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Nursing Workplace agility and Nurses' Voice Behavior

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Abstract

Background: In highly dynamic environments, workplace agility, often fostered by supportive leadership, encourages nurses' voices to share ideas for improvement and reduces reliance on rigid, traditional hierarchies, directly enhancing both individual performance and patient care quality. **Aim:** To assess the nursing workplace agility and nurses' voice behaviors. **Methods:** Descriptive-correlational research design was used in this study. **Setting:** The study was conducted at New Surgeries Hospital, which is affiliated with the Ministry of Higher Education and Scientific Research in all departments of general surgery, orthopedics, neurology, vascular, and cardiothoracic as well as in all intensive care units. **Subjects:** All nurses (470) employed in the aforementioned contexts were included in the study. **Tools:** Two tools for data gathering were employed: nursing workplace agility and nurses' voice behavior questionnaire. **Results:** The study revealed that 42.5% of nurses perceived a high level, 38.1% had a moderate level, and 19.4% had a low level. Of the nurses surveyed, 43.4% of the studied nurses reported a moderate level of voice behaviors, 39.4% indicated a high level, and 17.2% of them exhibited a poor nurses' voice behaviors. **Conclusion:** Nursing workplace agility was positively correlated with nurses' voice behavior. **Recommendations:** Cultivate an agile environment in which nurses feel secure in voicing their concerns and apprehensions without fearing adverse repercussions and organize systematic training sessions that concentrate on enhancing agility skills, problem-solving techniques, and communication competencies.

Keywords: Nurses, voice behavior, workplace agility.

Introduction

In recent years, the nursing profession within healthcare organizations has encountered numerous significant challenges. These challenges include rising patient numbers, staff shortages, increasingly complex care requirements, the emergence of new diseases, and evolving health regulations. Together, these factors have highlighted the critical need for nurses who are both agile and adaptable while delivering safe, efficient, and cost-effective nursing services in compliance with strict regulatory and accreditation standards (Aiken et al., 2021). Nurses have an obligation and commitment to exhibit the skills required to quickly adjust to these changes. (Clauss, Abebe, Tangpong, & Hock, 2021).

An agile workplace encourages innovation, flexibility, and provides resources for staff development. It entails the capacity of nurses and nurse managers to move, think, and respond rapidly and effectively within complex, high-pressure healthcare environments. It bridges the gap between following rigid protocols and managing the unpredictable nature of modern patient care (Ewais & Tawifk, 2026; Akkaya, 2021; Buchan, Catton, & Shaffer, 2020).

Organizational agility is a broader system-wide capability that involves an organization's "sensing" ability to detect external changes and "acting" agility to implement new technologies or care models rapidly. Workforce agility reflects the flexibility of frontline nurses to adapt nurses' clinical behaviors to dynamic environments. High workforce agility is strongly correlated with innovative work behavior and increased job satisfaction, particularly in critical care units. An agile workforce is one that can anticipate, proactively adapt, quickly recover, communicate across functional boundaries, and be adaptable to change (Majd & Majd, 2023; Omidvar, Zahed, Moeinikia, & Khaleghkhah, 2021).

Nursing workforce agility involves flexible staffing, continuous skill development, and innovative, collaborative behavior, enabling better responses to patient demands, reduced burnout, and improved safety. Agile nurses are more likely to find new, efficient ways to work and solve problems in critical care and other high-pressure units. Effective managerial agility is essential to lead nursing teams. It involves swift decision-making, crisis management proficiency, and the ability to reallocate resources immediately based on fluctuating

patient needs. Nursing workplace agility involve responding quickly , using resources wisely, supporting the nursing staff, and coming up with unique answers to problem **(Alviani, Hilmiana, Widianto, & Muizu, 2024; Atalla, Ali, El-Ashry, & Mostafa, 2024).**

Nursing workforce agility has three primary sub-behaviors: proactive, adaptive and resilience. Proactivity behaviors refer to nurses` ability to anticipate future challenge, also involve assuming accountability and initiative for ones`s deeds and objectives. It also refers to the anticipating and acting in advance of future situations, problems, or changes before they escalate **(Gougjehyaran, Maleki, & Sahebihagh, 2025).**

Adaptive behavior, or task agility, reflects the nurses` capacity in response to organizational demands, involving cross-training, multiskilling, and enlargement, enrichment, and job rotation. It refers to the ability to adjust to changing circumstances and demands within the healthcare setting **(Tessarini & Saltorato, 2021).** Resilience behavior indicates the capacity of nurses to modify their work schedules in order to accommodates personal and organizational requirements, enabling more control over

timetables through agreements such as flexible work schedules, tele commuting, and part-time empolyment **(Franco & Landini, 2022).**

Within the healthcare system, the professional nurses have various responsibilities that extend beyond direct patient care to include care coordination, development of professional nursing standards, implementation of quality improvement initiatives, and management of complex nursing care systems. Nurses often possess unique, practical insights that can lead to more efficient work processes and innovative, proactive solutions to daily problems **(Mackavey, Henderson, & Morris, 2025).**

Nurses` voice behavior refers to their opportunity to express opinions regarding workplace-related issues, including work processes, task practices, and other hospital running procedures, and can be (promotive or prohibitive). Promotive voice, where nurses are able to freely express their innovative ideas and constructive suggestions for change to improve hospital efficiency. Also, it is defined as a proactive communication to improve workplace practices, and patient care is essential for fostering safe,

efficient, and innovative healthcare environments **(Fletcher, 2023)**.

Prohibitive voice behavior, which involves speaking up to prevent harm or address unsafe practices, is critical for enhancing patient safety and organizational accountability in healthcare settings. Nurses who engage in prohibitive voice behavior, such as reporting errors, challenging unsafe protocols, or addressing unethical behavior, play a vital role in reducing adverse events and fostering a culture of transparency **(Kang, Kim, & Lee, 2023)**.

Significance of study:

Healthcare organizations must be much more adaptable and dynamic to endure in a competitive environment. In order to encourage nurses' and their leaders'. Organizational agility in healthcare sector must meet the highest standard of nurses' and patients' requirements, expectations. And requirements. **(Akkaya & Mert, 2022)**. The role of organizational agility as a mediator in the enhancement of nurses' skills and conduct that provides essential assistance for nurses moving into advanced practice to support career objectives and professional growth **(Pereira, Mellahi, Temouri, Patnaik, & Roohanifar, 2019)**.

The voice behavior of good nurses encourages social and psychological contexts enable efficient use of resources, and uphold the sustainability and equity of the organization. **(Guo et al., 2021)**. Because they spend more time with patients than anyone else in the hospital, nurses are perceptive, imaginative, and passionate about patient care . Their vocal behaviors influence good improvements for nursing practice and eventually improve patient. Nurses' voice behaviors influence positive changes for the practice of nurses and ultimately improve patient care. Therefore, understanding the relation between workplace agility and nurses' voice behaviors is imperative, particularly in countries like Egypt that have a large nursing workforce.

Aim of Study:

Assess the nursing workplace agility and nurses' voice behaviors.

Research Questions:

- What are the levels of nurses' perception of workplace agility?
- What are the levels of nurses' voice behaviors?
- What is relation between the nursing workplace agility and nurses' voice behaviors?

Research design:

A descriptive-correlational research design was used in this study.

Setting:

The study was performed at New Surgeries Hospital, which is affiliated to the Ministry of Higher Education and Scientific Research. It was conducted in all departments of general surgery, orthopedics, neurology, vascular, and cardiothoracic as well as all intensive care units.

Subjects:

The following departments comprised all (N=470) staff nurses from the aforementioned setting.

Tools:

The data of the study collected using two tools:

Tool I: Nursing Workplace Agility questionnaire: This tool consisted of two parts as follows:

Part (1): Nurses' personal and work-related data:

This part included nurses' personal data and work-related data: age, gender, marital status, number of children, department, position, educational level, years of experience, and previous attending workshop or seminar related to agility

Part (2): Nurses' Perception of Workplace agility: It was developed by the researcher based on related literature reviews (Coetzee et al., 2021, Naqach & Chaouki, 2023; Reinhold, 2024). It was used to assess the levels of

nursing workplace agility as perceived by nurses. The 21 items comprised three subscales: proactivity behavior (7 items), adaptation behavior (9 items), and, and resiliency behavior (5 items). Nurses' responses were measured on a five-point Likert ranging from almost always (5) to almost never (1).

Scoring system:

The total score was categorized according to statistical cut-off point and summing scores of all categories. The total scores represent varying levels as follows:

- High workplace agility level >80% (score>105).
- Moderate workplace agility level 60% - 80% (score 63-84).
- Low workplace agility level < 60% (score<63).

Tool II: Nurses' Voice Behaviors questionnaire.

This was developed by the researcher based on related literature reviews (Gyensare, Arthur, Twumasi, Agyapong, & Ratajczak-Mrozek, 2019; Lee, Seo, & MacPhee, 2025) to assess nurses' voice behaviors. It contained 14 items, including three subscales' behaviors as follows: promotive voice (9 items) and prohibitive voice (5 items). Nurses' responses were measured on a five-point Likert

ranging from almost always (5) to almost never (1).

Scoring system:

The total score was categorized according to statistical cut-off point and summing scores of all categories. The total scores represent varying levels as follows:

-High nurses' voice behaviors level >80% (score >56).

-Moderate nurses' voice behaviors level 60% - 80% (score 42-56).

-Low nurses' voice behaviors level < 60% (score <42).

Method

An official permission was obtained from the Dean of Faculty of Nursing and the authoritative personnel that were submitted to the previously mentioned settings.

Ethical considerations:

-Approval of Ethical Scientific Committee at Faculty of Nursing was obtained with code number 414-3-2024.

-The researcher presented herself to the participants; a full explanation of the main method of the study was provided to obtain their acceptance and cooperation as well as their informed consent.

-The right to abstain or terminate participation at any time was respected.

-Assuring nurses about the privacy and confidentiality of collected data

and explaining that it was used only for study purposes only.

-The nature of the study was not causing any harm or pain for the entire subject.

-Confidentiality and anonymity were maintained regarding data gathering, and the participants have withdrawal rights.

-The study's tools (I & II) were translated into Arabic and presented to a jury of five experts in specialty to check their face content and validity.

-The panel comprises three professors and two assistant professors specializing in nursing administration from the Faculty of Nursing at Tanta University. The experts' replies were represented using four points rating scale ranging from; 4 =strongly relevant to and 1= not relevant. Necessary modifications were made, including clarification, omission of certain items, adding others, and rephrasing of some word. The face validity value of nurses' opinion regarding workplace agility (Tool I) was 99.8%, and nurses' voice behaviors (Tool II) was 98%.

-A pilot study was carried out on 10% of the subjects (n=47), who were included in the main study sample during the actual collection of data. It was carried out after the experts' opinions and before starting

the actual data collection. The pilot study was done to test the clarity, sequence of items, applicability, relevance of the questions, and to determine the time needed to complete the questionnaire. The pilot study was excluded from the study's subjects.

-The estimated time needed to complete the questionnaire items from nurses was 10-15 minutes, in which 5-10 minutes for the first tool and 5 minutes for the second tool.

-**The reliability of the tools** was assessed using Cronbach's Alpha Coefficient test, revealing a reliability value of 0.893 for the nurses' perceptions of workplace agility questionnaire (Tool I) and a reliability value of 0.973 for the nurses' voice behaviors questionnaire.

-**Data collection phase:** The data was obtained from nurses who were working in the previously mentioned settings by the researchers, where the data was collected over four months starting from December 2024 to the end of March 2025. Nurses will give the questionnaire to participants in small groups across several settings throughout morning and evening shifts. The questionnaire was completed in the presence of researchers to ascertain that all questions were answered.

Statistical analysis

The statistical analysis of the data was done using SPSS (Statistical Package for Social Science) version 20 to conduct tabulation and statistical analysis. Quantitative data were described using range, mean, and standard deviation. Frequency charts and cross-tabulations with percentages were used to illustrate the outcome of categorical data and tested by chi-square. Pearson correlation was used to test the nature and strength of relation between two quantitative variables. Cronbach's alpha was used to assess internal consistency reliability, indicating how closely related a set of items are as a group. A two-tailed test with an alpha error of 0.05 was used for all statistical analysis. A statistically significant p value was defined as one that was less than or equal to 0.05.

Results

Table (1): Illustrates the frequency and distribution of nurses' personal and work-related data. It shows that less than half (43.4%) of nurses were between the ages of 30 and under with a mean score of 32.66 ± 9.0 , and less than three-quarters (70%) of them were females. More than sixty percent (62.6) of the studied nurses were married, and 47.7% of them had 1 to 2 children had an average score of 0.99 ± 1.05 . Additionally, less than

half (40.7) of nurses worked in general intensive care units, and more than half (59.8%) of them were positioned as staff nurses. Moreover, more than half (51.3%) of nurses had bachelor's degrees in nursing, and 60.4% of them had less than or equal to 10 years of experience in nursing with a mean score of 9.67 ± 9.2 .

Figure (1): Displays the nurses' percentage for attending workshops related to agility. It is observed that the vast majority (91.31%) of the studied nurses didn't attend any workshop related to workplace agility.

Figure (2): Determines the total nurses' perceived levels of overall workplace agility. It shows that the high perception of overall workplace agility was held by 42.5% of the nurses under study. While a moderate perception levels was shown by 38.1% of nurses, and only 19.4% of them demonstrated a low perception level of overall workplace agility.

Figure (3): Declares the general levels of vocal habits among nurses. It shows that 39.4% of the nurses in the study had a high degree of voice behavior, while the largest percentage (43.4%) had a moderate level. However, 17.2% of the nurses in the study exhibited poor nursing voice behaviors.

Table (2): Describes the overall mean score of nurses' perception of workplace agility dimensions. It is observed that the total mean score of nurses' perception of workplace agility was 75.51 ± 19.96 . The highest average mean score was assigned for the proactivity (3.81 ± 1.23), followed by the resiliency (3.56 ± 1.16), and lastly the adaptability (3.52 ± 1.05) of workplace agility, respectively.

Table (3): Clarifies nurses' mean scores of voice behavior domains. It is observed that the total mean core of nurses' voice behaviors was 48.54 ± 14.24 . The overall average mean score for prohibitive voice was 3.53 ± 1.08 . Whereas the score for promotive voice was 3.39 ± 1.12 .

Figure (4): Affirms the correlation between dimensions of nurses' perception of workplace agility and their voice behaviors. There was strong, positive statistically significant correlation between nurses perception of workplace agility and their voice behaviors, where $r=0.933$ and $p=0.000$.

