finding found that more than half of them had poor knowledge scores about congenital clubfoot.

Regarding the studied nurses' total practices level regarding congenital clubfoot care, the current study highlighted that all nurses had unsatisfactory level of practice regarding care of infant congenital clubfoot. Their lack of previous cast care training, the fact that nearly half of them completed technical school, the experience of half of them was less than five years.

According to **Judd (2023)**, who concurred with the current findings, the majority of the studied nurses demonstrated poor practice because of inadequate training programs and a heavy workload that might have prevented them from reading to improve their skills. The current

study findings contradicted with those of **Khan et al. (2023)**, who found that most nurses had satisfactory level of practice regarding congenital clubfoot care.

Regarding association between nurses' overall practice score and knowledge related to congenital clubfoot, According to the current findings, nurses' knowledge and practice scores were positively correlated. This might be because the theoretical component was successful in influencing nurses' practice as they acquired new concepts and were proficient in using them in their work. That might illustrate how crucial it is to integrate theory and practice.

Accordingly, a study conducted by **Olson et al., (2022)**, revealed that there was a strong positive correlation between nurses' total knowledge and total actual practice regarding care of infant with congenital clubfoot. In contrast to **Singh & Mali, (2022)** who noted that, no statistically significant differences were found between total nurses' practice mean scores and their total knowledge score. They added that, these alarming findings revealed that nurses may not follow the best recommended practices, even if they are available.

Regarding correlation between socio-demographic characteristics of the nurses and their overall knowledge and practice scores. It was determined that the age of nurses and their level of knowledge and practice

were negatively correlated. The fact that young nurses had new information while still recalling what they had learned in their academic institution may help to explain this finding. Additionally, younger nurses tend to be more active than older nurses, who are more innovative in their nursing profession and have superior physical health. However, by the middle of their forties, nurses begin to rely more on routine care than on current knowledge, and they are also more likely to gain weight and develop chronic illnesses.

According to **Krestyashin et al. (2023)**, older nurses have less access to continuing professional development activities than younger colleagues, which is in line with the results of the present study. However, **Alfaya et al. (2022)**, disapproved of the present results, arguing that years of employment in the same or similar situation increase one's level of expertise and practice in this area and may even foster competency.

Furthermore, the results of this study showed that the total of the nurses' knowledge, practice, and education scores varied statistically significantly. Nurses' knowledge and practice were found to positively correlate with their level of education. This might be because highly qualified nurses with bachelor's degrees are better equipped to meet the needs of these children and can offer specialized care. They typically have the

necessary knowledge and skills.

The current findings were supported by **Williams et al. (2022)**, who stated that nurses with bachelor's degrees in nursing science, had the best knowledge and practice scores because they had access to more material. Additionally, nurses' advancement and ongoing education increase their knowledge, provide chances for colleagues to share experiences, and enhance professional decision-making and action.

Conclusion

Based on the results of this study, it can be concluded that approximately three quarters of nurses had low levels of total knowledge, and all nurses who were studied had unsatisfactory practice levels regarding the care of infants with congenital clubfoot. There was a positive correlation between the total knowledge scores of the nurses who were studied and the total practice scores regarding to nursing care of the infant with congenital clubfoot.

Recommendations

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

1. To educate nurses on basic clinical skills, such as cast care and infection control for children with clubfoot, an in-service training program should be held regularly.
2. Further research should be conducted on a large sample to

achieve generalizability.

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Effect of Continuous Care Model on Patient's Knowledge and Health Outcome Regarding Systemic Lupus Erythematosus

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Abstract

Background: Systemic Lupus Erythematosus is a chronic autoimmune disease which can impact several body systems or organs, resulting in a range of clinical symptoms. **Aim:** This study aimed to evaluate the effect of continuous care model on Patient's knowledge and health outcome regarding systemic lupus erythematosus. **Research design:** Quasi-experimental research design was utilized to conduct study. **Setting:** The study was conducted at Department of Rheumatology and Outpatient Clinics at Fayoum University Hospital. **Sample:** Purposive sample of 60 patient diagnosed with systemic lupus erythematosus. **Data collection tools:** Tool I: Structured Interview Questionnaire: It consisted of two parts: Part A: The Patient's Demographic Characteristics. Part B: Medical data. Tool II: Patient's Knowledge Regarding Systemic Lupus Erythematosus. **Tool (III) :** Lupus Patient Reported Outcomes (Lupus PRO). **Results:** There was a statistically significant improvement in the patient's total knowledge and health outcomes score post one and three months of continuous care model application compared with pre implementation. **Conclusion:** Continuous care model efficiently improved systemic lupus patients' knowledge and reported outcomes. **Recommendations:** Implementing continuous care model for all individuals with systemic lupus erythematosus to improve their knowledge and their health outcomes.

Key words: Continuous Care Model, Health Outcomes, Knowledge & Systemic Lupus Erythematosus

Introduction

Systemic lupus erythematosus (SLE) is a chronic, inflammatory, autoimmune illness caused by the immune system's aberrant hypersensitivity, which causes inflammation in connective tissues. This inflammation can cause persistent damage to various physiological systems, including the joints, kidneys, blood cells, brain, skin, lungs, central and peripheral nervous system, heart and platelets **(Flouda, & Boumpas, 2025)**.

The disease usually progresses in a relapsing-remitting pattern, with alternating periods of low disease activity and remission. About 20% to 30% of SLE patients have chronically active or persistently illness. Severe and refractory SLE can cause permanent organ damage and higher mortality rates **(Schilirò et al, 2024)**. It affects about 3.4 million people globally, with 400,000 new cases being identified each year. It is most typically seen in women between puberty and menopause **(Dai, Fan, & Zhao, 2025)**.

It's unclear specifically causes SLE. The disease's nature can be explained by the interactions between genetic, environmental, immunological, and hormonal factors. Most typically, a person with SLE inherits the risk from one or both parents and then developed the illness when they exposed to a trigger. Triggers may include being pregnant, undergoing

surgery, being ill, or exposed to sunlight **(Amer et al,2024)**.

Fatigue, skin lesions, arthralgia and synovitis, nephritis, hematologic system involvement, and neuropsychiatric symptoms including anxiety and depression are some of the clinical signs. All of these characteristics can reduce SLE patients' health-related quality of life (HRQoL). Remission and minimizing organ damage are the goals of SLE treatment by immunosuppressive medication, and lifestyle changes such as smoking cessation and avoiding UV rays **(Geertsema-Hoeve et al, 2024)**.

Nurses have critical roles in providing care for patients with systemic lupus erythematosus by organizing and monitoring the patients' general health, managing symptom control, giving psychological support to patients and caregivers and offering individualized education based on patient needs **(Yel, Ozer, & Yildirim, 2024)**.

The continuous care model (CCM) represents a theoretical framework consisting of four interdependent stages: orientation, sensitization, control, and evaluation. Nurses that use CCM should accurately determine patients' needs, support them, and integrate both patients and family in problem solving processes. The model is intended to create and implement continuous model care

that promote acceptance, build a greater knowledge of health objectives, and control diseases and possible complications (**Moustfa, Mohamed & Mohamed, 2024**).

Continuous care model plays an important role in improving patient attitudes since it identifies their needs. Continuous care is a regular process that aims to establish effective, interactive, and continuous contact between patients and caregivers in order to detect needs and problems, sensitize patients to accept ongoing health behaviours and help them maintain, improve, and enhance their health. The application of this model promotes accurate diagnosis of patient problems, stimulates patients and their families to solve life problems, and encourages their participation (**Abd El Aliem, Ahmed, & Sharaby, 2023**).

Significance of the study

Systemic lupus erythematosus is a multisystem heterogenous disease that can potentially lead to serious organ complications, with the potential to cause morbidity and occasional mortality. Patients with SLE have various complications caused by the disease or its treatment (**Talash et al., 2025**).

According to estimates, SLE affect aproximitly 3.4 million people worldwide and the number of newly diagnosed individuals is 400,000 every year. The estimations for men

were 1.53 (0.41 to 4.46) per 100 000 person-year and 0.06 million people annually, respectively, while women were 8.82 per 100 000 person-year and 0.34 million people yearly. **Dai et al., (2025)**. Overall, 6.1/100,000 people in Egypt were expected to have adult SLE (1.2/100,000 men and 11.3/100,000 women) (**Sayed et al., 2025**).

The continuous care model is a nursing approach that provides a structured plan to strengthen patients' knowledge, accountability, and engagement in their long-term care, as well as in managing disease and its complications. Since educational programs alone tend to lose effectiveness over time without proper follow-up, integrating continuous monitoring and care with education can encourage SLE patients to adopt healthier behaviors, lower the likelihood of complications, and improve their overall quality of life (**Abdelrahman, Fathy, & Sabry, 2023**).

Aim of the study

This study aimed to evaluate the effect of continuous care model on Patient's knowledge and health outcome regarding systemic lupus erythematosus.

Research Hypothesis

H1: Patient's knowledge mean scores will be exhibit improvement post implementation of continuous care model.

H2: Health outcome of studied patients will be exhibit improvement post implementation of continuous care model.

Subjects and Methods

Research design

Quasi experimental research design was used to perform the study.

Setting

This study was done at Department of Rheumatology and Outpatient Clinics at Fayoum University Hospital.

Sample

Purposive sample of 60 SLE patient.

Sample Size:

The sample size was determined using Stephen Thompson's equation

$$n = \frac{N \times p(1-p)}{\left[\left[N - 1 \times \left(d^2 \div z^2 \right) \right] + p(1-p) \right]}$$

$$n = \frac{70 \times 0.5 \times (1 - 0.5)}{\left[\left((70 - 1) \times \left(\frac{0.05^2}{1.96^2} \right) \right) + 0.5 \times (1 - 0.5) \right]}$$

$$= 59.34 \cong 60$$

N = Community size is 70, p = Ratio provides a neutral property is equal to 0.12, d = the error rate is equal to 0.05 and z = Class standard responding to the level of significance equal to 1.96. n = the sample size is 60 SLE patients.

- **Inclusion criteria:** Adult patients, age 20-60 years from both sexes, ability to communicate and agree to participate in the study.

- **Exclusion criteria:** Patients with health complications as renal failure, stroke, paralysis, cognitive dysfunction.

Tools of data collection:

Data was collected by using the following three tools:

Tool I: Structured Interview

Questionnaire: It was developed by the researcher based on recent and relevant literatures. (Yousef, et al., 2018 ; Mohamady, Srour, & Saad, 2022). It consisted of two parts:

Part1: Demographic characteristics such as age, gender, marital status, education status, occupation and residence.

Part 2: Medical data: such as duration of disease, family history, chronic illness, present symptoms, precipitating factors, times of medical follow up etc.

Tool II: Patient's knowledge regarding systemic lupus erythematosus:

It was adopted by Sullivan (2016) and adapted by the researcher to assess patient knowledge level about SLE. It includes definition of disease, causes, signs and symptoms, diagnosis, treatment and complications of systemic lupus.

Scoring system:

Each question in knowledge was checked and every correct answer was scored 1 and incorrect answer or don't know scored 0. The total score of each subject was calculated, converted into percentage and interpreted as follows:

4. <50% : Inadequate knowledge
5. 50 - 75% : Moderately adequate knowledge

6. $\geq 75\%$: Adequate knowledge

Tool (III) : Lupus Patient Reported Outcomes (Lupus PRO):

SLE-specific tool that was adopted from **Jolly (2012)**, to assess the health outcome. This tool has a 43-item questionnaire that includes health related quality of life domains and non health related quality of life.

The Lupus PRO employs a 5-point Likert response scale, with 0 indicating never or not applicable, 1 indicating a little of the time, 2 indicating some of the time, 3 indicating most of the time, and 4 indicating all of the time. Additionally, certain items with reversal score as a negative item. Grades for each item were combined to calculate a percentage score.

Validity and Reliability

A jury of five experts in Medical Surgical Nursing evaluated the instruments' validity. Changes were made based on their feedback. Cronbach's Alpha coefficient test was used to examine tool reliability; patient knowledge was 0.824, while Lupus Patient Reported Outcomes (Lupus PRO) was 0.793.

Pilot study

The pilot study was conducted using 10% of the sample to assess the clarity and applicability of the tools, as well as the time required for data collection. The necessary modifications were made based on the findings of the pilot study. Subjects who participated in the pilot

study were included in the study once minor alterations were implemented.

Field work

- An approval was obtained from the director of El-Fayoum University Hospital.
- A oral informed consent was obtained from each participant prior to data collection after the researcher explained the purpose of the study.
- Data was collected from internal rheumatology department and rheumatology clinic at Fayoum University Hospital for 8 months during the period from first November 2024 to last June 2025.
- In this study, the researcher applied the four stages of continuous care model (CCM): orientation, sensitization, control, and evaluation to patients with SLE.
- **The orientation stage:** The first stage involved the researcher meeting the patients, introducing herself to establish a line of communication, explaining the nature and purpose of the study to the patients who participated in the study, identifying available communication channels, such as phone calls or the WhatsApp application, and emphasizing the importance of scheduling phone calls. A 30-45-minute session was held with the patient and her/his family

- The patients who are participated in the study filled out the questionnaire sheet.
- **The first session:** It was used to assess the patient using Tool (I) to assess the patients demographic data, and medical patient history, Tool (II) to assess general knowledge of SLE patients and Tool (III) to assess lupus patient reported outcomes . Patient take 20:30 minute to complete the questionnaire sheet
- The nursing education booklet had been developed; the content meets the patients' needs, and their levels of understanding.
- **Sensitization stage:** The purpose of this stage was to increase patients' engagement in the continuing care process, as well as their understanding health outcomes from SLE, through the distribution of SLE-related educational materials and the preparation of educational programs. Every patient had six sessions, each lasting 45-60 minutes and taking place three days a week in a separate room apart from the rheumatology outpatient clinic or the rheumatology department. Discussion, questions, and responses were all employed as teaching tools. Obtaining comments on what was offered during the previous session and presenting the objectives of the current one, keeping in mind the necessity to use simple language to meet the patients' educational level. The care model sessions were delivered as follows:
 - **The second session:** It was done to provide nursing education for patient about disease definition, causes, risk factors, symptoms and complication .
 - **The third session:** It was done to provide nursing education for patient about complication, diagnostic methods, treatment modalities, pregnancy and contraception method
 - **The fourth session:** It was done to provide nursing education for patient about exercise, importance of maintain healthy weight, balanced diet, avoid smoking, how to manage stress and family role.
 - Following sessions often begin with a brief summary of prior discussions in plain Arabic language.
 - Each session ended by a summary of what has been taught during the previous session and the objectives of new topics.
 - Feedback and reinforcement of nursing education was performed according to patients need to ensure their understanding
 - Each patient obtained a copy of the nursing education booklet that included the teaching content.

- **The fifth session** through phone call: After one month was done to assess the effectiveness of continuous care model on improving patient's knowledge using Tool (II), and reported outcomes using Tool (III).
- **Control stage:** The stage's objectives were to evaluate the standard of treatment patients received, promote patient engagement in their own care, and reinforce and integrate healthy self-care habits and practices. For two months, the researchers conducted weekly phone conversations with SLE patients (when permitted by the patient) during this phase. Each call takes ten minutes, however this varies based on the patient's needs and comprehension.
- **Evaluation stage:** Posttest after three months from the education was done to assess the effectiveness of continuous care model on improving patient's knowledge using Tool (II), and reported outcomes using Tool (III). Patient take 10:15 minute to complete the questionnaire sheet.

Ethical considerations:

An official permission to conduct the study was obtained from Fayoum University Supreme Committee for Scientific Research Ethics. Participation in the study was voluntary and subjects had given complete full information

about the study before taken oral consent. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information. Ethics, values, culture and beliefs had be respected.

Statistical design

The statistical software for social science (SPSS) was used to arrange, tabulate, and statistically evaluate the data that had been gathered. ANOVA, T-test, chi square (X²), and percentage range were used in the statistical study.

$P > 0.05$ Non significant

$P \leq 0.05$ significant

$P < 0.001$ High significant

Results

Table (1): Demographic Characteristics of Patients with Systemic Lupus Erythematosus: shows that the majority of patients were female (90.0%). The mean age was 28.79 ± 12.60 years, with more than one third patients aged 25–<35 years (35.0%). Regarding marital status, 73.3% were married. The table also illustrates that nearly half of the patients had secondary education (45.0%). In terms of occupation, housewives (61.7%). Concerning residence, three quarter participants were from rural areas (75.0%).

Table (2): Frequency and Percentage Distribution of Medical Data Among Patients with Systemic Lupus Erythematosus: presents that the

mean disease duration was 2.76 ± 1.89 years, with the largest proportion of patients having the disease for 1–3 years (35.0%). Regarding lupus symptoms, the most frequently reported were fatigue (70.0%), arthritis (66.7%), and myalgia (63.3%). Concerning precipitating factors, both emotional stress (60.0%) and physical stress (58.3%) were dominant, followed by sunlight exposure (50.0%).

Family history of lupus was observed in 21.7% of patients. With respect to chronic diseases, 26.7% reported comorbidities, most commonly involving the heart and blood vessels. Finally, follow-up visits were nearly equally distributed between regular (48.3%).

Figure (1): Percentage distribution of the total knowledge level pre, post, and follow up implementation of the continuous care model among the studied patients with SLE: shows that there was a clear and statistically significant improvement in patients' knowledge following the continuous care model. Regarding total knowledge, adequate responses improved from 11.7% at pre to 81.7% at post, and remained 85.0% at follow-up.

Figure (2): Percentage distribution of the total health outcomes pre, post, and follow up implementation of the continuous care model among the studied patients with SLE: Demonstrate that the health

outcome improved markedly, with high outcome levels rising from 17% at pre to 63% post ($p < 0.001$), and maintained at follow-up 67% ($p = 0.411$).

Table (3) : Relation between Demographic Characteristics of The Studied Patients and Their Total Knowledge Scores Throughout Pre, Post, and Follow-Up Phases: The results revealed no significant relation with gender and occupation at any phase ($p > 0.05$), while age, marital status, educational level, and residence showed highly significant associations with knowledge scores throughout all phases ($p < 0.001$).