Table (1): Distribution and Frequency of personal and work-related data for nurses (No= 470)

Nurses' Personal and Work-Related Data	Number	%
Age		
<30	204	43.4
30-40	195	41.5
>40	71	15.1
Min. – Max.	(22-56)	
Mean $\pm$ SD	32.66 $\pm$ 9.02	
Sex		
Male	141	30.0
Female	329	70.0
Marital status		
Married	294	62.6
Unmarried	176	37.4
Number of children		
Zero	206	43.8
1-2	224	47.7
>2	40	8.5
Mean $\pm$ SD	0.99 $\pm$ 1.05	
Min. – Max.	(0-4)	
Department		
General Surgery	32	6.8
Orthopedic	60	12.8
Neurological	40	8.5
Vascular	50	10.6
Cardiothoracic	80	17.0
General ICU	191	40.7
CCU	17	3.6
Position		
Staff nurses	281	59.8
Charge nurses	157	33.4
Head nurses	28	5.9
Supervisors	4	0.9
Educational Level		
Secondary nursing diploma	10	2.1
Technical nursing diploma	179	38.1
Bachelor science in nursing	241	51.3
Post graduate studies	40	8.5
Years of experiences		
<10	284	60.4
10-20	135	28.7
>20	51	10.9
Mean $\pm$ SD	9.67 $\pm$ 9.2	
Min. – Max.	(1-35)	

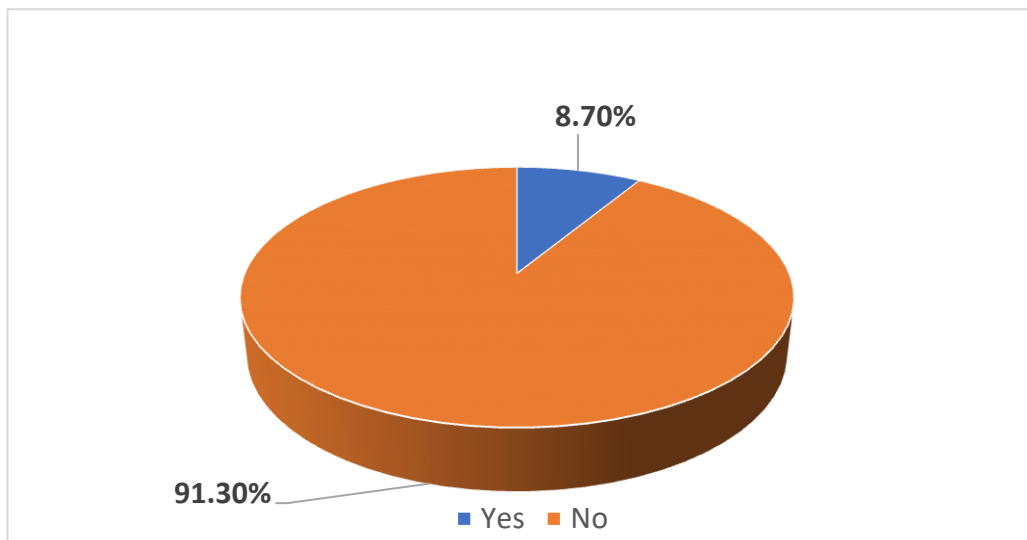


Figure (1): Nurses' percentage for attending workshops related to Agility.

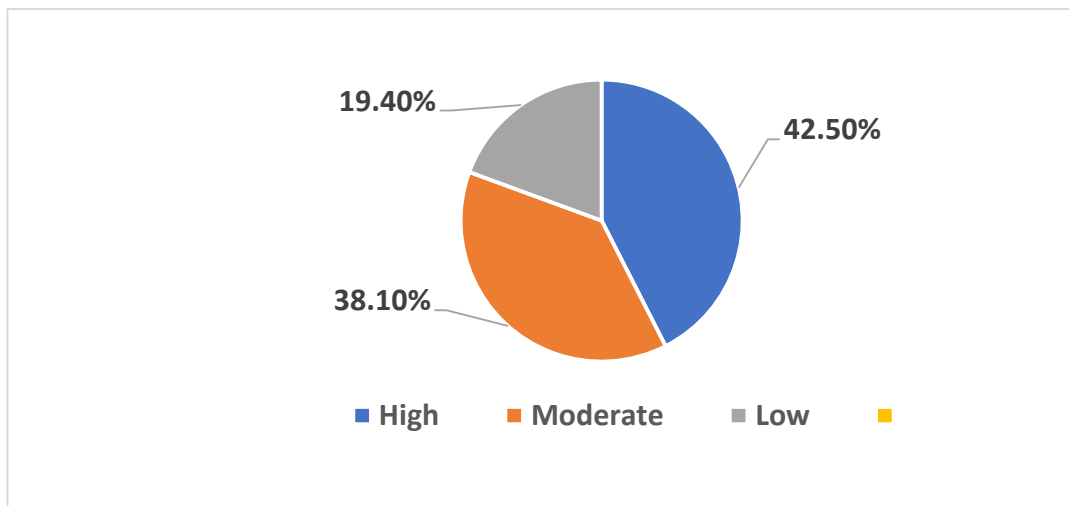


Figure (2): The total nurses' perceived levels of overall workplace agility.

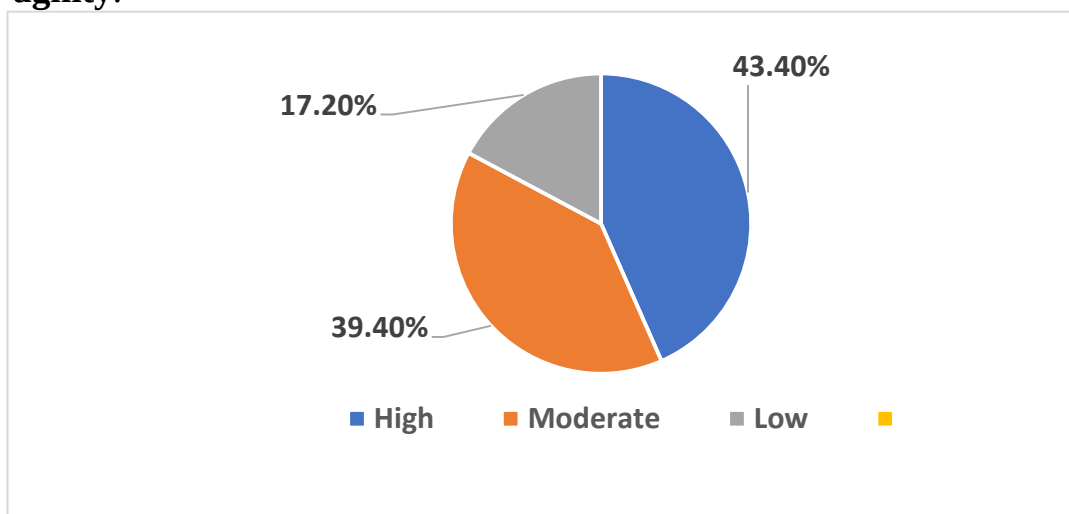


Figure (3): Overall levels of vocal habits among nurses

Table (2): Overall mean scores of nurses' perception of workplace agility dimensions (No= 470)

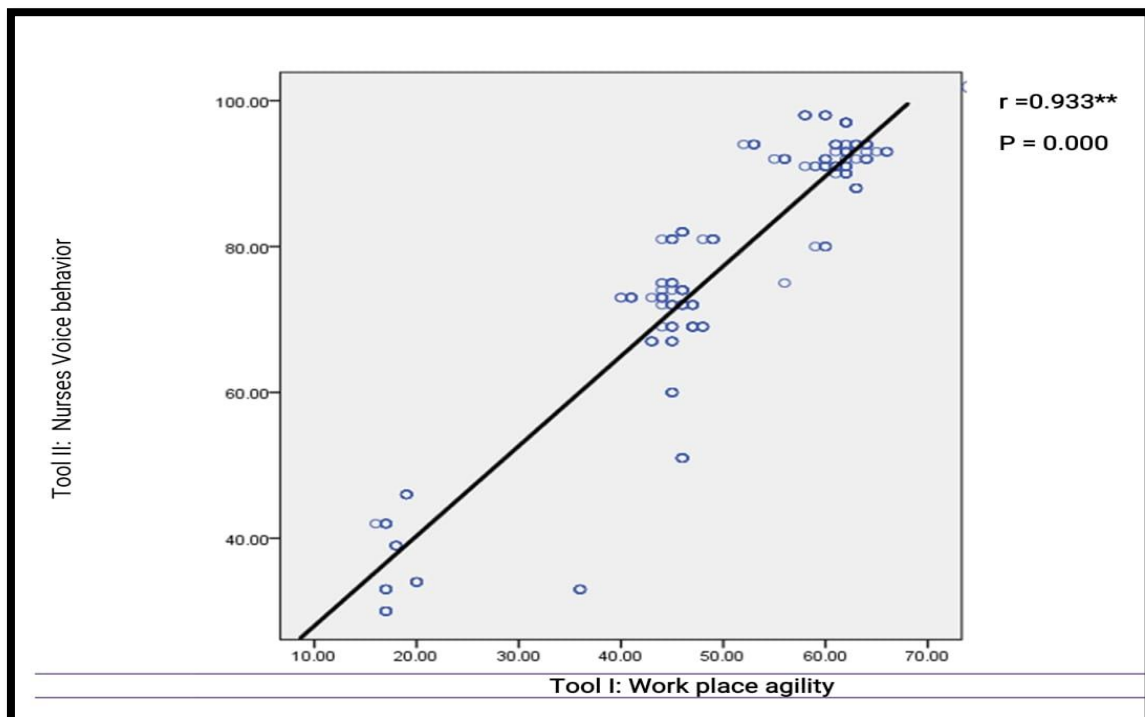
Workplace agility	Score range	Total score			Average score (1-5)	Ranking
		Min. – Max.	Mean $\pm$ SD	Median	Mean $\pm$ SD	
Proactivity	(7-35)	(7-35)	25.83 $\pm$ 6.516	28	3.81 $\pm$ 1.23	1
Adaptability	(9-45)	(11-44)	31.64 $\pm$ 9.345	32	3.52 $\pm$ 1.05	3
Resiliency	(5-25)	(6-24)	18.05 $\pm$ 5.33	19	3.56 $\pm$ 1.16	2
Total	(21-35)	(30-98)	75.51$\pm$19.96	68		

SD: Standard deviation

Table (3): Nurses' mean scores of voice behavior domains

Voice behaviors subscales	Score range	Total score			Average score (1-5)	Ranking
		Min. – Max.	Mean $\pm$ SD	Median	Mean $\pm$ SD	
Prohibitive voice	(5-25)	(5-25)	17.13 $\pm$ 5.24	17	3.53 $\pm$ 1.08	2
Promotive voice	(9-45)	(9-41)	31.41 $\pm$ 9.30	31	3.39 $\pm$ 1.12	1
Total	(10-70)	(16-66)	48.54$\pm$14.24	47		

SD: Standard deviation

**Figure (4): Correlation between dimensions of nurses' perception of workplace agility and their voice behavior.**

Discussion

New technology, new models, new ways of dealing with competition, digitalization, market liberalization and fragmentation, economic uncertainty, shifting demographics, and ongoing social and political turbulence have all affected the healthcare organizations' environment. In dynamic and complicated hospital environments, nursing agility is a critical quality for efficient and successful management. Quick decision-making, flexibility in shifting circumstances, and the capacity to adjust to unforeseen obstacles are all necessary for the use of managerial agility, as well as nurses' voice behavior. Nurses' voice behavior is a critical component of effective healthcare delivery, influencing both organizational development and patient outcomes (**Tessarini & Saltorato, 2021**). Therefore, this study attempted to evaluate the nursing workplace agility and nurses' voice behaviors.

Findings of the current study reveal that the around roughly two-fifths of nurses had generally a high view of nursing workplace agility and more than one-third of them had a moderate perception level. This finding indicates that the majority of nurses perceived their work environment as adaptive and capable of responding effectively to change,

which reflects the high-stakes nature of nursing environments that necessitate rapid, flexible responses. Such findings mirror a growing awareness among nurses about the importance of flexibility, adaptability, and resiliency within the healthcare organizations.

The high perception level in the present study could be attributed to the younger age of the participants and the predominance of nurses holding bachelor's degrees, as represented in their demographic data. These characteristics may enhance their readiness to embrace new practices and technologies, which are essential components of workplace agility. Moreover, despite the fact that most of the studied nurses had not attended formal workshops related to agility, their perception was still relatively high, suggesting that agility may have been developed through practical experience and exposure to dynamic clinical conditions.

These findings are supported by **Atalla et al. (2024)** revealed that the nurses' perception level of workplace agility was high. Moreover, the study performed by **Kamal et al. (2025)** revealed that more than half of the studied nurses had a high perception level of organizational agility. In the same line, **Abdel Elsalam & Ahmed (2024)** found that around two-thirds

of nurses had a high level of workplace agility.

On the other hand, these results contradict with the study of **Hussein, Mohamed, & Kamal (2022)**, which showed that highly percentage of nurses had a moderate level of organizational agility. Moreover, **Zeid et al. (2024)** confirmed that nurses perceived a low level of organizational agility. The study of **Kamal (2022)** stated that less than half of tested nurses expressed a moderate level of organizational agility.

In this context, **Gougjehyaran et al. (2025)** concluded that high workplace agility generates a wide-range of advantages for nurses, patients, healthcare systems, and institutions. Furthermore, **Shatila (2025)** explored that agility and digital leadership play vital roles in helping firms to withstand unexpected changes, which act as key mediators between artificial intelligence adoption and the resilience of an organization.

Furthermore, more than one-third of the studied nurses showed a moderate perception level, and only a few percent had a low perception level of workplace agility. These findings can be attributed due nurses feeling that while their unit or team is agile, the overall hospital system (bureaucratic leadership style or inadequate

resource allocation) hinders total organizational agility.

Similarly, the study of **Ewais, Hassan, and Tawifk (2026)** discovered that staff nurses at Beni-Suef University Hospital had a modest view of organizational agility. The findings of **Basiony & Ibrahim (2023)** disclosed a moderate level of organizational agility as perceived by nurses. The study findings also are congruent with a study conducted by **King (2021)**, which discovered that institutions maintained moderate agility levels during COVID-19, suggesting that embracing advanced e-HRM practices for overcoming operational challenges and improving performance.

Likewise, the recent research findings by **Hussien, Seada, & Hassan (2026)** indicates that the biggest percentage of nursing personnel had a modest degree of overall perception of organizational agility in different intensive care units at Cairo University hospitals. **Abdel-Aziz, Ebrahim, & Amer (2025)** found a moderate level of overall organizational agility as experienced by nursing staff covers all medical and surgical departments at Benha University Hospital.

The results of the current study indicate that a significant portion of the nurses requested through there was high level in all dimensions of

nursing workplace agility. Among these dimensions, proactivity received the highest mean score, followed by resiliency and adaptability. The findings can be explained by individual resources, personality traits, and career development, which together illustrate the dimension of proactivity. The proactivity is characterized by an active, self-initiated, and forward-looking approach to change, which is highly valued and actionable compared to merely reacting to adversity.

Congruently, **Saleem, Isha, Yusop, Awan, & Naji (2021)** ranked the proactivity dimension as the highest mean score among Malaysian nursing staff, followed by adaptability, and finally resilience, which all enhance their safety performance. According to the literature review by **Athamneh & Jais (2023)**, human resource agility is a crucial, multi-dimensional construct. It is primarily comprised of individual proactivity characteristics, resilience traits, and adaptation abilities, all of which are essential for organizational success.

In the same vein, **Gougjehyaran et al. (2025)** described proactivity as a key component of workforce nursing agility, acting as a forward-looking, self-directed behavior that allows nurses to anticipate challenges, initiate improvements, and adapt to

changing environments before issues escalate. On the other side, the findings of **Walpita & Arambepola (2020)** confirmed that the resiliency domain of nursing workplace agility had the highest mean score among Sri Lankan nurses, directly enhancing nursing quality and performance in South Asia.