Table (4): Relation Between Demographic Characteristics of The Studied Patients and Their Health Outcome Scores Throughout Pre, Post, and Follow-Up Phases: The findings showed no significant differences with gender and occupation at any stage ($p > 0.05$). Conversely, age, marital status, educational level, and residence demonstrated highly significant associations with the total reported outcome during all phases ($p < 0.001$), where older, married, more educated, and urban participants consistently reported higher scores compared with their counterparts.

Table (5): Correlation between Health Outcome and Knowledge among Patients with Systemic

Lupus Erythematosus across Different Phases: showed a statistically significant positive correlation was observed between total health outcome and total

Knowledge among patients with systemic lupus erythematosus. At the pre-test, ($r=0.588$, $p<0.001$) and still at the follow-up phase ($r=0.612$, $p<0.043$).

Table (1): Frequency and Percentage Distribution of Demographic Characteristics of Patients with Systemic Lupus Erythematosus (n=60)

Patients' demographic characteristics	Frequency (N)	Percent (%)
Gender		
- Female	54	90.0
- Male	6	10.0
Age		
- <25	19	31.7
- 25- <35	21	35.0
- 35- <45	14	23.3
- 45 or more	6	10.0
Mean±SD	28.79 ± 12.60	
Marital status		
- Married	44	73.3
- Single	14	23.3
- Widow	0	0.0
- Divorce	2	3.3
Educational level		
- Non-educated	14	23.3
- Primary	15	25.0
- Secondary	27	45.0
- Bachelor	4	6.7
- Post-graduate	0	0.0
Occupation		
- Housewife	37	61.7
- Employee	10	16.7
- Unemployment	5	8.3
- Self-employed	8	13.3
Residence		
- Rural	45	75.0
- Urban	15	25.0

Table (2): Frequency and Percentage Distribution of Medical Data Among Patients with Systemic Lupus Erythematosus (N=60)

Items	No.	%
Disease duration		
- < 1 year	15	25.0
- 1-3 years	21	35.0
- 3-5 years	14	23.3
- > 5 years	10	16.7
Mean±SD	2.76 ± 1.89	
SLE symptoms		
- Fever	25	41.7
- Headache	26	43.3
- Confusion	17	28.3
- Arthritis	40	66.7
- Fatigue	42	70.0
- Skin rash	31	51.7
- Aching in deep breathing	22	36.7
- Myalgia	38	63.3
- Anaemia	27	45.0
Precipitating factors		
- Emotional stress	36	60.0
- Physical stress	35	58.3
- Sunlight	30	50.0
- Irregular eating patterns	4	6.7
- Lack of sleep	10	16.7
- Hormonal changes	15	25.0
Family history		
- Yes	13	21.7
- No	47	78.3
Chronic disease		
- Yes	16	26.7
- No	44	73.3
If yes:		
- Heart and blood vessels	10	16.7
- Joint disease	2	3.3
- Asthma	4	6.7
- DM	6	10.0
- Others	10	16.7
Times of follow up		
- Regular	29	48.3
- When necessary	31	51.7

Figure (1): Percentage Distribution of The Total Knowledge Level Pre, Post, and Follow up Implementation of The Continuous Care Model among The Studied Patients with SLE

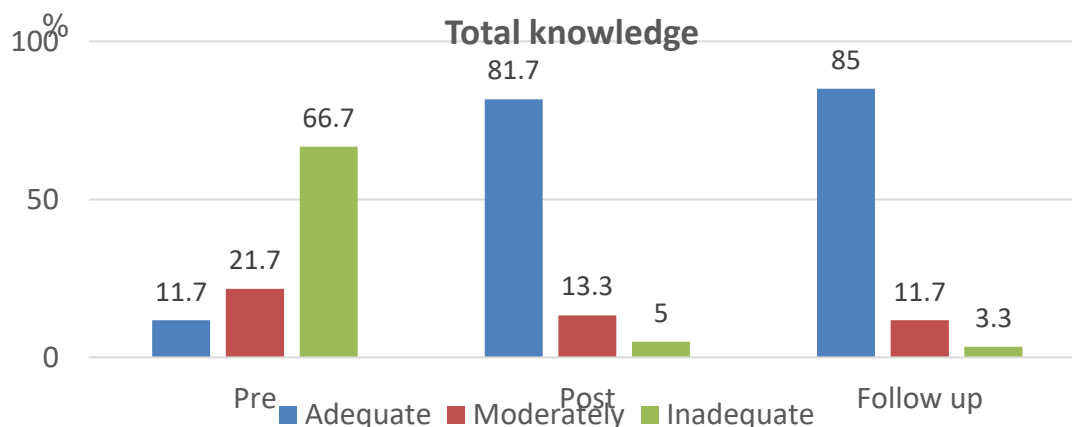


Figure (2): Percentage Distribution of The Total Health Outcomes Pre, Post, and Follow Up Implementation of The Continuous Care Model among The Studied Patients with SLE.

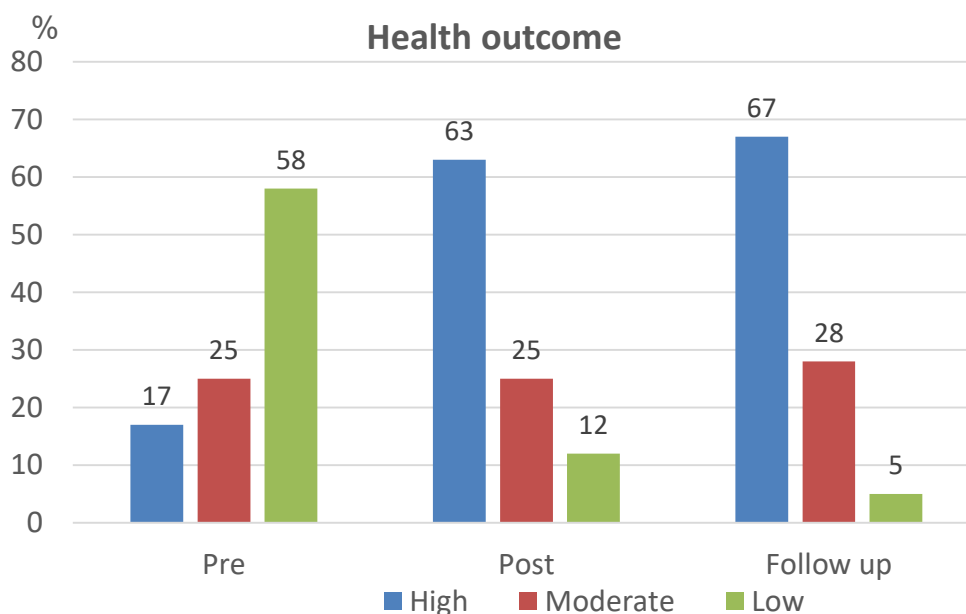


Table (3) Relation Between Demographic Characteristics of The Studied Patients and Their Total Knowledge Scores Throughout Pre, Post, and Follow-Up Phases (N=60)

Demographic Characteristics	Total knowledge											
	Pre		Tests		Post		Tests		Follow up		Tests	
	Mean	SD	t/f	P-value	Mean	SD	t/f	P-value	Mean	SD	t/f	P-value
Gender												
- Female	4.52	1.60	0.258	0.797	13.15	1.99	0.927	0.358	15.22	2.13	0.602	0.549
- Male	4.33	2.25			12.33	2.50			14.67	2.34		
Age												
- <25	3.47	1.22	13.001	<0.001*	11.00	0.75	36.837	<0.001*	12.95	0.91	25.494	<0.001*
- 25- <35	4.24	1.70			13.05	1.77			15.71	1.95		
- 35- <45	5.21	0.89			14.79	0.80			16.29	1.27		
- 45 or more	7.12	0.75			15.67	0.52			17.67	0.52		
Marital status												
- Married	4.95	1.57		<0.001*	13.86	1.76	21.818	<0.001*	16.07	1.72	28.934	<0.001*
- Single	3.29	1.20			11.00	0.68			12.79	0.70		
- Divorce	3.00	1.41			10.00	0.00			12.00	0.00		
Educational level												
- Non-educated	3.07	1.14	9.943	<0.001*	10.86	0.77	22.434	<0.001*	12.71	0.73	17.562	<0.001*
- Primary	4.07	1.28			12.47	1.81			15.13	2.17		
- Secondary	5.26	1.51			14.15	1.49			16.11	1.58		
- Bachelor	6.07	1.41			15.75	0.50			17.50	0.58		
Occupation												
- Housewife	4.27	1.68	1.681	0.181	12.84	2.08	0.784	0.508	15.22	2.10	0.586	0.627
- Employee	4.60	1.07			13.00	2.21			14.80	2.53		
- Unemployment	6.13	1.22			14.20	1.48			16.20	2.05		
- Self-employed	4.50	2.07			13.50	2.00			14.75	1.98		
Residence												
- Rural	4.07	1.56	3.926	<0.001*	12.31	1.76	6.456	<0.001*	14.56	2.08	4.403	<0.001*
- Urban	5.80	1.21			15.33	0.72			17.00	0.85		

Table (4): Relation Between Demographic Characteristics of The Studied Patients and Their Health Outcome Scores Throughout Pre, Post, and Follow-Up Phases (N=60)

Demographic Characteristics	Total health outcome											
	Pre		Tests		Post		Tests		Follow up		Tests	
	Mean	SD	t/f	P-value	Mean	SD	t/f	P-value	Mean	SD	t/f	P-value
Gender												
- Female	64.28	6.58	0.147	0.884	129.09	3.83	0.428	0.671	129.72	4.28	0.413	0.681
- Male	63.83	10.72			128.33	6.47			130.50	5.28		
Age												
- <25	57.42	3.49	29.397	<0.001*	125.95	3.14	12.885	<0.001*	126.53	2.01	22.201	<0.001*
- 25- <35	64.81	5.31			129.14	3.75			129.05	3.99		
- 35- <45	68.14	4.85			130.57	3.06			132.36	2.90		
- 45 or more	74.67	2.34			134.67	1.21			136.83	1.17		
Marital status												
- Married	66.89	5.94	19.922	<0.001*	130.41	3.59	13.999	<0.001*	131.00	4.37	7.772	<0.001*
- Single	57.36	3.65			125.43	2.90			126.57	2.03		
- Divorce	54.00	0.00			123.50	0.71			126.00	0.00		
Educational level												
- Non-educated	56.50	3.28	21.468	<0.001*	124.71	2.58	13.013	<0.001*	126.50	2.03	12.270	<0.001*
- Primary	62.93	5.19			128.80	2.54			127.80	2.57		
- Secondary	67.52	5.50			130.78	3.83			131.81	4.37		
- Bachelor	74.02	3.27			133.00	2.94			135.25	3.10		
Occupation												
- Housewife	63.97	7.14	0.282	0.838	129.14	3.83	0.530	0.664	129.11	4.38	1.088	0.362
- Employee	64.20	5.61			128.50	2.95			130.30	3.68		
- Unemployment	67.01	8.80			130.80	4.32			132.40	5.37		
- Self-employed	63.75	7.54			128.00	6.35			130.75	4.17		
Residence												
- Rural	61.53	5.74	6.988	<0.001*	127.78	3.73	4.735	<0.001*	128.04	3.32	7.601	<0.001*
- Urban	72.33	2.82			132.73	2.69			135.07	2.25		

Table (5): Correlation between Total Health Outcome and Total Knowledge among Patients with Systemic Lupus Erythematosus across Different Phases.

Total health outcome	Total knowledge	
	r	P-value
Pre	0.182	0.107
Post	0.588	<0.001
Follow up	0.612	<0.043

Discussion

Systemic lupus erythematosus (SLE) is an autoimmune illness that causes extensive inflammation of blood vessels and connective tissue. There is no cure for lupus, although medical treatments and lifestyle changes can help manage it. SLE can be mild or life-threatening. Lupus patients who receive adequate medical care, preventative care, and education can greatly improve their function and quality of life (**Bagare et al., 2024**).

This study aimed to evaluate the effect continuous care model care on knowledge and health outcomes in systemic lupus patient.

Regarding the age of the studied patients, the results revealed that more than one third patients aged 25–<35 years with the mean age was 28.79 ± 12.60 , as SLE primarily affects young women of childbearing age, this finding was in accordance with **Elmetwaly et al. (2021)** who stated that mean age was 27.54 ± 11.02 years. These results similar with **Elsayed, & Mesbah, (2018)** who stated that SLE affects young adults and starts in the second or third decade of life and mean age was 28.76 ± 5.98 .

Regarding the gender of the studied patients, the current study found that the most of patients were female, with a ratio of 9 female: 1 male, this consistent finding across studies highlights the effect of endogenous sex hormones, which have multiple impacts on the

immune system and cause gender-related differences in the prognosis and outcome of SLE. This study similar with **Arkema et al., (2023)** which found that majority (87%) of studied patients were females.

In the same line, the study performed by **Gui et al., (2022)** which found that majority of the studied patients 90.9% were females with a female: male ratio of 9.96 :1. These results similar with the result of study performed by **Şahin et al., (2025)** who found that majority of the studied patients (88.1%) were females

Regarding to marital status, the finding of the current study revealed that, less than three quarters were married. These results are in accordance with the studies performed by **Ayad et al., (2024)** which revealed that more than two thirds were married. Moreover, this was in line with the study conducted with **Barakat et al., (2024)** which reported approximately two thirds were married.

In relation to the educational level of the studied patients, it was found that, the current study had different levels of education with dominance of secondary education. As nearly half of the patients had secondary education. This finding may be due to majority of studies patients were females and lived in rural areas. This result was in agreement with the study performed by **Amer et al., (2024)** who reported that half of the

studied patients were had secondary education

According to professional level of the patients in the current study the less than two thirds of the patient was housewife and not working. This study agreement with **Mohamad et al., (2020)** who stated that more than two thirds of the patients not working. The predominance of non-working females in SLE cohorts may reflect the diseases functional limitations and its impact on work capacity.

As regarding residence three quarter are rural and in line with the study conducted by **Mohamady et al., (2022)** stated that the majority of the patient were rural. Rural residence may pose additional challenges, including limited access to specialized care, longer travel times, and potential delays in diagnosis and treatment.

As regards to the onset of disease, The present study findings showed that more than one third of studied patients had been diagnosed for less than three years (mean = 2.76 ± 1.89 years), these results supported with the study done by **Rizk et al., (2020)** who found that more than half of patient have disease duration less than four years. Also this result a line with **Zahiri et al.,(2022)** who report almost all patients had disease duration less than three years (mean = 2.06 ± 1.33 , 2.21 ± 1.33 years) in control and study group respectively.

Regarding symptoms of systemic

lupus erythematosus as reported by the studied patient, the present study results illustrated the most common symptoms in the current study was more than two thirds fatigue and arthritis, and less than two thirds had myalgia, and almost one half had skin rash, less than half of patient had headache, fever and anaemia.

This result is agree with the study performed by **Farouk et al., (2023)** who stated that less than two thirds had fever and fatigue, more than half of patient arthritis, more than two thirds of patient had skin rash.

Regarding family and disease history, the study found that more than three quarter of the patients did not have family history of SLE or autoimmune disease. This finding was in the same line with **Sheha et al., (2024)** report that more than two thirds of the patients didn't have family history of SLE or autoimmune disease.

Regarding precipitating factors, the present study clarified that, less than two third of studied patient had emotional stress, and physical stress. This finding is consistent with the study done by **Mohamady et al, (2022)** who stated that more than two thirds of studied females had physical and emotional risk factors for SLE respectively.

As regard other chronic diseases the present study results revealed that less than three quarter of patient didn't have other chronic diseases. These results approved with **Ahmed et al.,(2023)** who found that roughly three-quarters of the studied patients didn't have a family

history of systemic lupus erythematosus. On the contrary, **Kankaya & Karadakovan, (2020)** found that more than half of study sample had other comorbidities.

Follow-up practices revealed that slightly less than half of the patients attended regular visits, while the remainder sought care only when necessary. This finding is contradict with **Mohamad et al., (2020)** who found that more than half of the patient attend follow up visit only when necessary.

According to the total knowledge of the studied patients regarding systemic lupus erythematosus, the findings of the current study demonstrated that, a noticeable progress among the studied patients' total score of knowledge pre, one month and three months follow up after continuous care model implementation This result supports the study hypothesis (H1) which stated that the total mean score of knowledge regarding SLE was improved at post and follow-up implementation of continuous care model as compared to pre implementation of continuous care model among patients with SLE.

This result is consistent with **Hamad et al.,(2024)** who report that the degree of satisfactory knowledge increased from 10.0% in the initial evaluation to 91.25% and 88.75%, respectively following non-pharmacological nursing interventions implementation and follow-up.

This study finding was supported by

Faheim et al., (2023) who demonstrated a noticeable progress among the studied patients' total score of knowledge pre, post and follow up after self- care guidelines implementation.

Similarly, these study findings were supported by **Salem et al., (2024)** who report remarkable effect of the self-care program on adolescents' knowledge towards SLE that result in competent practices and positive attitude after the self-care program.

According to the mean health outcomes scores of the studied patients,The present study revealed substantial improvements in all measured outcomes following the application of the Continuous Care Model (CCM) among patients with systemic lupus erythematosus (SLE). The overall reported outcome score nearly doubled from baseline (64.42 ± 5.53) to post-intervention (128.58 ± 3.67), with gains maintained at follow-up. The absence of significant decline between post-intervention and follow-up underscores the sustainability of the CCM impact.

In this respect, **Ahmed et al.,(2023)** illustrated a highly statistically significant difference between the total mean lupus PRO score pre, post, and follow up implementation of the self-care guidelines among the studied patients with systemic lupus erythematosus.

This result is agreeing with **Hamad et al.,(2024)** who revealed a highly significant difference between the pre/post and pre/ follow up mean scores for quality of life dimensions include physical functioning, fatigue, general health, pain, emotional well-being and total quality of life after implementation of non-pharmacological nursing interventions.

These findings are consistent with **Mohamady et al., (2022)**, who demonstrates that all Lupus PRO items showed highly statistically significant changes before and one month after self-care management. Furthermore, found that using the self-care model improved SLE flare-ups that were brought on by physical stress in addition to achieving a high quality of life .

A similar result was reported in the study of **Elghareeb, & Mahmoud, (2022)** who reported that there was a highly statistically significant difference in reported health outcome of pain and fatigue score before implementation of self-management instruction, which slightly decreased after implementation of self-management instruction.