In this regard, **Tawfik & Mahgoub (2024)** revealed that agility acts as a crucial buffer, especially with highly adaptable and proactive nurses experiencing less deterioration in well-being and performance. The study of **Leonelli & Primavera (2022)** reported that the adaptability aspect functions as a critical mediator for nurses, bolstered by social support and effective coping mechanisms, and directly correlates with reduced burnout and better management of constant, rapid workplace changes in crisis periods. The findings of the current study highlighted that fewer than half of nurses had a modest level of nurses' voice behaviors, whereas one-third of them had a high level and approximately one-sixth of them had a low level of nurses' voice behavior. This means that nurses' overall voice behaviors ranged between high to moderate. The interpretation of these findings can be explained by nurses' willingness to proactively share suggestions, feedback, responsibility, or concerns

toward their work —reveals that while a significant portion of them exhibited high levels of engagement, various individual and organizational barriers still prevent them.

These findings in line with the study performed by **Hossny et al. (2026)** recorded increased levels of voice conduct in spite lower view of humble leadership at Al-Mobara Hospital, affiliated with the Health Insurance Authority, compared to El-Mahalla Hospital, which is affiliated with the Ministry of Health and Population. Moreover, the research of **El-Said, Ahmed, & Bashandy (2025)** documented that less than fifty percent of nurses have a high level of nurses' voice behavior and around one third of them have a moderate level in two medical facilities at Minia city.

In this aspect, the findings of **Huang et al. (2025)** exposed a moderate level of overall voice behavior among Chinese nurses of two public university hospitals in Türkiye. Additionally, the finding of **Yilmaz, Keskin, and Sönmez (2025)** reported a moderate and positive significant correlation. In the same context, the study of **Lu, Xia, Wang, & Zou (2025)** revealed a moderate level of overall voice behavior among Chinese nurses.

The results of the present study indicated a statistically significant link between nursing workplace

agility and nurses' voice behavior. From the researcher's perspective, this result can be clarified by the fact that workplace agility provides nurses with a flexible and adaptive working environment that enables them to respond effectively to constant changes in healthcare settings. When nurses perceive their workplace as agile, they are more likely to feel confident, encouraged, and able to voice their opinions and thought. This supportive environment encourages proactive communication, where nurses feel safe to speak up regarding issues related to patient care, workflow improvement, and organizational challenges.

Moreover, agile work environments promote collaboration, shared decision-making, and continuous learning, which in turn can enhance nurses' engagement and sense of responsibility. As a result, nurses are more inclined to demonstrate voice behaviors that contribute to improving the overall quality of healthcare services and sustaining positive organizational outcomes.

This result agrees with the study of **Elsayed et al. (2022)**, who found a highly statistically significant positive correlation between staff nurses' creative work practice in critical care unit and workforce agility. The findings of **El-Sayed et al. (2024)** showed that higher levels

of organizational agility are associated with increased climate activism and enhanced green work behavior in the nursing workplace. In the same line the results of **Tawfik, El-Ashry, Atalla, & Mahgoub (2025)** found a positive correlation between nurses' agility and quality of work life, signifying that higher agility is linked with better work satisfaction and well-being, countering the negative effects of toxic leadership. Moreover, **Kamel, Abdeen, Ahmed, & Attia (2025)** revealed a statistically critical positive association between nurses' readiness for change and their sense of organizational agility.

This finding is contradictory to the research of **El-Sayed, Alsenany, Atta, Othman, & Asal (2025)**, who found significant negative correlations between agility and both workplace gaslighting and workaholism, indicating that toxic workplace behaviors undermine nurses' agility. Whereas the study of **Bashandy, Mohamed, Ahmed, & Thabet (2022)** found organizational agility and nurses' enthusiasm for their work are significantly correlated negatively with toxic leadership. This result supports the study of **Zhuang et al. (2025)**, who state that voice behavior in nurses showed a significant positive correlation with thriving at work and

was strongly correlated with psychological empowerment. Also, **Atalla, Mostafa, & Ali (2022)** found that there are statistically significant positive strong association between overall nurses' core competencies and total vocal behavior, which are crucial for organizational development.

Conclusions

In light of present study's findings, it is concluded that the majority of nurses had a moderate or high perception of nursing workplace agility, with less than half perceiving a high level, more than one-third a moderate level, and only a few percent a low level. Whereas less than half of the studies staff nurses reported a modest level of voice behaviors, more than one-third indicated a high level, and only a few percent of nurses perceived a low level of nurses' voice behaviors. There was a strong positive statistically significant relation between nurses' perception of nursing workplace agility and their voice behavior.

Recommendations

For hospital administrators:

-Establish and fortify both formal and informal communication frameworks that encourage nursing professionals to articulate their thoughts and concerns candidly, devoid of any apprehension regarding potential repercussions.

-Implement "speak-up" initiatives and foster an environment where nurses can raise concerns and report issues without fear of retaliation, thus promoting proactive voice behavior.

-Organize systematic workshops and training sessions that concentrate on enhancing agility skills, problem-solving techniques, communication competencies, assertiveness, and constructive feedback mechanisms to empower nurses to express their viewpoints with confidence.

For head nurses:

-Cultivate an environment in which nurses feel secure in voicing their concerns and apprehensions without fearing adverse repercussions.

-Engage nurses in the processes of planning, policy formulation, and problem resolution to augment their sense of ownership, agility, autonomy, and accountability concerning patient care results.

-Encourage exhibiting active listening and responsiveness, thereby serving as exemplars in the demonstration of effective voice behavior and expressing gratitude for nurses' contributions.

For nurses:

-Create formal channels to actively engage in collaborative discussions and articulate their perspectives and apprehensions regarding workplace practices to elevate the quality of patient care.

-Participate in available workshops focused on communication and leadership to fortify their verbal expression and interpersonal dynamics.

-Solicit constructive criticism by proactively seeking evaluative feedback from superiors and colleagues to facilitate their professional development and optimize communication effectiveness.

For nursing education

-Incorporate organizational agility and voice behavior into nursing curriculums and professional development programs to help nurses adapt to rapid changes and strengthen organizational agility.

-Use simulation scenarios to train nurses on fast decision-making and problem-solving to improve individual agility and facilitate students' application of vocal behaviors in high-stakes situations.

For nursing research:

-Shift from cross-sectional studies to daily diary Method or longitudinal research to track how changes in workplace agility affect voice over time.

-Utilize qualitative interviews to understand the reasons behind voice silence, alongside quantitative tools measuring agility levels.

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Barriers to Green Practice Regarding Waste Management Among Nurses at Burn and Plastic Surgery Units

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Abstract

Background: Green nursing promotes environmentally sustainable healthcare. In Egypt, hospitals are improving green practices but face challenges like limited green space, rising waste, and emissions. In burn units, strict infection control and proper hazardous waste management are essential to prevent sepsis and protect both patients and the environment. **Aim:** to identify the Barriers to green practice regarding waste management among Nurses at Burn and Plastic Surgery units. **Subjects and methods:** This study was carried out on 50 nurses who were providing direct care for patients undergoing burn and plastic surgery units. **Tool I:** Nurses' self-administrative questionnaire, it consisted of two parts: **Part I:** It was used to assess sociodemographic characteristics of nurses. **Part II:** It was designed to assess Nurses knowledge about green practice regarding waste management in burn and plastics surgery units'. **Tool II:** Waste reduction and prevention check list for evaluation green practice regarding waste management among nurses. **Tool III:** Barriers of green practice regarding waste management questionnaire. It was used to assess barriers of green practice regarding waste management among nurses. **Results:** There was a strong positive correlation between nurses' total knowledge and total green practices ($r = 0.923$, $p \leq 0.001$). A strong negative correlation was found between total knowledge and total barriers ($r = -0.752$, $p \leq 0.001$). Additionally, total green practices were significantly negatively correlated with total barriers ($r = -0.642$, $p \leq 0.001$). **Conclusions:** Comprehensive systemic reform is required to embed sustainability as a core component. **Recommendations:** Healthcare systems should integrate sustainability into infrastructure, policies, and quality indicators.

Keywords: Barriers, Green Practice, Waste Management, Nurses, Plastic Surgery Unit.

Introduction

Environmental nursing, based on Florence Nightingale's theory, links environment to health and emphasizes nurses' roles in promoting sustainable, healing environments, addressing ecological risks, and advocating for environmental health change (Gilbert, 2020). In Egypt, most waste is landfilled or dumped illegally, but the country aims to reduce landfill waste to 20% by 2030 (Atalla et al., 2024).

Recently, the greening of healthcare organization and environmental sustainability become the main concern of the majority of organizations. "green management" is the process of integrating ecologically friendly practices and guidelines into the running and administration of medical facilities (O'Hara et al., 2022).

Green nursing aims to reduce healthcare's environmental impact through evidence-based practices, recognizing the link between environmental and human health. Nurses play a key role in implementing eco-friendly measures in patient care, emphasizing a professional responsibility to both patient well-being and the health of the planet (Seppänen and Or, 2025).

Green practice at hospitals refers to the practice of implementing environmentally sustainable policies and procedures in burn unit and management of healthcare facilities (O'Hara et al., 2022). The health sector in any country consumes a significant portion of financial and human resources, thus reflecting the economic dimension of sustainability (Alharbi et al., 2021). Hospitals create major environmental impacts through resource consumption, products, and waste generation, and the health sector has a substantial global climate footprint (Bandoophanit et al., 2018).

Green practice at hospitals involves collaboration between healthcare professionals, administrators, and environmental experts to develop and implement sustainable policies and procedures. The ultimate goal of green practice at hospitals is to promote a culture of sustainability and environmental stewardship in the healthcare system (Adu et al., 2020).

Environmental sustainability is becoming more important to HealthCare sectors worldwide. In fact, the Global Green and Healthy Hospitals Network are bringing together for assisting healthcare services worldwide in becoming more ecologically conscious. Since

nurses act 60% of the global health care workforce, they play a crucial role in implementing green practices in burn unit (**Elsayed et al., 2020**).

Medical waste must be handled and disposed properly; health issues and environmental concerns arise from lacking of clear rules for handling medical waste, as well as from inadequate training and ignorance of their application. Today nurses must be environmentally attentive in evaluating the impact of their practices on the environment and how to provide options to reduce hazard because they are expected to perform expanded tasks under various conditions (**Mohammed et al., 2019**).

Nurses' adherence to infection prevention and control reduces complications, shortens hospital stay, and supports healing especially in burn patients undergoing skin grafting, where strict wound care is essential (**Ghorbanmovahhed et al., 2023**).

Managing healthcare waste in burn and plastic surgery units is crucial due to its infectious and hazardous nature. While regulations, public awareness, and new technologies have improved waste management, barriers remain, including poor administrative commitment, lack of guidelines, limited staff awareness and training, resistance to change,

financial constraints, and inadequate infrastructure (**Musa et al., 2020**).

Barriers for waste management include Poor waste segregation methods, a lack of awareness, and insufficient training are causing problems for many healthcare facilities, particularly those in developing countries, despite the recognized need of proper waste management (**Alshagrawi and Alahmari, 2025**).

According to Vision 2030, the Egyptian government is committed to turning environmental challenges into opportunities. Waste management has taken steps to become more sustainable, even if it is still a health risk (**Wahaab et al., 2020**).

Healthcare delivery generates various wastes, with 15% being hazardous such as soiled cotton, bandages, needles, syringes, IV tubing, and catheters that can harm humans and the environment. The remaining 85% is general, non-hazardous waste like paper, drug wrappers, cardboard, and leftover food (**Capoor and Parida, 2021**).

The process and method adopted for waste management should be technically and financially sustainable in the long run. It has to also be ensured that there are no adverse health and environmental consequences of waste handling,

treatment, and disposal activities (Mugabi et al., 2018).

Aim of the study: to identify Barriers to Green Practice Regarding Waste Management among Nurses at Burn and Plastic Surgery Units

Subjects and Methods:

Design: This descriptive research design was used in this study.

Setting: the study was conducted at Burn unit of Emergency hospital and Plastic Surgery department of New Surgeries at Tanta University Hospital.

Sample: Convenience sample of all available nurses (50) who were working in the previous mentioned setting who were providing direct care for patients undergoing burn and plastic surgery units.

Nurses were separated into 4 groups according to level of education: master degree, Bachelor degree, diploma and nursing technician.

The assessment was delivered through 5 structured sessions covering green practices, waste management, and related barriers.

Inclusion Criteria:

-Nurses working in burn and plastic surgery units

Nurses who received any training of green practice regarding waste management

-Both sex (male and female)

-At least 6 months of experience

-Willingness to participate

Exclusion Criteria:

-Nurses on leave during data collection

-Nurses who refused participation

-Nurses with less than 6 months experience

Data collection tools:-

Three tools were utilized in this study to assess the barriers to green practice regarding waste management among nurses in burn and plastic surgery units.

Tool I: Nurses' self-administrative questionnaire:

It was designed by the researcher in simple Arabic language after reviewing the related literature and studies. (It was written in the form of multiple-choice questions) to suit the understanding level of the study subject.

Part I : It was used to assess socio demographic characteristics of nurses such as code, age, sex (male or female), marital status, area of residence (rural - urban), educational level (nursing technician- bachelor degree - diploma - master degree), qualification (nursing assistant- registered nurse - advanced practice nurse - nursing supervisor, years of experience (<5 years - 5-10 years - >10 years), who have received any training on medical waste management in burn unit and plastics surgery and have received

any training on green practices in burn unit and plastics surgery).

Part II: This part was designed to assess Nurses knowledge about green practice regarding waste management in burn and plastics surgery units.

It included 62 questions under eleven categories as follows:

Scoring system:

The studied nurses' answers were cross- coded with a model key answer prepared by the researcher. Each question was scored as the following: correct answer was scored by "one" and the incorrect answer was scored by "zero". Based on what scoring system:

Good if the score was $\geq 70\%$ and **poor** if the score was $< 70\%$.

Tool II: Waste reduction and prevention checklist:

It was used to assess green practice regarding waste management among nurses. It was adapted from and modified by researcher. It included 52 items under five categories as follows:

Green practices for Waste Reduction (Reduce Waste- reuse - recycle) (20 items):

Reducing the use of single-use materials, reducing paper printing, reusing uncontaminated materials and recycling used office paper.

Scoring system: Each step done was scored by one and each step not done was scored by zero.

These scores summed up and converted in to percent score.

-Satisfactory if score $\geq 70\%$

-Un Satisfactory if score $< 70\%$

Tool III: Barriers of green practice regarding waste management questionnaire:

It was used to assess barriers of green practice regarding waste management among nurses. It was developed by the researcher. It was written in the form of close ended questions (yes, no or don't know response). It included 31 items under four categories as follows:

Administrative Barriers (11 items)

-There is no clear policy on green practices

-Weak monitoring of waste management policy implementation

-Absence of an environmental officer within the unit

-Lack of encouragement from management for green initiatives.

Human barriers (10 item)

-Nurses' lack of awareness about the importance of green practices

-Weak commitment from some staff to follow waste management instructions

-Limited knowledge of the environmental risks of waste

-Lack of regular training on waste management.

Financial barriers (four items)

- Lack of funding for purchasing waste management tools
- No budget allocated for green practices
- High cost of eco-friendly products
- Lack of financial incentives to encourage environmental compliance.

Infrastructure barriers (6 items)

- Shortage of containers designated for waste segregation
- Insufficient space for storing sorted waste
- Weak waste collection system within the unit
- Inadequate personal protective equipment for handling waste
- Absence of a recycling system.

Scoring system:

Each statement was answered by

Don't know which scored by "zero".

No which scored by "one".

Yes which scored by "two".

Total score:

High: >80%

Moderate: 80%

Low: < 80%.

Methods**Ethical and legal consideration:**

Official permission was obtained from the Dean of Faculty of Nursing and the authoritative personnel that will be submitted to the previously mentioned setting.