Also, this result parallel with **Amer et al., (2024)** who report was reduction in the level of fatigue severity between participants in the study group than participants in the control group on post intervention and follow-up the implementation of self-management guidelines this support that non pharmacological management methods

provided by continuous care model such as range of motion exercises, relaxation exercises and improving diet with vitamins which supported by the illustrative colored booklet for reduction in fatigue levels, and improvement in physical fitness, and reported QOL.

Regarding the relation between demographic characteristics and total knowledge, the present study demonstrated that patients total knowledge scores were not significantly associated with gender or occupation across pre, post, and follow-up phases. On contract to this finding **Alkalash et al., (2024)** and **Alrashdi et al., (2022)** showed that knowledge score of participants was significantly associated with only participants gender.

Regarding the relation between occupation and patients total knowledge scores, the present study demonstrated that patients total knowledge scores were not significantly associated with occupation across pre, post, and follow-up phases. This suggesting that health education interventions can minimize the gap between employed and unemployed groups.

Conversely, the study revealed highly significant associations between knowledge scores and patients age, marital status, educational level, and residence across all phases. Younger patients (<25 years) had lower baseline knowledge compared with older groups, while patients aged 45 years or more demonstrated the highest post and

follow-up scores. This may be explained by the fact that older patients are usually more motivated to learn due to higher disease burden and experience.

This finding is contradict with the study done by **El Saman et al., (2020)** who found that a highly significant negative correlation between age and the knowledge and awareness score. This means that the older the age, the poorer the knowledge.

Regarding the relation between demographic characteristics and the total reported outcome across pre, post, and follow-up phases. The findings showed no significant differences with gender and occupation at any stage.

Conversely, age, marital status, educational level, and residence demonstrated highly significant associations with the total reported outcome during all phases, where older, married, more educated, and urban participants consistently reported higher scores compared with their counterparts. This agreement with **Katz et al., (2021)** who stated that individuals with limited health literacy had significantly worse patient-reported outcome scores.

Regarding the relation between total knowledge and total health outcome this study revealed that there was a statistically significant positive correlation was observed between total reported outcome and total knowledge among patients with systemic lupus erythematosus. This result was

supported by **Mohamady et al., (2022)** revealed a significant positive correlation among studied females total knowledge, fatigue pain, and total Lupus PRO score at the one month following self-care management.

This result supported the findings of **Elsayed & Mesbah (2018)**, who found a strong positive correlation between the overall knowledge, self-care behaviors, and post-intervention total Lupus Patient Reported Outcomes (PRO) score of the participants under study.

Similarly **Yousef et al., (2018)**. who stated highly statistically significant positive correlations between total lupus awareness and patients' total QOL as reported of physical health, pain, emotional health, body image, and fatigue for SLE patients under the study pre and post implementation of SLE health promotion program.

This result was consistent with **Amer et al., (2024)** who revealed that there was a negative correlation between the total patient's scores of awareness and their total scores of pains for the study group and control group through self-management guidelines phases ($P < 0.001$) and support that improving awareness level can result in reducing severity of pain.

Conclusion

It can be concluded that:

The study found that implementing a continuous care model effectively improved patients' knowledge of systemic lupus erythematosus. There

was a significant difference in total knowledge scores between pre and post-tests (after one month and three months). As adequate knowledge improved from 11.7% at pre to 81.7% at post, and remained 85.0% at follow-up.

The health outcomes of studied clients were improved significantly after continuous care model implementation. Health outcome score nearly doubled from 64.42 ± 5.53 pre to 128.58 ± 3.67 post ($p < 0.001$), with no significant change at follow-up ($p = 0.076$).

There was a highly positive association among studied subjects total knowledge Health outcome and score at the post intervention phase

Recommendation

- Implementing continuous care model for all individuals with systemic lupus erythematosus to improve their knowledge, self-care habits and their health outcomes.
- Provide an illustrated Arabic instructional booklet to all Rheumatology outpatient clinics in Fayoum City for newly admitted SLE patients.
- Further research and replication this study for large number of clients and in different setting are also required.

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Effect of Nursing Interventions Protocol on Patients with Arterial Cannulation at Intensive Care Unit

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Abstract: - arterial cannulation is a common invasive operation in the intensive care unit, used for a variety of reasons. nursing care is crucial for patients undergoing arterial cannulation in order to guarantee patient safety and minimize complications,. **Aim:** - Assess the impact of nursing interventions on patients in the intensive care unit who have arterial cannulation. **Design:** is quasi-experimental. **Setting:** Tanta Main University's New Surgeries Hospital's intensive care unit served as the study's site. **Subjects:** A purposeful sample of 60 adult patients undergoing arterial catheterization was split into two equal groups. The study group was overseen by a nursing intervention protocol created and carried out by the researcher, while the control group received standard care from the surgical intensive care unit nursing staff. **Tools:** -An arterial cannulation complications assessment tool and a critically ill patient assessment tool were also utilized. **Results:** Vascular complications and pain intensity were significantly different between the two groups. After arterial catheter removal, there was a significant decrease in peripheral ischemia consequences in the study group as compared to the control group (mean score of 2.00 ± 1.45 vs. 8.10 ± 2.05 , respectively). Additionally, the study group experienced much less pain than the control group, with mean scores of 0.00 ± 0.00 and 3.47 ± 0.937 , respectively. **Conclusions:** Clinical outcomes for patients with arterial cannulation improved as a result of the nursing interventions strategy. **Recommendations:** Nursing Interventions Protocol should be carried out as a routine care for patients at Intensive Care Units, as there was a significant improvement in the study group in decreasing vascular complications. **Key words:** Arterial Cannulation, Intensive Care Unit, Nursing Interventions protocol.

Introduction

Continuous patient monitoring is crucial because critically sick patients frequently experience a life-threatening, multisystem failure process that could cause significant morbidity or death. (S El-helaly, S abd-alazeem& E Mostafa, 2022; Brown, Ballal & Al-Haddad, 2024). Monitoring a patient in an intensive care unit (ICU) is done to improve patient care, such as by changing the patient's treatment or moving them to a step-down unit. Arterial blood pressure, central venous pressure (CVP) measurement, pulmonary artery catheterization, arterial blood gas (ABG) analysis, and other measures are all part of invasive monitoring in an intensive care unit. (Angelucci, Greco, Cecconi & Aliverti, 2025).

The patient's underlying condition and the ICU's equipment availability determine how the physiologic parameters are monitored. (Renner, Grünwald & Bein., 2016). An essential ICU operation, arterial cannulation minimizes the need for repeated punctures and enables regular blood gas analysis and direct blood pressure monitoring. (Walsh, Srivastava & Fitzsimons, 2025; Punja & Schenarts, 2023).

The US intensive care unit, reported arterial catheter utilization is 51.7% for patients in need of vasopressors and 49.2% for patients on mechanical ventilation. (Imbriaco, Monesi & Spencer, 2022). In Egypt, arterial

cannulation is performed on 10–97% of patients hospitalized to intensive care units, depending on their clinical circumstances. The dorsalis pedis, posterior tibial, radial, brachial, femoral, and ulnar arteries, as well as the temporal arteries, are potential cannulation sites. (Elgendy & Ganawc, 2023). In adults, the radial artery is typically the most accessible location for cannulation because of a number of benefits and a lower incidence of related problems. (Hager & Burns 2023).

Artery cannulation is generally a fairly safe technique, although there is a chance that complications could lead to bleeding, hematoma, artery occlusion, pseudoaneurysm, neurological issues, discomfort, inadvertent dislodgment, and catheter-related infections, including bacteremia. (Novak, 2017; Córdova, Santos, Toebe, Moraes & Souza, 2018). To lower these risks and guarantee patient safety, a thorough nursing intervention procedure must be developed and put into place. (Pierre, Ramos & Shimizu, 2024).

Because of factors like obesity, peripheral edema, and hypotension, critically sick patients are more prone to experience failure even though arterial catheterization has a high success rate and few problems. (Wang et al., 2020). 10% of first attempts are known to fail at the moment, and the process frequently results in several punctures. Direct heating of the radial artery and palmar warming of the radial artery (Balbay technique) are usually carried out before

to transradial coronary catheterization in order to lubricate the radial perforation and lower the number of failures at the first attempt of arterial perforation. **(Ahmad, 2023; Ünal et al., 2017).**

Significant pain and suffering are frequently experienced during arterial access. Both invasive and noninvasive methods have been investigated to control and lessen this pain. For example, it has been demonstrated that administering lidocaine intradermally around the puncture site prior to the arterial puncture significantly lowers the frequency and intensity of localized pain. **(Hudson, Dukes, & Reilly, 2016).** Furthermore, applying a cold pack before a surgery is an easy, non-invasive, and economical way to manage pain. **(Pagnucci, 2020; Bastami, Azadi & Mayel, 2015).**

The patency of vascular catheters must be maintained. Normal saline or normal saline plus 1 to 2 units/ml of heparin are the most common infusate fluids. **(Nuraeni, Iqbal, Roulita, Nurlaeci, & Mirwanti, 2022).** It is crucial to routinely check the catheter site for indications of infection. Nurses should inspect the insertion site and make sure the dressings are sterile and undamaged. Regular evaluations lower the chance of major consequences by assisting in the early detection of problems like infection or catheter displacement **(Mariano-Gomes, Ouverney-Braz & Oroski-Paes, 2024; Pereira. Pasrija & Keenaghan, 2024).**

After the arterial cannula is removed, the most crucial nursing action is to guarantee hemostasis by directly and adequately providing pressure to stop the bleeding from the artery catheter. New guidelines for controlling bleeding risks place a strong emphasis on the application of point-of-care tests and hemostatic treatments customized for each patient. **(Hou, Zhou, He, Chen & Zuo, 2023).** Pain and bleeding can be decreased by applying a cold pack to the insertion site during the first five minutes prior to arterial cannula removal. **(Kurt & Kaşıkçı, 2019).**

Furthermore, if a patient's blood supply is impaired, arterial cannulation may result in distal ischemia to the arterial cannula, so the distal pulses in the extremities need to be closely watched. When a patient complains of limb pain, the nurse must be on the lookout for changes in skin color and temperature. As soon as hemodynamic stability is achieved, arterial lines should generally be stopped **(Plowright & Sumnall, 2022).**

Significance of the study: Although arterial catheters are used often, little is known about the likelihood of problems. But it's important to be mindful of dangerous consequences like ischemia. Depending on the site of insertion, documented complications from arterial cannulation in adult intensive care units usually range from 10% to 13%. These complications include discomfort, thrombosis, hematoma, pseudoaneurysm, and in rare instances,

limb ischemia (1%) (**Imbriaco, Spencer & Spencer, 2024**). So, correct arterial line nursing care for critically ill patients is vital to reduce complications and ensure patient safety (**Elkholy, Marzouk & Elhaweet, 2024**).

The aim of this study was to determine the effect of nursing interventions protocol on patients with arterial cannulation at intensive care unit. **Research Hypothesis:** study group patients in intensive care unit who were exposed to the protocol showed decrease in arterial cannulation difficulties while the control group wasn't subjected to nursing interventions.

Design: is quasi-experimental. **Setting:** Tanta Main University's New Surgeries Hospital's intensive care unit served as the study's site. **Subjects:** 60 adult patients undergoing artery catheterization were included in the purposeful sample; they were split into two equal groups of 30 individuals each. Critical care nurses provided **the control group** with their usual nursing care. **The study group** was given the nursing interventions protocol that the researcher had created and apply it. The subjects were recently hospitalized patients of both sexes, aged 21 and older, who had no history of vascular surgery or bleeding disorders.

Tools of data collection: -Two tools were used

Tool (1): - Critically- Ill Patient Assessment Tool included two parts: -

Part (A) patient's demographic characteristics: - Such as patient's age, sex and body mass index (BMI).

Part (B) Patient clinical data included current diagnosis, past medical and surgical history and level of consciousness. Laboratory investigations included coagulation profile. Arterial line characteristics as purpose of arterial cannulation, site of artery used, and duration of arterial cannulation.

Tool (II): - Arterial Cannulation Complications Assessment Tool included the following parts: -

Part (A):- Vascular complications such as limb ischemia, temporary artery occlusion, heparin-induced thrombocytopenia manifestations, external bleeding and hematoma. **Total scoring system:-**Abnormal findings (present) was scored (1) and normal findings (absent) was scored (0)

Part (B):- Pain Assessment uses Critical-Care Pain Observation Tool (CPOT) by Gelinas & Johnston (2007). Scoring system: -Based on this scale, the patient's pain status was classified as painless (0), mild (0–3), moderate (3–6), or severe (6–8).

Method

The appropriate authorities at the study location granted official permission to conduct the study. Informed consent was acquired along with approval from the Faculty of Nursing's ethical committee. Privacy and confidentiality were guaranteed, and participants might leave the research at any moment.

Tools (I and II) were created by the researcher following a survey of relevant research, evaluated by specialists for content validity, and examined for dependability utilizing the proper statistical technique. The alpha Cronbach factor was used to test the produced tools' reliability, and the results were 0.883 for tool II and 0.913 for tool I.

A pilot study was performed on 10% of the total sample to evaluate the practicality and suitability of the instruments used. Data collection extended across six months, beginning in March 2024 and concluding in August 2024. To avoid cross-contamination of information, the researcher initiated data gathering with the control group before proceeding to the intervention group. The research process was implemented in four successive stages:

- **Assessment phase:** Upon admission, the investigator collected demographic details and clinical information using Tool I.
- **Planning phase:** The primary objective was to minimize vascular complications while preserving stable hemodynamic parameters; therefore, patient care strategies were formulated with defined goals and anticipated outcomes in mind.

Implementation phase:

- Participants in the **control group** continued to receive the standard nursing care routinely provided by the ICU staff. In contrast, those in the **study group** were managed

according to the researcher's structured nursing intervention protocol.

- **Pre-cannulation care:** Prior to arterial cannula insertion, patients underwent both psychological reassurance and physical preparation. The adequacy of collateral circulation was confirmed using the Barbeau (modified Allen's) test. The researcher also checked distal limb pulses, assessed capillary refill, and ensured proper antiseptic cleansing of the puncture site and surrounding skin with chlorhexidine solution, which was allowed to air dry. A sterile drape was then placed over the prepared area.
- **Balbay maneuver:** To promote vasodilation and ease cannula placement, the radial artery site was warmed by covering with the palm for three minutes following local infiltration of 1% lidocaine.
- **During cannulation:** Patients were kept supine and at rest in bed. Continuous hemodynamic monitoring was maintained throughout the procedure to promptly recognize any adverse responses. The insertion site was observed for signs of bleeding or hematoma formation.
- **Post-cannulation care:** The arterial line was stabilized and secured under a transparent dressing, with the date of application recorded. Dressing changes were carried out according

to hospital policy or earlier if there was evidence of bleeding, sweating, or local infection, always under aseptic non-touch technique. Line patency was preserved with heparinized saline. The necessity of the cannula was reviewed daily, and once no longer indicated, the line was removed.

- **During removal:** Coagulation profile was evaluated before removing the cannula. A cold compress was applied for the first five minutes around the site to minimize bleeding and discomfort. After the cannula was withdrawn, direct pressure was maintained on the site until complete hemostasis was achieved.

Evaluation phase:

Assessment for both groups (control and study) was performed at three points: prior to insertion, during the cannulation procedure, and after removal of the arterial line, using Tool II.

Results:

Figure (1) shows distribution of the studied patients with arterial cannulation regarding their age. Observations revealed that nearly half (46.67%) of the patients in control group were between 20 to 30 years old while the highest percentage (60%) of the patients in study group were between 30 to 40 years old. **Figure (2) shows distribution of the studied patients with arterial cannulation regarding gender,** it was noticed that, control

group has a slightly higher proportion of males (63.33%) than the study group (50%). **Figure (3) shows distribution of the studied patients with arterial cannulation BMI categories,** it was found that more than half of the patients in both control and stud groups (56.67 %) were over –weight.

Table (1) presents the distribution of patients with arterial cannulation based on their clinical data. In terms of current diagnosis, valvular disease was the most common condition, affecting 50.00% of the control group and 46.67% of the study group. **For past medical history,** cardiovascular diseases were the most frequently reported, affecting 50.00% of the control group and 43.33% of the study group. **In relation of surgical history,** the majority of patients had no prior surgical history, with 66.67% in the control group and 73.33% in the study group. **Regarding level of consciousness,** most patients were fully conscious, accounting for 83.33% of the control group and 76.67% of the study group.

Figure (4) shows the distribution of the studied patients regarding their arterial line characteristics. Regarding the purpose for arterial line insertion, higher proportion of patients required arterial lines for hemodynamic monitoring, with 76.67% in the control group and 86.67% in the study group. **As for the site of artery,** 90% of the control group had radial arterial lines, while 100% of the study group utilized radial lines,. **Regarding duration of arterial**

cannulation, 93.33% of the control group had lines in place for less than one week, compared to 100% in the study group. There was no statistically significant difference between both groups in relation to their arterial line characteristics

Table (2) presents the distribution of total vascular complications among the control and study groups throughout periods of study: before arterial catheter (AC) insertion, during insertion, and after removal. At baseline (before insertion), all patients in both groups had low complication levels (<60%), confirming the absence of significant vascular issues prior to intervention. During AC insertion, the control group showed a marked rise in high complication levels (26.67%), compared to only 3.33% in the study group. This difference widened substantially after AC removal, where 70% of the control group experienced high complication levels, versus only

10% in the study group. The mean complication score in the control group increased sharply from 0.20 ± 0.41 before insertion to 8.10 ± 2.05 after removal, indicating a significant deterioration in vascular status. In contrast, the study group mean rose only from 0.10 ± 0.31 to 2.00 ± 1.45 , reflecting substantial protection against vascular complications.

Table (3) shows that pain severity was significantly lower in the study group compared to the control group across all time points. Before insertion, 76.67% of the study group reported no pain, while only 36.67% of the control group did. During insertion, 60% of the control group experienced severe pain, whereas 76.67% of the study group reported only mild pain. After 30 minutes, all patients in the study group (100%) had no pain, in contrast to 53.33% of the control group who still experienced moderate pain.