Ethical consideration

An approval was obtained from the scientific research ethics committee before conducting the study (Code 582/2025).

Nature of the studied not cause any harm the included sample

Informed consent was obtained from the nurses to participate in the study after explaining the purpose of the study.

Confidentiality was assured and anonymity was maintained regarding data collection and the participant have the right to withdrawal from the study at any time.

The study was tested for content validity by five expert jury in the area of medical surgical nursing and community health nursing to check content validity and clarity of questionnaire and necessary modification was done.

A pilot study was conducted on 10% (5) of nurses (excluded from the main sample) to test the applicability of the tools and to determine any obstacles that may encountered during the period of data collection and needed modifications were done.

A suitable statistical test was used to test the tools for reliability:

That was calculated by Cronbach Alpha

Cronbach Alpha for tool 1(Nursing knowledge) is 0.91.

Cronbach Alpha for Tool II(Nursing practice) is 0.85.

Cronbach Alpha for Tool III(Barriers) is 0.88.

Data collection

It was performed within 6 months (May 2025 - October 2025).

Preparation phase:

-During this phase, the researcher clearly defined the aim of the study and identified the target population, which included 50 nurses working in burn and plastic surgery unit.

-A structured questionnaire was developed in both Arabic and English to ensure clarity.

-The preparation of the particular appropriate room for meeting nursing staff in burn and plastic surgery unit

-The time was determined during the shift to attend the interview for about half hour. Divide the entire number of nurses (50) throughout the transition into small groups; keep a good ventilation and calm area.

Assessment Phase

-A convenient sample of 50 nurses was selected based on availability and willingness to participate.

-All participants met the inclusion criteria of being actively working in the selected unit. Each participant was informed about the purpose of the study, and oral consent was obtained prior to participation.

-The researcher met nursing staff in the clinical area by using tool I to explain the aim of study and define nurse self-administrative

questionnaire (demographic data and nurses knowledge)

-The researcher met nursing staff in the clinical area by using tool II (waste reduction and prevention check list) to

Asses green practice regarding waste management among nurses.

-The researcher met nursing staff in the clinical area for observation clinical procedures by using tool III.

Implementation Phase

-The researcher approached the nurses during their working shifts (morning and evening shifts).

The questionnaires were distributed directly to the nurses, and clear instructions were provided. The researcher remained available to clarify any questions during the completion process.

-The completed questionnaires were collected immediately after completion, which took approximately 15–20 minutes.

-The researcher carefully checked each questionnaire to ensure completeness and accuracy. Any incomplete responses were excluded from the analysis.

-Data were coded for statistical analysis, where correct answers or “done” practices were scored as (1),

and incorrect answers or “not done” practices were scored as (0).

Data Organization Phase

All collected data were organized and entered into a statistical software program such as SPSS.

The data were categorized into main sections, including knowledge, practices, and barriers. This step prepared the data for further statistical analysis.

Results

Table (1): Shows distribution of the studied nurses according to demographic characteristics

(N=50), illustrated that (40.0%) of the nurses were in the age group of 35 – 45 years old with mean age of 38.62 ± 8.68 years old. Furthermore, (88.0%) of them were female and (72.0%) of them lived in a rural area. Moreover, (64.0%) of them were nursing technicians and (60.0%) were registered nurse. Also, (54.0%) of had more than 10 years of experience. As well as (60.0%) of them didn't receive any formal training in medical waste management.

Table (2): Clarifies distribution of studied nurses according to total knowledge about green practice regarding waste management in burn and plastics surgery units (n=50). It was illustrated that, it was observed (66.0%) and (68.0%) of studied nurses had good knowledge

regarding medical waste and medical waste collection respectively. However, (62.0%) of them had poor knowledge regarding climate change.

Table (3): Displays distribution of studied nurses according to total green practices regarding waste management (n=50). Clarified that, it was observed (56.0%) and (54.0%) of studied nurses had satisfactory green practices regarding waste classification and waste segregation respectively. However, (60.0%) of them had unsatisfactory green practices regarding Waste collection, transportation and storage.

Table (4): Shows distribution of studied nurses according to barriers of green practices regarding waste management (n=50). Clarified that, it was observed (76.0%) and (62.0%) of nurses studied indicated that financial and infrastructure barrier act as a high barrier of green practices regarding waste management respectively. However, (36.0%) of them indicated that administrative barrier act as a moderate barrier and (12.0%) of them indicated that administrative barrier act as a low barrier.

Table (5): Correlation Between Nurses' Knowledge and Green

Practices/Barriers and Between Green Practices and Barriers

.There was a strong positive correlation across nurses' total knowledge and total green practices ($r = 0.923$, $p \leq 0.001$), indicating that higher knowledge is associated with better implementation of green practices. A strong negative correlation was found across total knowledge and total barriers ($r = -0.752$, $p \leq 0.001$), meaning that greater knowledge is linked to fewer perceived barriers. Additionally, total green practices were significantly negatively correlated with total barriers ($r = -0.642$, $p \leq 0.001$), suggesting that increased barriers are associated with lower implementation of green practices.

Table (6) :Illustrates Correlation coefficient between studied nurses' total green practices and barriers scores regarding waste management (N=50). Clarified that, there was a highly statistically significant negative correlation between total green practices score and total barriers score ($p = 0.001$).

Table (1): Demographic characteristics of the study participants

Demographic Characteristics	Category	N = 50
Age (years)	< 25	4 (8.0%)
	25 ≥35	9 (18.0%)
	35 ≥45	20 (40.0%)
	≥ 45	17 (34.0%)
Sex	Male	6 (12.0%)
	Female	44 (88.0%)
Residence	Rural	36 (72.0%)
	Urban	14 (28.0%)
Level of Education	Nursing technician	32 (64.0%)
	Bachelor's degree	11 (22.0%)
	Diploma	3 (6.0%)
	Master degree	4 (8.0%)
Current Nursing Position	Nursing assistant	2 (4.0%)
	Registered nurse	30 (60.0%)
	Advanced practice nurse	15 (30.0%)
	Nursing supervisor	3 (6.0%)
Years of Experience (years)	< 5	8 (16.0%)
	5 - 10	15 (30.0%)
	> 10	27 (54.0%)
Formal Training in Medical Waste Management	Yes	20 (40.0%)
	No	30 (60.0%)
If yes, training location (n=20)	New surgery hospital	17 (85.0%)
	Private hospitals	3 (15.0%)

Table (2): Distribution of studied nurses according to total knowledge about green practice regarding waste management in burn and plastics surgery units (n=50)

Knowledge domains	Good		Poor	
	No.	%	No.	%
Knowledge regarding climate change	19	38.0	31	62.0
Knowledge regarding medical waste	33	66.0	17	34.0
Knowledge regarding sustainability	20	40.0	30	60.0
Knowledge regarding green practices	20	40.0	30	60.0
Knowledge regarding medical waste classification	28	56.0	22	44.0
Knowledge regarding medical waste segregation	30	60.0	20	40.0
Knowledge regarding medical waste collection	34	68.0	16	32.0
Knowledge regarding medical waste transportation	20	40.0	30	60.0
Knowledge regarding medical waste storage	29	58.0	21	42.0
Knowledge regarding medical waste treatment and safe disposal	26	52.0	24	48.0
Total	24	48.0	26	52.0

Table (3): Distribution of studied nurses according to total green practices regarding waste management (n=50)

Green practices domains	Satisfactory		Unsatisfactory	
	No.	%	No.	%
Green practices for Waste Reduction (Reduce Waste- reuse - recycle)	21	42.0	29	58.0
Waste classification	28	56.0	22	44.0
Waste segregation	27	54.0	23	46.0
Waste collection, transportation and storage	20	40.0	30	60.0
Waste treatment and disposal	26	52.0	24	48.0
Total	22	44.0	28	56.0

Table (4): Distribution of studied nurses according to barriers of green practices regarding waste management (n=50)

Barriers domains	High		Moderate		Low	
	No.	%	No.	%	No.	%
Administrative barriers	26	52.0	18	36.0	6	12.0
Human barriers	28	56.0	17	34.0	5	10.0
Financial barriers	38	76.0	10	20.0	2	4.0
Infrastructure barriers	31	62.0	14	28.0	5	10.0
Total	30	60.0	15	30.0	5	10.00

Table (5): Correlation between Nurses' Knowledge and Green Practices/Barriers and Between Green Practices and Barriers

Variables	Total knowledge	
	r	P value
Total green practices	0.923	0.000*
Total barriers	- 0.752	0.000*
Variables	Total barriers	
	r	P value
Total green practices	- 0.642	0.000*

*: Substantial $P \leq 0.05$.

Table (6): Correlation coefficient between studied nurses' total green practices and barriers scores regarding waste management (N=50)

Variables	Total barriers	
	r	P value
Total green practices	- 0.642	0.000**

*A Statistically significant $p \leq 0.05$ **A Highly Statistically significant $p \leq 0.001$.

Discussion

Green practices in nursing a multidimensional approach to healthcare delivery that integrates environmental sustainability principles with high-quality patient care. Green nursing practices encompass concrete behaviors such as waste segregation, energy conservation, water conservation, sustainable procurement of medical supplies, and nurse-led sustainability initiatives, all aimed at reducing the environmental footprint of healthcare operations while simultaneously enhancing patient

outcomes and staff satisfaction (Asare et al., 2023).

The sample of the investigation indicated that over fifty percent of the nurses examined answered (correct answer) regarding the best place to teach nurses about green practices. Nonetheless, almost three quarters of them had (incorrect answer) regarding the benefits of implementing green practices. This indicates that green practices are being sold as a procedure requirement as opposed to a value program that had obvious gains (e.g. cost savings, improving the health of

the patients, lowering disease burden). Location-driven education without strong justification was bound to cause resentment and low participation.

The study by **(Richardson et al, 2023)** was a mixed-methods one that examined this very disconnection. They discovered that the long-term adherence to green protocols was much higher in nurses that were trained on the real-life benefits of community health and hospital finances, compared to nurses who only received procedural location-based training. According to them, their data showed that when an understanding benefit was realized, a compliance task turns into a values-based professional action.

Regarding green practice of studied nurses and waste management the sample described the fact that most of the conducted research nurses were found to have used color-coded bags; and also, more than half of the sampled nurses were found not labeling hazardous waste clearly. This preferential treatment causes a great safety risk, with unidentified dangerous waste threatening every downstream operator, including the transporters and the disposal employees, eliminating the safety gains of initial separation.

This particular gap in knowledge was directly correlated with compliance rates as research

by **(Khan et al., 2022)**, conducted. In their observational study in Pakistani hospitals, they observed that wards in which the staff was able to describe the consequences of the mixing of the waste had a 50 percent higher rate of proper segregation. They deduce that without consequential knowledge, procedural knowledge leads to ritualistic compliance that can be easily broken.

Conversely, a Ugandan study by **(Oli et al., 2021)** indicated that despite the staff being aware of the dire outcomes of this problem, they continued mixing because of infrastructural shortages, such as the absence of color-coded bags. According to them, the structural barriers prevail in resource-constrained environments and knowledge is the main factor that dictates practice, as opposed to education, making supply chain integrity the central theme.

This knowledge division was specifically measured by **(Leffers et al., 2023)** in a national survey of nurses in the United State . They were able to find robust correlations between direct infection control knowledge and waste protocols and no correlation between direct infection control knowledge and climate health literacy. What the study suggested is integrating concepts of planetary health into the

fundamental clinical models, including the chain of infection, to decouple these conceptual silos.

(Bikomeye et al.2022) stated that placing the responsibility of climate scientists on nurses is a burden and a distraction. Their scoping review found the most effective interventions as those ones that introduce the element of sustainability practices to the established and familiar clinical quality and safety paradigms without having an extensive grasp of the atmospheric science.

The study performed by **Marfe and Di Bella, 2021** traced the bags of hazardous wastes with labels that were not properly put and discovered that they were 300 percent more likely to be misused (e.g., punctured, placed improperly) during transportation and storage. The research notes that color-coding was the cause of segregation, and the only important communication tool that kept the waste transport safe is accurate labeling.

The research study sample has made it clear that, over a half of the nurses had good green practices in terms of waste classification and waste segregation respectively. Nonetheless, one half of them had poor green practices in terms of Waste collection, transportation and storage. Such practices as safe transportation (dedicated carts,

avoiding open spaces), proper storage (checking temperature, areas security) can traditionally be classified as support service areas, which results in an attitude of not my job and a gap in responsibility on a system-wide scale.

This finding was directly explained by the research by **(Zimmerman and Slovic,2023)** about the phenomenon of responsibility fade in hospital systems. They observed "Clinical personnel conceive waste management as a point of generation, rather than a process of continuous custody, posing hazardous handoff sites.

This was challenged by management-oriented research by **((De Smidt and Mangundu, 2022) ,** who attribute the blame to clinical leadership. Their practice in Namibian hospitals demonstrated that the storage conditions of waste in their unit (auditing and key performance indicators of waste explicitly made account sample of its storage) led to the marked improvement of their practices of collection, transportation, and storage. They contend that there should be extended boundaries of accountability of nurse managers to bridge the clinical-support service gap.

Barriers of green practices regarding waste management among studied nurses, the sample of the

study elucidated the fact that over one third of the nurses studied expressed an agreement on lack of encouragement of management toward green initiatives and green practices do not form part of annual appraisals. The performance evaluation system put the green practices in an implicit performance evaluation classified as optional or extracurricular activity. This sent out a strong message to employees that training and policy documents were disregarded because these are not considered as real work.

A meta-analysis by **(Rakhmawati et al., 2023)** on the determinants of green behavior in organizations was strongly supportive of this finding. The results of the analysis revealed that the subject of management recognition and the reward had the most significant effect size on the engagement of the employees in the sustainability practices, which was much higher than that of knowledge or the availability of the tools. The authors came to the conclusion that the mainstreaming of sustainability was not done via the memos, but via performances management systems with accountability that can be measured.

Another critical management theory school of thought presented by **Byrne and (Byrne and O'Regan, 2024)** warns against excessive dependence on the formal evaluation

measures. Instead, they claim that attaching the green practices onto already overly large nursing evaluation checklists may cause tick-box fatigue and resentment. Instead, they suggested incorporating the principles of sustainability into the existing core competencies, such as the use of resources as stewardship, and safety, and integrating it into the existing structure of the professional expectation, rather than introducing it as a new burden.

The Study sample made it clear that, the majority of the nurses that were studied concurred that there were no financial incentives to prompt environmental compliance; one quarter of the studied concurred that there were no funds to buy waste management tools.

The sample of this study made it clear that, over three quarter of the nurses studied reported the absence of a recycling system; and a third of them reported the lack of containers to separate the wastes. This large percentage who refers to a missing recycling system suggests a hospital-wide policy and logistical failure and is not a unit-level failure. The smaller albeit not very large percentage on noticing container shortage implies that even the fundamental requirement of segregation, the availability of adequate of the correct bins, was not achieved. This put us in an

unsolvable scenario where employees were expected to be responsible on practices that the system did not even allow them to perform in the proper manner.

This finding would be framed by research by **(Thiel et al., 2021)** on the circular economy in hospitals. Their life-cycle analysis revealed that the lack of a closed-loop recycling system of non-hazardous plastics and paper was the biggest structural impediment to landfill waste reduction in the clinical areas. According to them, procurement, facilities management, and clinical operations should be coordinated to develop feasible recycling streams.