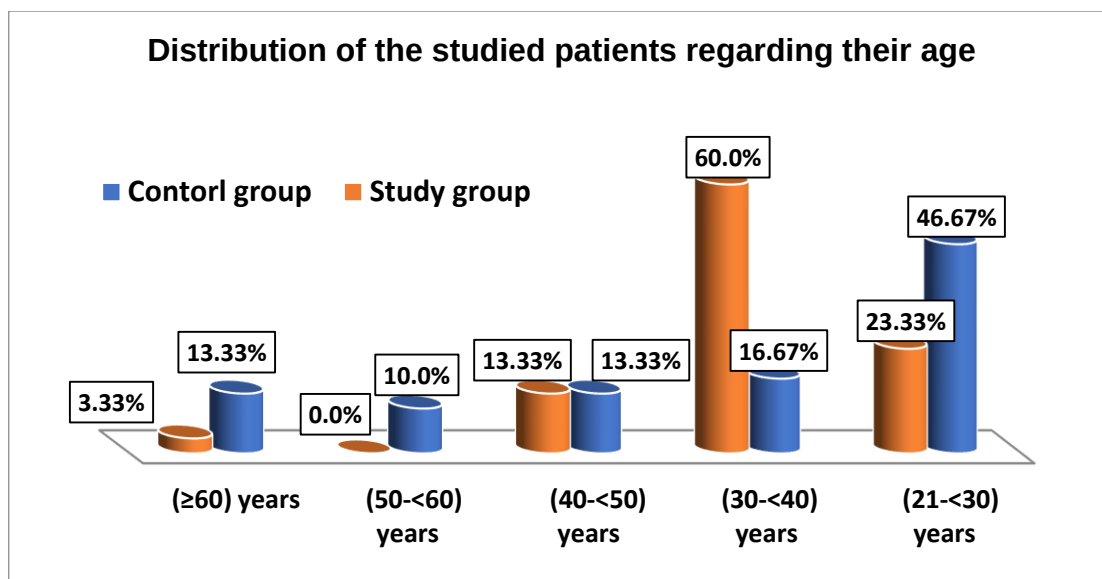


Figure (1): Distribution of the studied patients according to their age (n=60)

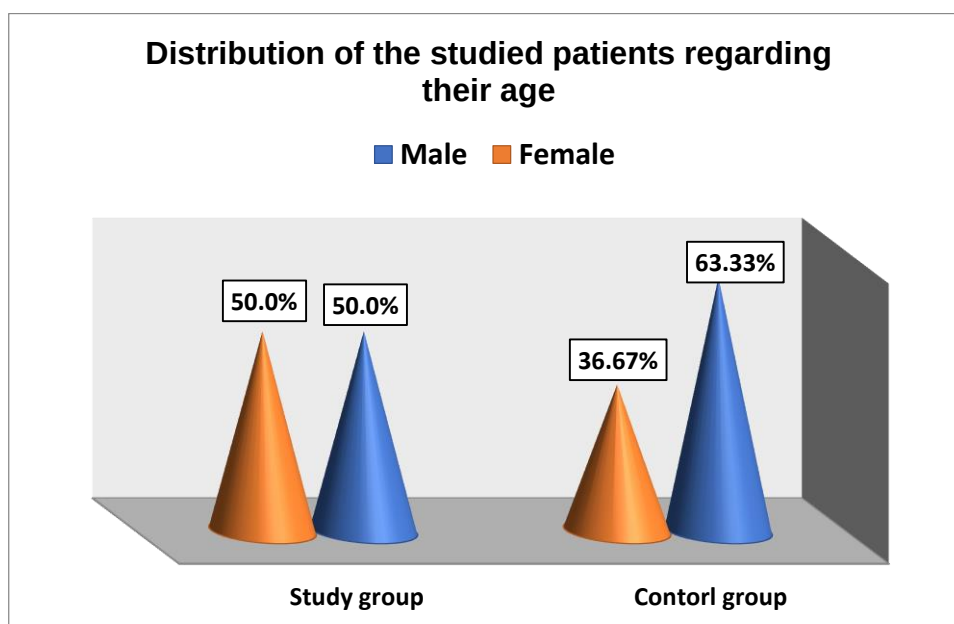


Figure (2): Distribution of the studied patients according to their gender (n = 60)

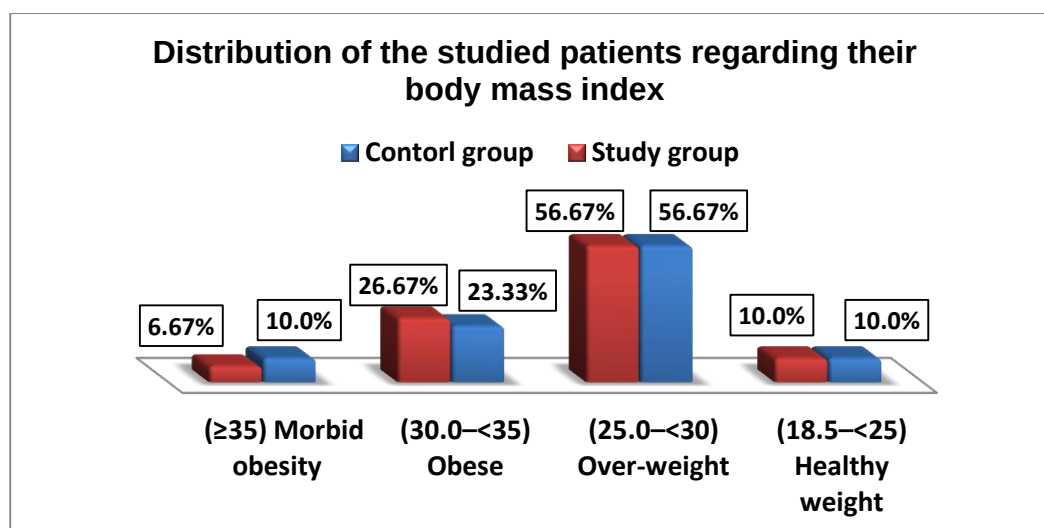


Figure (3): Distribution of the studied patients regarding their body mass index

Table (1) presents the distribution of patients with arterial cannulation based on their clinical data

Clinical data	The studied patients (n=60)				χ^2 P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
Current diagnosis					
Abdominal surgeries	3	10.00	3	10.00	
Valvular disease	15	50.00	14	46.67	3.276
Thoracotomy cases	1	3.33	2	6.67	0.513
Head trauma	4	13.33	3	10.00	
Multi-fracture	7	23.33	8	26.67	
# Past medical history					
Cardiovascular diseases	15	50.00	13	43.33	
Respiratory disease	1	3.33	0	0.00	2.343
Endocrinal diseases	1	3.33	2	6.67	0.310
Others	5	16.67	0	0.00	
# Surgical history					
None	20	66.67	22	73.33	
Vascular surgery	4	13.33	0	0.00	0.445
Any invasive procedure	5	16.67	4	13.33	0.505

Abdominal surgeries	7	23.33	6	20.00	
Level of consciousness					
Fully conscious	25	83.33	23	76.67	2.745
Semi-conscious	4	13.33	7	23.33	0.286
Coma	1	3.33	0	0.00	

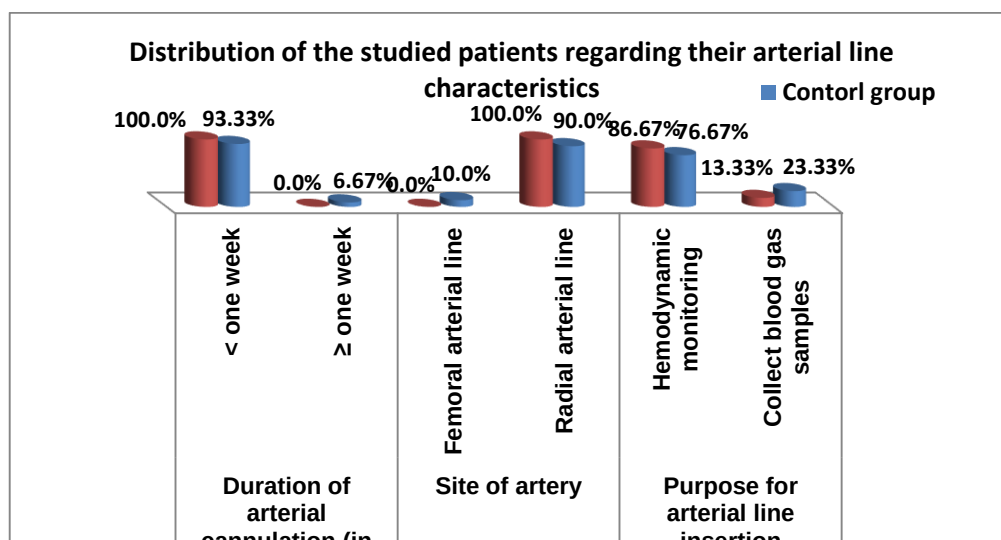


Figure (4): Distribution of the studied patients regarding their arterial line characteristics

Table (2): Distribution of the studied patients regarding total level of vascular complications throughout periods of study

Total vascular complications level	The studied patients (n=60)															
	Control group (n=30)							χ^2 P	Study group (n=30)							χ^2 P
	Before insertion AC		During insertion AC		After removal AC		Before insertion AC		During insertion AC		After removal AC					
	N	%	N	%	N	%	N		%	N	%	N	%			
▪ Low	30	100.00	22	73.33	9	30.00	12.45	30	100.0	29	96.67	27	90.00	8.92		
▪ High	0	0.00	8	26.67	21	70.00	0.000*	0	0.00	1	3.33	3	10.00	0.003*		
Range	(0-2)		(2-8)		(5-12)		F=	(0-1)		(0-4)		(0-5)		F=28.15		
Mean ± SD	0.20±0.41		3.30±1.40		8.10±2.05		64.32 P=0.000*	0.10±0.31		1.15±0.65		2.00±1.45		P=0.000*		
Control Vs Study																
t	1.10		4.56		7.89											
P	0.275		0.000*		0.000*											

<60 Low $\geq$ 60% High

* Significant at level P< 0.05.

Table (3): Distribution of the studied patients regarding pain severity using CPOT scale throughout periods of study

Total CPOT Level	The studied patients (n=60)													
	Control group (n=30)							Study group (n=30)						
	Before insertion AC		During insertion AC		After 30 min of insertion AC		χ^2 P	Before insertion AC		During insertion AC		After 30 min of insertion AC		χ^2 P
	N	%	N	N	%	N		N	%	N	%	N	%	
▪ No pain	11	36.67	0	0.00	0	0.00		23	76.67	0	0.00	30	100.00	
▪ Mild	7	23.33	0	0.00	14	46.67	74.49	7	23.33	23	76.67	0	0.00	92.61
▪ Moderate	9	30.00	12	40.00	16	53.33	0.000*	0	0.00	7	23.33	0	0.00	0.000*
▪ Severe	3	10.00	18	60.00	0	0.00		0	0.00	0	0.00	0	0.00	
Range	(0-7)		(4-8)		(2-6)		F=59.69	(0-1)		(2-4)		(0-0)		F=349.28
Mean ± SD	2.23±2.373		6.77±1.331		3.47±0.937		P=0.000*	0.23±0.430		2.97±0.718		0.00±0.00		P=0.000*
Control Vs Study														
t	4.541		13.762		20.262									
P	0.000*		0.000*		0.000*									

No pain (0) Mild (1-3) Moderate (4-6) Severe (7-8)

* Significant at level P<0.05.

AC: Arterial Cannulation

Discussion

The present study examined the influence of a nursing intervention protocol on ICU patients undergoing arterial cannulation. With respect to sociodemographic variables, the results demonstrated no statistically significant difference between the control and study groups. The mean age in the control group was 37.63 ± 14.177 years, compared to 35.50 ± 7.999 years in the study group. This outcome corresponds with the findings of **Smith, Brown & Lee (2021)**, who emphasized that similarity in age distribution across groups reduces bias in clinical investigations.

Similarly, the current findings align with the work of **Rao & Cheema (2019)**, who assessed evidence-based practices for preventing ventilator-associated pneumonia in ICU patients and observed that most participants were middle-aged. Conversely, these results differ from those of **Tonna et al. (2024)**, who evaluated a quality improvement program targeting sleep and delirium in surgical ICU patients and reported a higher median age of 61 years. In the same context, **Sayed, El Kenany, Ahmed, & Allam (2024)** identified a mean patient age of 47.70 ± 9.259 years, which is also higher than that observed in the current study.

Regarding gender, the analysis showed that male patients formed the majority of ICU admissions, though no significant

variation was detected between groups. Comparable trends were noted by **Fowler et al. (2021)**, who indicated that around 60% of ICU admissions were male, pointing to a gender-related imbalance in critical care admissions. This observation is further supported by **Klotz, Heuermann, Hanke, Petersen & Sievers (2015)**, who found that gender had no significant impact on outcomes associated with arterial catheterization.

As for body mass index (BMI), over half of the patients in both groups were classified as overweight, with no significant group differences detected. These results are consistent with the work of **Brown et al. (2019)**, who highlighted the importance of comparable anthropometric profiles in enhancing study validity. Likewise, **Gribsholt et al. (2021)** and **Yang et al. (2022)** documented that nearly half of their studied populations were overweight or obese. They also noted that higher BMI values were associated with increased risks of hospitalization, ICU admission, pain severity, and the likelihood of undergoing invasive interventions.

Concerning current diagnosis, valvular diseases were the most common diagnoses in both groups, followed by cases of multiple fractures. This is because the study was conducted in the surgical care unit. This pattern aligns with **Hou et al., (2023)** who noted that patients with valvular disorders and bone

fractures are among those most likely to require arterial catheterization. However, **Borg & Trapani (2024)** pointed out that variations in diagnoses may affect study accuracy, particularly when a standardized classification of patient conditions is not applied.

Additionally, medical and surgical history, cardiovascular diseases were the prevalent among patients in both groups. Most of the patients had no previous surgical history. These findings are in agreement with **Sengupta et al., (2022)** who stated that patients with cardiovascular diseases often require surgical interventions. However, **Elgendy & Ganawe, (2023)** reported that the absence of previous surgical history does not necessarily imply lower risk, as some patients may still be prone to complications due to other chronic conditions.

Concerning level of consciousness, the majority of patients in both groups were fully conscious, with no statistically significant difference between the groups. This finding is consistent with **Novak (2017)** who found the most of study sample were alert and conscious patients are less likely to experience complications related to anesthesia. Nevertheless, **Andropoulos, (2020)** reported that the presence of patients in a coma or semi-conscious state may influence outcomes, especially in studies assessing anesthesia effectiveness or emergency medical interventions.

The findings revealed notable differences in the purpose and site of arterial line insertion between the control and study groups. A higher proportion of patients in the study group required arterial lines for hemodynamic monitoring compared to the control group. This finding is in line with **Lee, (2025)** who emphasized that hemodynamic monitoring is critical in intensive care settings for optimizing patient outcomes. On the other hand, blood gas sampling was more common in the control group, which may reflect variations in clinical protocols.

Also, the radial artery was the predominant site for cannulation in both groups, which is consistent with **Gutte, Azim, Poddar, Gurjar & Kumar (2023)** who reported that radial access is generally preferred due to its lower rate of complications. Also, study conducted by **Nuttall et al., 2016** found that radial artery was cannulated in majority of patients. Additionally, the duration of cannulation was shorter in the study group, as all patients had lines in place for less than one week. This finding supports **Card et al., (2024)** who stated that earlier removal of arterial lines can help in reducing the risk of infection.

As regarding to vascular complications, the findings demonstrated clear differences between the two groups. The control group experienced more post-cannulation vascular issues such as pallor, pain,

discoloration, and temporary occlusion, while the study group reported no such complications across different time points. The consistent stability of ischemic symptoms in the study group suggests that the applied measures were effective in preventing complications associated with arterial cannulation. These findings were consistent with **Hixson, Jensen, Melamed,& Qadir, (2024)**, who emphasized that advanced management techniques reduce vascular risk. Furthermore, **Majmundar et al., (2022)** and **Dahan, Engberts & Niesters, (2016)** highlighted the importance of continuous assessment and preventive strategies to maintain vascular integrity.

Moreover, the findings indicated that the study group maintained stable vascular conditions after catheter removal, while a considerable portion of the control group experienced various vascular concerns. This supports the effectiveness of the intervention in reducing overall vascular complication levels. The progressive improvement seen in the study group over time suggests that the benefits of the intervention are cumulative and increase with continued application. These outcomes further reinforce the results of **Elkholy et al., (2024)** who emphasized the role of standardized nursing protocols in reducing the risk of complications associated with arterial lines.

In terms of pain assessment during catheter insertion and post-procedural phases, the responses differed clearly between both groups. Patients in the study group appeared more comfortable, with reduced signs of facial tension and muscular reactions during the procedure. Post-procedurally, the study group returned to a state of rest and relaxation more rapidly than the control group. These results provide further evidence for the intervention's positive impact on pain management as Balbay maneuver and cold pack application around insertion site for the first 5 minutes before removal of arterial cannula. Similar findings were reported by **Kurt & Kaşıkçı (2019)** and **Bastami et al., (2015)** who concluded that the application of cold reduced pain in patients after the withdrawal of the arterial catheter. The absence of overt pain behaviors in the study group supports the argument that the interventions contributed to a more effective pain control strategy that significantly improve patient comfort compared to routine care. However, **Yaseno et al., (2024)** reported That different local ways with no medication during radial arterial puncture not achieve pain relieve effectively.

In summary, the nursing interventions protocol contributed to better outcome as vascular issues, pain control and improved hemodynamic stability, offering a safe and effective alternative

to standard care. The consistent improvements across pain-related and vascular condition suggest that this protocol could be beneficial in enhancing procedural outcomes and minimizing associated complications

Conclusions

Based on the current study's findings, it can be said that the study group experienced less pain, vascular complications, infection and improve patient safety than the control group when interventions were implemented for patients with arterial cannulation in the critical care unit.

Recommendations

A. Clinical Practice

Recommendations:

The standardized arterial cannulation protocol should be implemented as routine practice in all critical care units to minimize complications and improve patient outcomes

Ultrasound guidance should be mandatory for all arterial line placements to increase first-attempt success rates

B. Administrative

Recommendations:

Develop comprehensive training programs for healthcare providers on the protocolized arterial cannulation technique

Establish quality assurance measures to monitor compliance with the standardized protocol

C. Research Recommendations:

Conduct multicenter studies with larger sample sizes to validate these findings across diverse patient populations

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