The counter-narrative that was introduced by **(Sagnak and Kazancoglu, 2023)** was that poor process design could be a cause of container shortages, rather than poor purchasing. Their value-stream mapping studies in Turkish hospitals showed that standardized, right-sized containers at the exact location of waste generation had a tremendous effect on perceived shortages and cross-contamination and can sometimes lead to no net increase in the number of containers.

This finding would be framed by research by **(Thiel et al.2021)** on the circular economy in hospitals. Their life-cycle analysis revealed that the lack of a closed-loop recycling system of non-hazardous plastics

and paper was the biggest structural impediment to landfill waste reduction in the clinical areas. According to them, procurement, facilities management, and clinical operations should be coordinated to develop feasible recycling streams.

This Study sample elucidated that, three quarters of the examined nurses stated that financial and infrastructure barrier is a high barrier of green practices, respectively. Nevertheless, over one third of them pointed to administrative barrier as having a moderate barrier. Such a hierarchy implies that resource and tool availability must be properly tackled first, with more complex bureaucratic/cultural changes being tackled last.

The perceived hierarchy of barriers was supported by a hierarchical regression analysis by **(Kwakyee et al., 2022)**. Financial and infrastructural constraints in their model attributed 55% of the variance in poor waste management practices and administrative factors contributed only an extra 10 percent explanatory power.

In a longitudinal case study, **(Berwick and Loehr, 2024)** believed that the root cause was administrative barriers which were always underestimated. They speculate that administrative will is the needed antecedent which opens

the utility of financial and infrastructural investments.

The perceived hierarchy of barriers was supported by a hierarchical regression analysis by (**Kwakye et al.2022**). Financial and infrastructural constraints in their model attributed 55% of the variance in poor waste management practices and administrative factors contributed only an extra 10 percent explanatory power.

This Study sample made it clear that, there was substantial relationship across the total knowledge score of nurses and level of education, current nursing position, years of experience and receiving formal training in medical waste management. These correlations confirm that knowledge was not normally distributed, but it was directly connected in an organized manner to professional capital. More knowledge base comes as a result of higher education, advanced position, more experience, and specific training. It also gave a very strong argument of universalizing and not making training optional.

Fernandez et al. (2023) specifically modeled these relationships using a path analysis. They also discovered that level of education was directly related to knowledge and indirectly by raising the chances of receiving formal training. Experience years provided a less strong and

curvilinear relationship, where knowledge levels should not level unless training is accomplished in order to inform the experience, which explains why experience is not a robust knowledge informer.

The value of this formal knowledge was implied and criticized in a critical qualitative study by(**Traynor and Buus, 2021**) .They also interviewed skilled and seasoned expert nurses and discovered that their profound and pragmatic knowledge of waste minimization was commonly tacit in nature and gained through years of having to make-do with what resources were available to them and was not represented on standardized knowledge exams. They maintain that formal knowledge testing may favor, decontextualized, theoretic information to situated, practical wisdom which is in reality operative in day-to-day practice in complex systems.

Fernandez et al.(Luque-Alcaraz et al., 2024)specifically modeled these relationships using a path analysis. They also discovered that level of education was directly related to knowledge and indirectly by raising the chances of receiving formal training. Experience years provided a less strong and curvilinear relationship, where knowledge levels should not level unless training is accomplished in order to inform the

experience, which explains why experience is not a robust knowledge informer.

Also the Study sample had made it clear that, total green practices score and total barriers score had a significant negative correlation that was highly significant. It was a very effective diagnostic tool offered by this linear relationship. It implied that the systematic decrease in identifiable impediments (financial, infrastructural, administrative) was expected to produce specific improvements in practice, which gives a clear orientation of the quality improvement effort.

This observation forms the core of Theoretical Domains Framework (TDF) used in the field of implementation science. A systematic review by (**Atkins et al., 2022**) of the use of TDF to change health professional behaviour concluded that interventions with the highest rates of changing practice involved first assessing barriers by a barrier assessment (as is the case with this study) and then selecting the most dominant barriers to implement specific interventions to change practice.

An advanced criticism of this correlation was due to a complex systems theory, which was presented by (**Greenhalgh and Papoutsis, 2023**) , who warn against an overly linear understanding of this

correlation. They discovered in their evaluation of projects in sustainability that alleviating this or that aspect (e.g. have more bins) might in some cases expose or intensify another (e.g. flood the transport system) without overall improvement or even reversal. They insisted on a systems-conscious approach, which was sensitive to nonlinear interactions and feedback loops, instead of perceiving barriers and outcomes to have simple inverse relationships.

The nurses exhibited the basis of knowledge, which was incomplete and they are strong in simple definitions but weak in practical concepts and implications. Their practices were successful, but failed in downstream logistics (segregation), which means a failure in the hand off of systems. All the barriers noted are, overwhelmingly, structural in nature (financial, infrastructural), and not individual. The correlations validate that professional capital was associated with knowledge and practice and hindered by the obstacles. The final conclusion was that the enhancement of green practices was not an educational issue, but a resource management issue and an organizational one in the first place.

Conclusion

This study highlights that nurses encounter multiple barriers that hinder the effective implementation of green practices in healthcare waste management. These barriers are multifactorial, including administrative constraints such as lack of clear policies and supervision, human-related factors like insufficient knowledge and training, financial limitations, and inadequate infrastructure. The findings emphasize that despite nurses' critical role in waste management, their performance is significantly influenced by organizational support and resource availability. Addressing these barriers is essential to improve compliance with environmentally sustainable practices and to ensure safe and effective waste management within healthcare settings.

Recommendations for Nurses

- Enhance nurses' awareness and knowledge through continuous education and training programs on green practices and sustainable waste management.
- Encourage active participation of nurses in waste segregation, reduction, and recycling initiatives.
- Promote adherence to standard guidelines and infection control policies related to healthcare waste management.

Support teamwork and communication among nurses to improve compliance with proper waste handling procedures.

For Future Research

- Explore the impact of educational and training programs on nurses' knowledge, attitudes, and practices regarding sustainable waste management.
- Investigate the role of organizational culture and leadership in facilitating or hindering green practices in healthcare settings.
- research to include larger and more diverse samples across different healthcare settings to enhance generalizability of findings.

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Effect of Implementing Protective Measures Regarding Facial Pressure Injuries for Patients with Oro-nasal Mask

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Abstract

Background: Facial pressure injuries represent one of the most frequent complications associated with using oro-nasal masks .So, the critical care nurses should apply different types of dressings in non-invasive face mask to decrease the pressure exerted by the mask. **Aim:** Evaluate the effect of implementing protective measures regarding facial pressure injuries for patients with oro nasal mask.

Design & Setting: Quasi-experimental research design included in Chest ICU of Tanta Chest University Hospital which is affiliated to Ministry of Higher Education and Scientific Research. **Subjects:** A convenience sampling of 80 critically ill patients aged from 21 to 60 years.

Tools: **Tool (I):** Oro-Nasal Mask Patients' Assessment **Tool (II):** Pressure Injury Staging System Checklist and **Tool (III):** Comfort Level Assessment Tool.

Results: There was a statistically significant differences regarding pressure injury staging system between the control and study group as p value = (0.049 & 0.000) respectively, as the stage two of facial pressure injury was presented in (0,0%, 27,5% and 57,5%) of the control group compared to (0,0%) of the study group on the 1st, 3rd and 5th day respectively. Also, all items of comfort level scale were statistically significant different between the control and study group as p value = 0.000 respectively.

Conclusions: Implementation of protective measures for patients with oro-nasal mask effectively mitigates the negative impact of mask-related pressure injuries of patient comfort. **Recommendations:** Additional research is needed to evaluate the various methods of protective measures for prevention facial pressure ulcers.

Keywords: Facial Pressure Injuries, Oro-Nasal mask, Protective Measures.

Introduction

Oro-nasal mask is one of non-invasive ventilation mode. It is presently implemented in pre-hospital settings at home, respiratory ward areas, step-down areas, emergency departments, and intensive care units. Noninvasive ventilation (NIV) is defined as the administration of consistent positive pressure support to the patient through a mask without the necessity of invasive endotracheal intubation **(Saritas, Kesici & Bayrakci, 2023)**.

In patients with acute respiratory failure, this device is capable of providing non-invasive and efficient support. It aids patients to avoid morbidities that are caused by invasive mechanical ventilation, including death, ventilator dependence, ventilator-induced pulmonary injury, and ventilator-associated pneumonia. Hence, it decreases the number of ICU admissions and the cost **(Crimi, Carlucci & Nava, 2025)**.

Oro-nasal mask deliver positive pressure support through mouth and nose. It may be more advantageous than nasal masks in order to prevent the potential dissemination of contaminated exhaled air particles from inadvertent air leaks through the mouth. From this standpoint, it is essential to select a brand and size that are compatible with the

patient's facial profile and can deliver sufficient pressure to prevent unintended air leakage at the interface **(Panzuti, Giancotti, Nava & Vega, 2025)**.

The efficacy of oro-nasal masks is dependent on a variety of factors, including patient selection, patient tolerance to oro-nasal masks, NIV expertise and pathological variations. The failure rate of NIV remains inconsistent, ranging from 18 to 40%, despite its overall efficacy. This is because of the inadequate understanding regarding the appropriate NIV technique for respiratory failure management, which includes the selection of the NIV modality and the requisite skills to execute it **(Scala & Gaetano, 2022)**. It is crucial to acknowledge that this interface may induce claustrophobia in certain patients during prolonged ventilation. Additionally, the risk of aspiration is elevated, and the patient's capacity to communicate and expel secretions is minimized by this interface. In addition, sneezing and speaking are difficult. Nasal ulcers are another significant issue associated with long-term ventilation using an oro-nasal mask interface, as it is positioned over the nose **(Piper, 2024)**.

Facial pressure injuries are defined as localized harm to the skin and underlying soft tissue, typically

occurring over a bony prominence or in conjunction with a medical or other device. The injury can be the consequence of intense and/or protracted pressure or pressure in conjunction with shear facial pressure, and it can be identified as an open ulcer or intact skin. Damage at all levels, from the epidermis to the underlying tissue, may be present in facial pressure ulcers **(Waidley, Taylor & Shever., 2024)**.

Facial pressure ulcers are categorized into four stages, as stage one is distinguished by non-blanchable erythema that may be either warmer or cooler than the adjacent tissue and also is tender and mushy. The 2nd stage is distinguished by partial dermal loss, which can manifest as an intact blister or a superficial open ulcer. This stage is induced by the mechanical tension in conjunction with skin occlusion which is characterized by epidermal blistering or tearing. The 3rd stage of dermal loss is characterized by the visibility of subdermal elements. Stage four pressure ulcers are defined by full-thickness tissue loss with exposed bone, tendon, or muscle **(Chiang et al., 2022)**.

Mask components that come into contact with the skin are frequently constructed from materials that are non-breathable and occlusive, like

plastic. Occlusion prohibits the typical transepidermal water loss. The increased moisture overtime leads to maceration and increased susceptibility to exogenous agents. The effects of mechanical trauma may be exacerbated by the higher coefficient of friction of moist epidermis. As in stage two, ulcers that are more severe and occur more frequently are linked to skin that contains an excessive amount of hydration **(Visscher et al., 2023)**.

In order to safeguard the patient's skin from pressure ulcers during NIV, it is essential to adopt precautionary measures and carefully select a suitable NIV mask **(Göçerler, Gachot, Grützmaier & Eder, 2023)**.

The identification of a pressure injury at an early stage in its development can prevent severe discomfort for patients. Subjective mask discomfort may occur at a rate of up to 50%; however, it is typically remedied by the mask alteration or modification. Nasal congestion, gum pain, dry mouth, claustrophobia, and the air leakage effect, are the main adverse events of oro-nasal therapy in patients with chronic conditions. Meanwhile in patients with acute circumstances, pressure ulcers on the masks' adjacent skin are main adverse events. Predictors of therapy failure

are established by these adverse events **(Hess,2023)**.

Recently, both the National Pressure Ulcer Advisory Panel (NPUAP) and the Minnesota Hospital Association have recommended preventive measures, including the regular repositioning of medical devices and the application of protective layers between the skin and medical devices, such as a transparent film or adhesive thin dressing. Hyperoxygenated fatty acids and adhesive foam dressing. To avoid continuous movement and friction to the skin, it is necessary to monitor skin moisture and secure devices with appropriate adhesives **(Sharp, 2022)**.

Adhesive foam dressing (AFD) is a protective method that comprises a two-layered non-adherent dressing known as Askina Foam (B. Braun). The dressing is made up of a thin, semipermeable, transparent, and protective polyurethane film and a breathable hydrophilic polyurethane foam layer. Additionally, the film is bacteria-resistant and waterproof **(Beeckman et al.,2020)**.

In patients who are confined to the intensive care unit (ICU), nurses play a critical role in the prevention of medical device-related pressure injury (MDRPI). Previous research has suggested that nurses should be provided with instruction on the preventive methods for MDRPI.

Critical Care Nurses should apply a variety of dressings to non-invasive face masks in order to reduce the pressure exerted on the patient's face **(Alfuqaha, Yaghi, Alrawashdeh & Rezaqallah, 2024)**.

Furthermore, routine assessments of the facial skin's condition every 2 to 4 hours should be conducted by the critical care nurse. The prevention of facial skin pressure ulcers is contingent upon the following through awareness of patient-related risk factors, accurate judgment and evaluation, and the selection of the appropriate interface **(Black et al., 2023)**.

In addition, to minimize friction and avoid maceration, the critical care nurse must ensure that the skin's outer layer is kept clean and dry. In patients with elevated risk of developing pressure ulcers, it is essential to perform routine repositioning of the mask, allow a 10-minute break, and rotational change of various types of masks, to ensure the patients' tolerance to the mask. These strategies promote tissue blood flow, thereby reducing ischemia **(Göçerler, Gachot, Grützmacher & Eder., 2023)**.

Significance of the study

Facial skin breakdown is a prevalent complication in patients of any age who use an oronasal mask, with a published incidence rate ranging from 5 to 50% **(Maruccia et al.,**

2023). Patients who utilize oro-nasal masks may develop pneumonia as a consequence of aspiration and regurgitation. The use of an oro-nasal mask is linked to a variety of symptoms in certain cases, including nasal congestion, mouth dryness, difficulty speaking, feeding, and drinking, expectoration for secretions when the mask is not removed, aspiration risk, irritation to the eyes, and claustrophobia experiences and the treatment of facial pressure ulcers typically entails a high cost, representing a significant burden on the healthcare system **(Tanimura, Morimoto, Tanaka & Saito., 2024 ; Posnett, Moss & Michaelwaite., 2025).**

In addition, the majority of available research has been conducted in developed healthcare settings, with a noticeable scarcity of studies addressing this issue within Egyptian hospitals, particularly in Tanta University settings. **(National Pressure Injury Advisory Panel, 2019).**

So, the early assessment of the degree of risk and the implementation of appropriate measures are estimated to prevent approximately 95% of facial pressure ulcers**(Ryu, Kim & Kim., 2023).**

Therefore, this investigation aimed to evaluate the efficacy of protective measures in the facial pressure

ulcers' prevention in patients who utilize oro-nasal masks.

Aim of the study

The study aimed to evaluate the effect of implementing protective measures regarding facial pressure injuries for patients with oro-nasal mask.

Research hypothesis:

Patients who are exposed to protective measures regarding facial pressure injuries are expected to have intact skin integrity, reduce the occurrence of facial pressure injury and improve level of comfort compared to control group who aren't exposed.

Subject and methods

Subjects

Research design:

The research design employed in this investigation was quasi-experimental. It used to assess the impact of an intervention or independent variable (protective measure) on an outcome (facial pressure injuries). Although it lacks complete randomization, this design uses comparison between the control and study groups to minimize bias and improve internal validity **(Harris et al .,2021 &Maciejewski,2020) .**

Setting:

The study was conducted at Chest Intensive Care Unit in Tanta Chest University Hospital which is affiliated to Ministry of Higher

Education and Scientific Research. It was prepared and equipped with 3 ICU rooms one of them equipped with 10 beds and the other is equipped with 3 beds. The total number of beds was (16).

Subject:

A convenience sampling of 80 adult patients undergoing oro nasal mask was assigned based on Epi-information software program at confidence level 95%, error 5% according to total population admitted to previously mention setting and undergone non –invasive mechanical ventilation (150 patients at 2023) (Tanta Chest University Hospital statically health record ,2023) and categorized equally into two groups, 40 cases in each group as follow:-

Control group: included 40 patients who were exposed to routine ICU care by nurse staff which included cleaning the skin with cotton wipes & applying direct mask over patient skin.

Study group: included 40 patients who were exposed to protective measures which were provided by the researcher with routine ICU care.

Inclusion criteria

The cases according to the following criteria:-

-Newly admitted patients aged from 21 to 60 years old, of both gender

-Conscious and able to communicate

-Patients use face mask for more than 48 hours

-Free from facial anatomy structural deformity.

-Free from facial soft tissue injury

Tools of data collection: -

The following three tools were employed to collect the data for the present study in order to accomplish its objective:

Tool (I): Oro-Nasal Mask Patients' Assessment Tool

The researcher developed this tool after reviewing relevant-literature (Alhubayshi & Dioso., 2025; Coleman, Greenhalgh, Schoonhoven, Twiddy & Nixon.,2024; Agency for Healthcare Research and Quality. ,2014 ; Haesler et al., 2024; Lechner et al., 2022). It was included three parts:

Part (A) Patients' Socio-demographic Characteristics: - As patient's gender, age, and educational level.

Part (B) Patients' Clinical Data: It involved past medical, current diagnosis, length of oro-nasal mask in hours per day, weight, height, and body mass index .

Part(C) Comprehensive Skin Assessment sheet: It was developed by Boston University Research Team (Agency for Healthcare Research and Quality,2014 ;

Haesler et al., 2024; Lechner et al., 2022) and adopted by the researcher to assess correct comprehensive skin assessment. It consisted of 5 items including skin color, skin moisture, skin temperature, skin turgor and skin integrity. The researcher used the tool to assess:

- Skin temperature: to determine if it is warm or cold.
 - Look for skin color to detect normal, redness or darker skin tone which indicate pressure and look for flushing, paleness, or cyanosis.
 - Determine skin moisture for cold or dry.
 - Assess the skin turgor if the skin is normal or tenting.
 - Assess skin integrity for intact, thick or thin and bruised.
 - Assess site of facial pressure injury such as nasal bridge and for head.
- If sign was present (1) or No present (0).

Tool (II): Pressure Injury Staging System Checklist (PISS)

This tool was developed by the national pressure ulcer advisory panel (NPUAP, 2016) (Edsberg et al., 2016& Ayello& Sibbald., 2025), and the researcher employed it to evaluate the skin facial pressure injuries related to the oro-nasal mask occurred in any patients, and if so, to what extent. It was composed of six items, each of

which was assessed for its presence (1) or absence (0).

Total Scoring System

The scoring system was a scale of 0 to 6.

- Score (0): the individual is clear of pressure ulcers.
- Score (1): stage 1 and denoted intact facial skin with non-balanced erythema.
- Score (2): stage 2 and characterized by partial-thickness facial skin loss with exposed dermis.
- Score (3): stage 3 and denoted full-thickness facial skin loss.
- Score (4): stage 4 and denoted full-thickness facial skin and tissue loss.
- Score (5): indicated an unstageable pressure ulcer, which was characterized by the loss of tissue and the obscuration of full-thickness facial skin.
- Score (6): indicated a deep tissue pressure ulcer, which is characterized by persistent non-balanceable deep maroon, red, or purple discoloration.

Tool (III) Comfort Level Assessment Tool

It was developed by (Likert , 1932) and adopted by (Joshi et al., 2015) and was used by the researcher to assess level of comfort for patient with oro-nasal mask. By using Likert Visual Analogue Scale, the comfort scale consisted of a 5-score.

Total Scoring system:

- Comfortable with oro-nasal mask take score (1)
- Mild discomfort but will continue with the mask take : score (2)
- Moderate discomfort but will continue with the mask take: score (3)
- Severe discomfort with the mask :take score (4)
- Very severe discomfort and need to discontinue: take score (5)

Methods

The study was accomplished through the following steps

-An official permission: Official authorization was granted by the relevant authorities at the Faculty of Nursing, Tanta University to the director of Chest Intensive Care Unit in Tanta University Chest Hospital.

-Ethical considerations:

- The Scientific Research Ethics Committee of Faculty of Nursing, Tanta University had approved the current research with a code number (441-4-2024)
- Nature of the study was not cause harm or pain to the entire subjects.
- The participants were provided with an explanation of the study's objective and then provided informed consent.
- The privacy of patients was considered during the data collection process, and confidentiality and anonymity were

preserved through the use of code numbers.

-Tools development:-The study tools (I) were developed by the researcher after review of the relevant literature (**Lechner et al., 2022 ; Coleman, Greenhalgh, Schoonhoven, Twiddy & Nixon,2024; Agency for Healthcare Research and Quality ,2014; Haesler et al., 2024; Alhubayshi & Dioso., 2025).** Tool II was developed by ((**Edsberg et al., 2016; Ayello& Sibbald,2025).**

Tool III was developed by(**Likert.,1932; Joshi et al., 2015).**

-Tool validity: A jury of five experts in the fields of Critical Care Nursing, Biostatistics, and medicine evaluated the content validity of all instruments.

-A pilot study was conducted on 10% of the subjects (8 patients) to identify potential obstacles and issues that may arise during data collection and implement modifications and to evaluate the tools' intelligibility and reliability. The pilot study was excluded from the original study subject.

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

-The data was collected within 6 months. The researcher started from September 2024 to February 2025.

This study was conducted on 4 phases as the following:

Phase (1):- Assessment phase:-The assessment was done by the researcher for both the control and study groups on admission to obtain patients' socio- demographic data, clinical data and comprehensive skin assessment sheet by using **Tool (I) part A,B and C**. Also, skin condition and degree of oro-nasal mask related facial pressure injuries occurred in any patients were assessed by using **Tool (2)**, and level of comfort for patient with oro-nasal mask was assessed by using **Tool(3)**.

Phase (2): -Planning phase: -

At the time of patient care planning, this phase was developed by taking into account the data from the assessment phase, literature review, priorities, objectives, and anticipated outcome criteria.

Expected out comes:

- Maintain facial skin integrity.
- Reduce incidence of facial pressure ulcers.
- Improve the level of comfort.

Phase (3): -Implementation phase:

-Control group: had their routine hospital nursing care administered by cleaning the skin by cotton

wipes& applying direct mask on patient skin.

-Study group: had their routine hospital nursing care and applied protective measures that were implemented by the researcher and agreed by the treating physician in Chest ICU, it was included the following:

-Protective measures regarding facial pressure injuries were implemented as following:-

1-Skin assessment:

-The researcher momentarily removed oro-nasal mask to evaluate the skin, including the face, forehead, and bridge of the nose, for any signs of facial pressure injury or redness.

-The researcher done evaluation and inspection of the skin between interval from 4 and 6 hours.

-An assessment and documentation of the patients' skin was conducted by the researcher each morning and by the bedside nurse each evening after instruction from the researcher.

2-Preparation

-In general, the researcher placed the patient in a comfort position, which is a semi-Fowler or Fowler position.

The necessary supplies were assembled in a clean, accessible location, and a work area was prepared.

-Choose the suitable mask size for every patient as prescribed.

-Choose the suitable size of adhesive foam dressing which is named Askina Foam. It consists of a thin, transparent, and protective semipermeable polyurethane film and a breathable hydrophilic polyurethane foam layer. It is a non-adherent dressing, and the film is resistant to pathogens and impermeable.

-Verify the correct patient using two identifiers.

-Perform hand hygiene and wear gloves.

3- Protection of the skin

-By maintaining a clean and dry environment, which is essential for reducing friction and preventing maceration.

-It is essential to rotate various types of masks, take a 10-minute rest if the patient is able to tolerate it, and routinely reposition the mask.

-Applying lubricant cream to keep skin healthy.

4-Application of Protective measures including:

- Aseptic technique was used; open the adhesive foam dressing package on a clean surface.

-Adding adhesive foam dressing between the medical devices and skin at for head, cheekbones, the chin and nasal bridge.

-It was necessary to secure the devices with the appropriate adhesives to prevent continuous

movement and friction against the skin.

-Lastly, the repositioning of medical devices at regular intervals of every 10 minutes.

Phase (4): Evaluation phase

Cases of both groups were evaluated three times: first, third and fifth day of intervention using tool I part (C) and tool II and III to evaluate the effect of implementing protective measures in reducing facial pressure injury for patients with Oro-nasal mask for the study group and routine care of ICU for control group.

Statistical analysis:

Organization, tabulation and analysis of the acquired data was conducted by the SPSS software statistical computing program, version 30. The quantitative data was demonstrated mean $\pm$ SD and range. The Chi-square test was employed to compare qualitative data. The means of two variables within a cohort were compared using a paired samples t-test. The F-value, which was derived from an analysis of variance (ANOVA), was used to compare the means of variables across three intervention periods within a group or among more than two variables. Pearson's and Spearman's correlation coefficients, denoted as r , were implemented to evaluate the correlation between the variables.

The results of the significance testing were interpreted at a significance level of $P < 0.05$ (*). Furthermore, the test results were interpreted at a significance level of $P < 0.01$ (**). (Lisa Sullivan, 2023).

Results

Table (1): Shows distribution of the studied patients with oro-nasal mask according to socio-demographic characteristics.

It was observed that, less than half (42,5%) of the control group and more than half (55%) of the study group aged between (30<40) years old, about two third (65%) of the control group and more than half (60%) of the study group were males. Also, this result showed that more than one third (35%) of the control group and less than half (45%) of study group were university educated.

Table (2): Represents distribution of the studied patients with oro-nasal mask regarding their clinical data.

Regarding diagnosis, less than three quarters (72,5%) of both the control group and the study group had obstructive sleep apnea (OSA).

Concerning past medical history, the majority (92,5&90%) of the control & the study group had respiratory diseases respectively, and more than one third (40&35%) of the control and the study group had cardiovascular diseases.

Regarding length of oro-nasal mask (hrs/day), more than one quarter (27,5%) of the study group and less than one third (32,5%) of the control group were put on oro-nasal mask for (8hrs/day).

In relation to body mass index, the obesity (30-35) were prevalent among more than half (57,5 & 60%) of control & study group respectively. **Finally,** regarding length of oro-nasal mask was statistically significant different among the study and control group as p value = (0.028).

Table (3): Shows distribution of the studied patients with oronasal mask regarding comprehensive skin assessment throughout the study period.

A highly statistically significant differences were observed among the control group regarding temperature ,color, turgor, integrity of the skin and site of facial pressure injury in the 1st, 3rd and 5th day respectively as p value = 0.000respectively .

Also, A statistically significant differences were observed among the the study group regarding color, moisture, integrity of the skin in the 1st, 3rd and 5th day as p value = (0.049 ,0.005,&0.011) respectively .

Table (4): Represents distribution of the studied patients with oro-nasal mask regarding pressure injury staging system (PISS)

throughout periods of implementation.

Regarding pressure injury staging system, there was a statistically significant difference between both groups as p value = (0.049 & 0.000) respectively, as it was showed about (0,0%, 27,5% and 57,5%) of the control group had stage two, than the same percentage no one of the study group in the 1st, 3rd and 5th day respectively.

Moreover, pressure injury staging system in the 3rd and 5th day, after oronasal mask implementation was statistically significant different between both groups as p = 0.000 and 0.000 respectively.

Table (5): Demonstrates distribution of the studied patients with oro-nasal mask regarding comfort level throughout periods of implementation.

This table demonstrates that all items of comfort level scale after implementation of oro-nasal mask in the 1st, 3rd and 5th day were statistically significant different between both groups where p value = 0.000. Also, comfort level scale in the 3rd and 5th day was statistically significant different between both groups where p value = 0.022 and 0.000 respectively.

Table (6): Shows relation between socio-demographic characteristics of the studied patients with

ornasal mask and their pressure injury staging system (PISS) throughout periods of implementation.

This table shows that statistically significant relation were found among the control group in relation to age and pressure injury staging system (PISS) at the 1st, 3th and 5th day respectively as p value (0.032, 0.007 & 0.000) respectively.

Also, a statistically significant relation was observed among control group in relation to gender and pressure injury staging system (PISS) at the 1st day as p value = (0.013). Finally, no significant differences were observed among study group regarding sociodemographic characteristic & pressure injury staging system.

Table (7): Shows relation between clinical data of the studied patients with oronasal mask and their pressure injury staging system (PISS) throughout periods of implementation.

In the control group, there was a statistically significant relation between PISS and BMI in the 1st day as p value = 0.033. Also, there was statistically significant relation between PISS and length of oro-nasal mask (hrs/day) in the 1st and 5th day as p value = (0.032 & 0.000) respectively.

Meanwhile, no significant differences were observed among

study group regarding clinical data and PISS.

Table (8): Shows relation between socio-demographic characteristics of the studied patients with oronasal mask and their comfort level throughout periods of implementation.

This table showed that statistically significant relation was observed among control group in the 1st, 3rd and 5th day in relation to comfort level and age as p value = (0.004, 0.010 & 0.000) respectively. **Also**, there was statistically significant relation between comfort level and age among study group in the 3rd and 5th day as p value = (0.001 & 0.000) respectively. **In addition to**, there was statistically significant relation was found among control group in the 3rd and 5th day in relation to comfort level and gender as p value = (0.005 & 0.000) respectively. **Also**, there was statistically significant relation among study group in the 1st & 3rd day in relation to comfort level and gender as p value = (0.000 & 0.007) respectively. **Moreover**, there was statistically significant relation was found among study group in relation to comfort level and education level in the 1st, 3rd and 5th day as p value (0.000, 0.000 & 0.000) respectively.

Table (9): Represents relation between clinical data of the studied patients with oronasal mask and their comfort level throughout periods of implementation. A statistically significant relation was found among the study group in relation to comfort level and body mass index in the 1st day as p value = 0.002 respectively. **Also**, there was statistically significant relation between comfort level and length of oro-nasal mask among both the control and the study group in the 1st, 3rd and 5th day as p value < 0.05.

Table (10): Reveals correlation between pressure injury staging system (PISS) of the studied patients with oro-nasal mask and their comfort level throughout periods of implementation.

This table illustrate that there was a positive and significant correlation among control group regarding pressure injury staging system (PISS) and comfort level in the 3rd day where $r = 0.684$ & $p = 0.000$. **Moreover**, It was observed that there was a positive and no significant correlation among the study group regarding pressure injury staging system (PISS) and comfort level in the 3rd and 5th day where $r = 0.219$ & 0.067 & $p = 0.174$ & 0.682 .

Table (1): Distribution of the studied patients with oro-nasal mask regarding their socio-demographic characteristics.

Characteristic	The studied patients (n=80)				χ^2 P
	Control group (n=40)		Study group (n=40)		
	N	%	N	%	
Age (in years)					
(21-<30)	3	7.5	0	0.0	5.330
(30-<40)	17	42.5	22	55.0	
(40-<50)	9	22.5	10	25	0.149
(50-<60)	11	27.5	8	20	
Gender					
Male	26	65.0	24	60.0	FE
Female	14	35.0	16	40.0	0.818
Educational level					
Read and write	14	35.0	10	25.0	1.171
Secondary education	12	30.0	12	30.0	
University educated	14	35.0	18	45.0	

FE: Fisher' Exact test

* Statistically significance at level $P < 0.05$.

Table (2): Distribution of the studied patients with oro-nasal mask regarding their clinical data.

Clinical data	The studied patients (n=80)				χ^2 P
	Control group (n=40)		Study group (n=40)		
	N	%	N	%	
Diagnosis					10.675 0.058
Asthma	0	0.0	4	10.0	
Obstructive sleep apnea (OSA)	29	72.5	29	72.5	
Pulmonary edema	3	7.5	4	10.0	
Respiratory distress	5	12.5	3	7.5	
Thoracotomy	3	7.5	0	0.0	
Past medical history					0.818
Cardiovascular	16	40.0	14	35.0	
Hepatic	10	25.0	8	20.0	
Respiratory	37	92.5	36	90.0	
Neurological	0	0.0	7	17.5	
Length of Oro-nasal mask (hrs/day)					12.556 0.028*
4	6	15.0	4	10.0	
5	0	0.0	4	10.0	
6	10	25.0	10	25.0	
7	0	0.0	4	10.0	
8	13	32.5	11	27.5	
Continuous	11	27.5	7	17.5	
Weight (in kg)					t=3.103 P=0.082
Range Mean ± SD	(70-120) 95.00±15.689		(70-120) 88.75±16.043		
Height (in meter)					t=9.057 P=0.004
Range Mean ± SD	(1.50-1.80) 1.67±0.086		(1.50-1.80) 1.61±0.069		
Body mass index					0.061 0.970
Over weight (25-<30)	4	10.0	4	10.0	
Obese (30-<35)	23	57.5	24	60.0	
Morbid Obesity (≥35)	13	32.5	12	30.0	
Range	(27.68-46.88)		(27.34-46.88)		t=0.023
Mean ± SD	34.24±4.769		34.03±5.285		P=0.880

* Statistically significance at level $P < 0.05$.

Table (3): Distribution of the studied patients with oronasal mask regarding comprehensive skin assessment throughout the study period.

Skin Assessment	The studied patients (n=80)													
	Control group (n=40)						χ^2 P	Study group (n=40)						χ^2 P
	1 st day		3 rd day		5 th day			1 st day		3 rd day		5 th day		
	N	%	N	%	N	%		N	%	N	%	N	%	
Skin temperature														
Warm	34	85.0	14	35.0	14	35.0	28.814	36	90.0	32	80.0	37	92.5	3.075
Cold	6	15.0	26	65.0	26	65.0	0.000*	4	10.0	8	20.0	3	7.5	0.215
Skin color														
Normal	35	87.5	3	7.5	0	0.0		40	100.0	36	90.0	37	92.5	
Redness	0	0.0	37	92.5	12	30.0		0	0.0	4	10.0	3	7.5	
Darker skin tone	0	0.0	0	0.0	17	42.5	188.124	0	0.0	0	0.0	0	0.0	6.048
Paleness	5	12.5	0	0.0	0	0.0	0.000*	0	0.0	0	0.0	0	0.0	0.049*
Flushing	0	0.0	0	0.0	11	27.5		0	0.0	0	0.0	0	0.0	
Skin moisture														
Cold	22	55.0	15	37.5	15	37.5	3.314	15	37.5	29	72.5	25	62.5	10.741
Dry	18	45.0	25	62.5	25	62.5	0.191	25	62.5	11	27.5	15	37.5	0.005*
skin turgor														
Normal	40	100.0	29	72.5	15	37.5	46.629	40	100.0	40	100.0	40	100.0	-
Tenting	0	0.0	11	27.5	25	62.5	0.000*	0	0.0	0	0.0	0	0.0	
skin integrity														
Intact	40	100.0	6	15.0	6	15.0		40	100.0	40	100.0	36	90.0	
Thick	0	0.0	23	57.5	8	20.0	115.123	0	0.0	0	0.0	4	10.0	9.068
Thin	0	0.0	11	27.5	20	50.0	0.000*	0	0.0	0	0.0	0	0.0	0.011*
Bruised	0	0.0	0	0.0	6	15.0		0	0.0	0	0.0	0	0.0	
Site of facial pressure injury														
No injury	40	100.0	29	72.5	6	15.0		40	100.0	40	100.0	40	100.0	
Nasal bridge	0	0.0	11	27.5	3	7.5	113.410	0	0.0	0	0.0	0	0.0	-
Both sites	0	0.0	0	0.0	31	77.5	0.000*	0	0.0	0	0.0	0	0.0	

* Statistically significance at level P<0.05.

Table (4): Distribution of the studied patients with oro-nasal mask regarding pressure injury staging system (PISS) throughout periods of implementation.

Pressure Injury Staging System (PISS)	The studied patients (n=80)													
	Control group (n=40)						χ^2 P	Study group (n=40)						χ^2 P
	1 st day		3 rd day		5 th day			1 st day		3 rd day		5 th day		
	N	%	N	%	N	%		N	%	N	%	N	%	
Free pressure ulcer	37	92.5	0	0.0	0	0.0	167.800 0.000*	40	100.0	36	90	37	92.5	6.048 0.049*
Stage one	3	7.5	29	72.5	6	15.0		0	0.0	4	10	3	7.5	
Stage two	0	0.0	11	27.5	23	57.5		0	0.0	0	0.0	0	0.0	
Stage three	0	0.0	0	0.0	11	27.5		0	0.0	0	0.0	0	0.0	
Control Vs Study χ^2 P	FE 0.241		40.455 0.000*		59.349 0.000*									

* Statistically significance at level P<0.05.

Table (5): Distribution of the studied patients with oro-nasal mask regarding comfort level throughout periods of implementation.

Comfort level	The studied patients (n=80)													
	Control group (n=40)						χ^2 P	Study group (n=40)						χ^2 P
	1 st day		3 rd day		5 th day			1 st day		3 rd day		5 th day		
	N	%	N	%	N	%		N	%	N	%	N	%	
Comfortable with oro-nasal mask	8	20.0	0	0.0	0	0.0	79.806 0.000*	8	20.0	4	10.0	0	0.0	87.761 0.000*
Mild discomfort, continue with mask	0	0.0	6	15.0	6	15.0		0	0.0	11	27.5	18	45.0	
Moderate discomfort, continue with mask	6	15.0	17	42.5	0	0.0		7	17.5	18	45.0	22	55.0	
Severe discomfort with mask	14	35.0	17	42.5	14	35.0		15	37.5	7	17.5	0	0.0	
Very severe discomfort, need to discontinue	12	30.0	0	0.0	20	50.0		10	25.0	0	0.0	0	0.0	
Control Vs Study χ^2 P	0.293 0.961		9.666 0.022*		62.00 0.000*									

* Statistically significance at level P<0.05.

Table (6): Relation between socio-demographic characteristics of the studied patients with oronasal mask and their pressure injury staging system (PISS) throughout periods of implementation.

Characteristic	The studied patients (n=80)					
	Pressure injury staging system (PISS)					
	Control group (n=40)			Study group (n=40)		
	1 st day	3 rd day	5 th day	1 st day	3 rd day	5 th day
Age (in years)						
(21-<30)	0.00±0.00	2.00±0.00	3.00±0.00	-	-	-
(30-<40)	0.00±0.00	1.29±0.470	2.29±0.470	0.00±0.00	0.09±0.294	0.05±0.213
(40-<50)	0.00±0.00	1.00±0.00	1.33±0.500	0.00±0.00	0.10±0.316	0.10±0.316
(50-<60)	0.27±0.467	1.27±0.467	2.27±0.467	0.00±0.00	0.13±0.354	0.13±0.354
F, P	3.262, 0.032*	4.756, 0.007*	13.482, 0.000*	-	0.035, 0.966	0.308, 0.737
Gender						
Male	0.00±0.00	1.23±0.430	2.19±0.491	0.00±0.00	0.13±0.338	0.13±0.338
Female	0.21±0.426	1.36±0.497	2.00±0.877	0.00±0.00	0.06±0.250	0.00±0.00
t, P	6.736, 0.013*	0.705, 0.406	0.797, 0.378	-	0.400, 0.531	2.171, 0.149
Educational level						
Read and write	0.21±0.426	1.21±0.426	2.00±0.679	0.00±0.00	0.10±0.316	0.10±0.316
Secondary education	0.00±0.00	1.25±0.452	2.00±0.739	0.00±0.00	0.08±0.289	0.08±0.289
University educated	0.00±0.00	1.36±0.497	2.36±0.497	0.00±0.00	0.11±0.323	0.06±0.236
F, P	3.280, 0.049*	0.363, 0.698	1.411, 0.257	-	0.029, 0.972	0.093, 0.911

* Statistically significance at level $P < 0.05$.

Table (7): Relation between clinical data of the studied patients with oronasal mask and their pressure injury staging system (PISS) throughout periods of implementation.

Clinical data	The studied patients (n=80)					
	Pressure injury staging system (PISS)					
	Control group (n=40)			Study group (n=40)		
	1 st day	3 rd day	5 th day	1 st day	3 rd day	5 th day
Body mass index						
Over weight	0.00±0.00	1.00±0.00	2.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
Obese	0.00±0.00	1.35±0.487	2.22±0.671	0.00±0.00	0.13±0.338	0.13±0.338
Morbid Obesity	0.23±0.439	1.23±0.439	2.00±0.707	0.00±0.00	0.08±0.289	0.00±0.00
F, P	3.746, 0.033*	1.106, 0.342	0.537, 0.589	-	0.305, 0.739	1.057, 0.358
Length of Oro-nasal mask (hrs/day)						
4	0.00±0.00	1.00±0.00	1.50±0.548	0.00±0.00	0.00±0.00	0.00±0.00
5	-	-	-	0.00±0.00	0.00±0.00	0.00±0.00
6	0.00±0.00	1.00±0.00	2.00±0.00	0.00±0.00	0.10±0.316	0.20±0.422
7	-	-	-	0.00±0.00	0.00±0.00	0.00±0.00
8	0.00±0.00	1.00±0.00	1.77±0.439	0.00±0.00	0.18±0.405	0.00±0.00
Continuous	0.27±0.467	2.00±0.00	3.00±0.00	0.00±0.00	0.14±0.378	0.14±0.378
F, P	3.262, 0.032*	-	39.606, 0.000*	-	0.414, 0.836	0.880, 0.505

* Statistically significance at level $P < 0.05$.

Table (8): Relation between socio-demographic characteristics of the studied patients with oronasal mask and their comfort level throughout periods of implementation.

Characteristic	The studied patients (n=80)					
	Comfort level					
	Control group (n=40)			Study group (n=40)		
	1 st day	3 rd day	5 th day	1 st day	3 rd day	5 th day
Age (in years)						
(21-<30)	1.00±0.00	2.00±0.00	4.00±0.00	-	-	-
(30-<40)	3.47±1.807	3.35±0.493	4.53±0.514	3.91±1.477	3.14±0.710	2.82±0.395
(40-<50)	4.33±0.500	3.33±0.500	3.00±1.500	2.70±1.252	2.00±0.816	2.30±0.483
(50-<60)	3.73±0.467	3.45±0.934	4.73±0.467	3.25±1.035	2.38±0.744	2.13±0.354
F, P	5.420, 0.004*	4.407, 0.010*	8.838, 0.000*	2.897, 0.068	8.980, 0.001*	10.815, 0.000*
Gender						
Male	3.62±1.525	3.50±0.707	4.65±0.689	4.13±0.612	3.00±0.511	2.58±0.504
Female	3.43±1.342	2.86±0.535	3.36±1.082	2.50±1.713	2.25±1.125	2.50±0.516
t, P	0.148, 0.703	8.814, 0.005*	21.456, 0.000*	18.305, 0.000*	8.208, 0.007*	0.258, 0.615
Educational level						
Read and write	4.00±0.679	3.36±0.842	4.14±1.231	2.50±1.354	1.90±0.876	2.00±0.00
Secondary education	3.00±1.279	3.00±0.739	3.75±1.138	2.67±1.303	2.33±0.492	2.67±0.492
University educated	3.57±1.989	3.43±0.514	4.64±0.497	4.56±0.511	3.39±0.502	2.78±0.428
F, P	1.587, 0.218	1.322, 0.279	2.598, 0.088	17.917, 0.000*	22.123, 0.000*	13.199, 0.000*

* Statistically significance at level P<0.05.

Table (9): Relation between clinical data of the studied patients with oronasal mask and their comfort level throughout periods of implementation.

Clinical data	The studied patients (n=80)					
	Comfort level					
	Control group (n=40)			Study group (n=40)		
	1 st day	3 rd day	5 th day	1 st day	3 rd day	5 th day
Body mass index						
Over weight	4.00±0.00	4.00±0.00	5.00±0.00	4.00±0.00	3.00±0.00	2.00±0.00
Obese	3.09±1.676	3.13±0.626	4.13±0.968	3.96±0.751	2.83±0.637	2.58±0.504
Morbid Obesity	4.23±0.832	3.31±0.855	4.08±1.256	2.33±1.969	2.33±1.303	2.67±0.492
F, P	3.104, 0.057	2.765, 0.076	1.342, 0.274	7.433, 0.002*	1.586, 0.218	3.047, 0.060
Length of Oro-nasal mask (hrs/day)						
4	3.50±0.548	3.00±0.00	3.00±1.095	3.00±0.00	2.00±0.00	2.00±0.00
5	-	-	-	1.00±0.00	2.00±0.00	3.00±0.00
6	4.60±0.516	3.70±0.483	5.00±0.00	4.60±0.516	3.30±0.483	3.00±0.00
7	-	-	-	1.00±0.00	1.00±0.00	2.00±0.00
8	4.46±0.519	3.77±0.439	4.31±1.316	4.36±0.505	3.36±0.505	2.36±0.505
Continuous	1.55±0.934	2.45±0.522	4.00±0.00	3.57±0.535	2.57±0.535	2.57±0.535
F, P	49.975, 0.000*	21.595, 0.000*	7.007, 0.001*	72.817, 0.000*	25.704, 0.000*	9.004, 0.000*

* Statistically significance at level $P < 0.05$.

Table (10): Correlation between pressure injury staging system (PISS) of the studied patients with oro-nasal mask and their comfort level throughout periods of implementation

Pressure injury staging system (PISS)	The studied patients (n=80)					
	Comfort Level					
	Control group (n=40)			Study group (n=40)		
	1 st day	3 rd day	5 th day	1 st day	3 rd day	5 th day
R	0.232	0.684	0.040	-	0.219	0.067
P	0.151	0.000**	0.809	-	0.174	0.682

r: Spearman' correlation coefficient

* Statistically significance at level $P < 0.05$.

** Statistically highly significance at level $P < 0.01$.

Discussion

Discussion of the present study was represented as the following:

The present study's findings indicated that a greater than half of the study group and less than half of the control group were between the ages of 30 and 40 years old. This distribution may reflect the common age for respiratory disorders requiring NIV, particularly OSA, which is often diagnosed in middle-aged individuals (**Hariputri & Rosyid, 2025**). These findings are consistent with **Emami Zeydi et al. (2024)**, who studied “Risk factors related to pressure injuries in critically ill patients using NIV: A systematic review”, and emphasized that the majority of oronasal mask users tend to be middle-aged adults requiring continuous positive airway pressure (CPAP) therapy. In contrast to **Lemyze et al., (2020)**, who study “Skin breakdown and noninvasive ventilation: The findings of a prospective multicenter observational study” and identified a higher prevalence of older adults among NIV patients in critical care, which differs from the age distribution found in the present study.

In relation to gender, the present investigation demonstrated that the control group consisted of less than two-thirds of males, while the study group was composed of more than

half of males. This could be attributed to the higher prevalence of OSA among males, along with increased exposure to occupational and environmental factors that predispose them to respiratory illnesses (**Locke & Sundar, 2022**). These results are corroborated by **Zhou et al. (2022)**, who showed that “Effectiveness of protective dressings in preventing facial pressure injuries during NIV”, and reported that male patients constituted the majority of NIV users in their sample. Conversely, **Emami Zeydi et al. (2024)**, who studied “Risk factors related to pressure injuries in critically ill patients using noninvasive ventilation”, and identified equal gender distribution among NIV users in certain clinical settings, suggesting that gender prevalence may vary according to population characteristics and institutional patient profiles.

Regarding educational level, the findings showed that more than one third of the control group and less than half of study group were university educated. This may be related to higher rates of diagnosis and treatment-seeking behaviors among individuals with greater health literacy (**Abdelwadoud et al., 2024**). This result aligned with the observations of **Coyer et al. (2021)**, who showed that “The facial

pressure injuries prevention in cases had NIV”, and reported that patients with higher educational attainment were more likely to adhere to NIV protocols and report mask-related complications. In contrast, **Ertürk et al. (2022)**, who studied “Medical device-related pressure injuries in COVID-19 cases that were monitored in an ICU”, and found that educational levels among NIV users varied considerably, with no clear pattern across settings.

Concerning medical diagnosis, the results of the current investigation suggested that obstructive sleep apnea was diagnosed in less than three quarter of the patients in both groups, followed by respiratory distress and pulmonary disorders. This reflects the common use of oronasal masks as the primary interface for CPAP/BiPAP therapy among OSA patients (**Weaver, 2022**). These findings are consistent with **Emami Zeydi et al. (2024)**, who studied “Risk factors related to pressure injuries in critically ill patients using NIV”, and reported that almost of the studied sample had OSA which constitutes the leading indication for NIV delivered through oro-nasal masks. However, these results were in constant with **Lemyze et al. (2020)**, who studied “Skin breakdown and NIV”, and discovered that cases had acute respiratory failure, and showed

higher susceptibility to pressure injuries. **Regarding past medical history**, the study showed that cardiovascular and respiratory diseases were the most common comorbidities among participants. This was consistent with the clinical profile of patients requiring NIV. These results were consistent with those of **Ertürk et al. (2022)**, who investigated "Medical device-related pressure injuries in COVID-19 patients", and affirmed that chronic illnesses contribute to reduced skin integrity. However, these results were in different with **Emami Zeydi et al. (2024)**, who studied “Risk factors related to pressure injuries in critically ill patients using NIV”, and stated that past medical history was insignificantly associated with facial pressure injuries after controlling for mask tightness and duration of use.

Concerning daily duration of oronasal mask use, a significant difference was observed between the two groups, with the control group wearing the mask for longer periods. This finding due to extend mask wearing is a well-established predictor of facial pressure injuries. **Ertürk et al. (2022)** corroborated this interpretation in their investigation of "Medical device-related pressure injuries in COVID-19 patients", and found that wearing

a mask for more than six hours nearly doubled the incidence of pressure injuries. Conversely, **Lemyze et al. (2020)**, who studied “Skin breakdown and noninvasive ventilation”, and argued that reducing mask-wearing time is not always feasible in severe respiratory failure cases.

Regarding body mass index (BMI), most participants in both groups were obese (BMI 30–35 kg/m²). This finding may explain by obesity increases the risk of facial pressure injuries due to altered mask fit and increased localized pressure (**Singar, 2025**). This finding was consistent with **Emami Zeydi et al. (2024)**, who showed that obese individuals require higher pressure levels during NIV. Conversely, these results disagree with **Coyer et al. (2021)**, who showed no direct correlation between BMI and pressure injuries after adjustment.

The present study examined the distribution of patients using oronasal masks with regard to comprehensive skin assessment throughout the study period, including skin temperature, color, moisture, turgor, integrity, and the site of facial pressure injury.

Regarding skin temperature, the findings revealed that most patients in both groups had warm skin on the first day. However, a marked decline in normal skin temperature

was shown in the control group in the 3rd and 5th days, whereas the study group maintained predominantly warm skin throughout the follow-up period. These findings were consistent with **Emami Zeydi et al. (2024)**, who found that sustained interface pressure impairs microcirculation, leading to early skin changes that predispose patients to pressure injury development.

Concerning skin color, the results showed a progressive increase in facial redness in the control group patients during the later days of follow-up, while minimal changes were found in the study group. The significant difference between the two groups indicates early inflammatory responses associated with pressure injury formation (**Van Damme et al., 2020**). This finding aligned with **Coyer et al. (2021)** who highlighted that unrelieved pressure from NIV interfaces frequently results in localized redness prior to overt skin breakdown.

With regard skin moisture, the control group exhibited an increasing prevalence of dry skin over time, whereas the study group demonstrated better maintenance of skin moisture. The improved skin moisture observed in the study group may be attributed to regular skin assessment and the application

of preventive skin care measures. These findings are supported by **Moraes da Silva et al. (2022)**, who showed that dry skin is more vulnerable to friction, shear, and subsequent pressure injury.

Regarding skin turgor, the findings revealed a significant deterioration in the control group than the study group. Reduced skin turgor indicates impaired skin elasticity and hydration, which are known risk factors for pressure injury development (**Wilson, Avsar, Patton, Budri ; Moore, 2023**). This observation consistent with **Emami Zeydi et al. (2024)**, who identified poor skin turgor as a contributing factor to device-related pressure injuries in patients receiving noninvasive ventilation.

In relation to skin integrity, a significant proportion in the control group cases developed the skin thinning by the 3rd and 5th days, while all patients in the study group maintained intact skin throughout the study period. This may reflect the effectiveness of preventive interventions in preserving skin integrity. These results are consistent with **Arundel et al. (2021)**, who demonstrated that structured prevention strategies significantly reduce skin breakdown associated with NIV masks.

Regarding the site of facial pressure injury, the results

indicated that the nasal bridge was the most commonly affected area among the control group patients, particularly by the 5th day of mask use, whereas no facial pressure injuries were observed in the study group. This finding showed by **Zhou et al. (2022)**, who emphasized that the importance of targeted protection for high-risk facial areas.

These results underscore the critical role of preventive strategies such as protective dressings, appropriate mask fitting, and frequent skin monitoring in maintaining skin health and preventing facial pressure injuries in patients using oronasal masks during NIV (**Cui et al., 2022**).

Regarding pressure injury staging system, the present investigation reported that patients in the control group exhibited varying degrees of pressure ulcers, with a significant increase in stage II ulcers on day 3rd and 5th. In contrast, no pressure ulcers were recorded in the study group. These findings align with **Alfuqaha et al. (2024)**, who demonstrated that protective dressings effectively prevented stage II pressure injuries.

The current study also revealed significant differences between two groups regarding comfort levels on 1st, 3rd and 5th days of mask use, with a noticeable improvement in

the study group than the control group while patients in the control group reported a progression from mild discomfort to moderate or severe discomfort with continued mask use.

These results are consistent with recent literature showing a strong relationship between mask pressure and patient comfort. Higher mask tightness and longer usage were associated with reduced comfort and an increased risk of facial injuries (Pietrzyk, Kielczynska, Kowalczyk, Mazurek & Domagala, 2024).

Thus, the present study demonstrates that optimizing mask fit and providing effective skin protection not only prevent pressure injuries but also enhance patient comfort during NIV therapy.

As concern relation between socio-demographic characteristics, clinical data of the studied patients and their Pressure injury staging through periods of implementation, The results of the present investigation indicated that age was significantly related to higher PISS scores in the control group across the 1st, 3rd and 5th days, suggesting that older patients are at increased risk of developing pressure injuries during oronasal mask use. As, age-related physiological changes, such as reduced skin elasticity, thinning of

the dermis, and impaired microcirculation, likely contribute to this vulnerability (Flores & Nugent, 2025). These results were consistent with Wang et al. (2022), who identified advanced age as a major risk factor for device-related pressure injuries.

Regarding gender, male patients in the control group demonstrated significantly higher PISS scores on the first day, although this association was not sustained over time. Zhang et al. (2024), identified that male sex as a potential but non-definitive modifier of pressure injury risk, particularly when combined with other factors such as edema and interface type.

The attenuation of socio-demographic associations in the study group over time further suggests that preventive interventions effectively reduced the influence of demographic risk factors, supporting evidence from recent ICU studies highlighting the effectiveness of proactive pressure management strategies (Emami Zeydi et al., 2024).

Regarding body mass index (BMI), the present findings demonstrated that BMI was significantly associated with higher PISS scores among overweight and obese patients in the control group, particularly on the first day. This suggests that increased BMI

predisposes patients to pressure injuries through altered tissue mechanics and reduced perfusion under sustained mask pressure (**jia et al.,2024**). These results were consistent with **Wang et al. (2022)**, who reported obesity as a key risk factor for NIV-related pressure injuries.

Additionally, longer daily duration of mask use was significantly correlated with increased PISS scores in the control group, especially on the 1st and 3rd days. This supported findings by **Emami Zeydi et al. (2024)**, who reported that prolonged interface application independently predicts pressure injury development.

In the study group, these correlations were statistically insignificant, underscoring the effectiveness of preventive interventions such as optimal mask fitting, frequent skin inspection, protective dressings, and scheduled mask relief. These results were consistent with **Azevedo et al. (2024)**, who highlighted early risk assessment and proactive skin care as essential components of prevention.

As regard relation between socio-demographic characteristics, clinical data of the studied patients and their comfort level through periods of implementation, the findings

revealed that age was significantly associated with comfort level in both groups, with older patients demonstrating higher comfort scores. These result was aligned with **Esquinas et al. (2019)**, who reported that older adults often adapt more effectively to NIV interfaces.

Also, it was found that gender significantly associated with comfort level was observed, particularly among male patients. This finding was consistent with **Noguchi et al. (2021)**, who reported fewer complaints of mask discomfort among males, potentially due to anatomical differences affecting mask fit.

Regarding educational level was also significantly associated with comfort, particularly in the study group, where higher education correlated with greater comfort across all time points. These results were consistent with **Fernández-García et al. (2020)**, who emphasized that health literacy enhances patient understanding, compliance, and comfort during NIV therapy.

Concerning clinical data, BMI showed that a statistically significant relation with comfort at certain time points, which may be related to individualized mask adjustment and cushioning. **Additionally,** longer mask-use duration was associated with reduced comfort. These

findings were consistent with **Emami Zeydi et al. (2024)**, who highlighting the importance of scheduled breaks and protective strategies.

Concerning the correlation between the pressure injury staging system (PISS) and comfort level, among the studied patients using oro-nasal masks, the results demonstrated a positive correlation in the control group during the 1st, 3rd and 5th days of implementation, with a highly statistically significant positive correlation on the 3rd day. This indicates that higher grades of pressure injury were associated with lower patient comfort. These findings was consistent with **Zeydi et al. (2023)**, who reported that increased pressure injury severity directly affected patient tolerance and comfort during mask use.

On the other hand, in the study group that received protective interventions, statistically insignificant correlation was reported between PISS and comfort level on the 3rd and 5th days. From the investigator's point of view, this could be attributed to the effectiveness of the implemented interventions, such as the use of protective dressings, proper mask fitting, and frequent skin assessment, which minimized the impact of pressure injuries on

patient comfort. These results aligned with **Arundel et al. (2021)**, who found that structured skin care protocols and preventive strategies significantly reduced patient discomfort despite continued mask use.

Coversely, **Lemyze et al. (2020)**, noted that some protective materials may interfere with mask seal and compromise ventilation efficiency, particularly in patients with severe respiratory failure.

Conclusion

Based on the findings of the present study, it can be concluded that implementation of protective measures for patients using oro-nasal masks was effective in reducing the incidence and severity of facial pressure injuries. Moreover, these measures improved patients' comfort levels and tolerance to the oro-nasal mask, which in turn enhanced adherence to therapy. Also, The results highlight the critical role of nursing care in early prevention and management of device-related pressure injuries

Recommendations

Based on the findings of the current study, it can be recommended that:
-Implement routine skin assessment protocols for patients using medical devices that apply pressure to the face.

-Educate healthcare staff on pressure injury prevention, early detection and intervention strategies.

-Involve patients and caregivers in awareness and self-monitoring for signs of facial skin breakdown.

-Further studies are needed to assess the various methods of protective measures to prevent facial pressure injuries.

-Conduct further research to evaluate long term effect of protective interventions.

Limitations of the study:-

This study had some limitations as follows:

1-The study was conducted in a single healthcare facility which may limit the generalizability of the finding.

2-The sample size was relatively small.

3-The study relied on short –term observation.

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Relation between Job Embeddedness and Organizational Commitment among Intensive Care Nurses

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Abstract

Background: Job embeddedness is a high-level aggregate driver for intensive care nurses (ICNs) retention which has a great impact on the safety and quality of patient care and ICNs' organizational commitment. **Aim:** To assess the relation between job embeddedness and organizational commitment among intensive care nurses. **Research design:** A descriptive - correlational research design was utilized to conduct this study. **Setting:** The study was conducted at Tanta University International Teaching Hospital. **Subjects:** All available intensive care nurses (n=241) working in previously mentioned setting. **Tools:** Intensive Care Nurses' Job Embeddedness and Intensive Care Nurses' Organizational Commitment Questionnaire. **Results:** The results of study showed that around half (46. 1%) of intensive care nurses had a high level of job embeddedness, and slightly less than two-thirds (62. 2%) of them had high level of organizational commitment. **Conclusion:** There was a strong statistically significant positive correlation between intensive care nurses' job embeddedness and their organizational commitment. **Recommendation:** Assess frequently intensive care nurses levels of job embeddedness and organizational commitment. Also, create a healthy work environment to increase intensive care nurses effectiveness and performance.

Keywords: Intensive care nurses, Job embeddedness, Organizational commitment.

Introduction

Nurses especially intensive care nurses operate under pressure and experience a variety of difficulties to provide patient care and achieve hospital objectives **(Curley et al., 2024)**. They face greater occupational hazards and more rigid expectations. Therefore, in order to achieve organizational objectives, promote effectiveness and efficiency, and enhance the quality of organization's healthcare services, intensive care nurses require job embeddedness **(Bergüés, Sánchez, Martín, & Lizarraga, 2024)**.

Job embeddedness is the extent that nurses are involved, bonded, and linked in the healthcare organization in which they work. It is also described as a mix of mental, physical, and financial factors that keep nurses in their jobs. **(Ike, Chuke, & Nnamchi, 2025)**.

The three dimensions of job embeddedness relevant to a nurse's hospital job are fit, links, and sacrifice **(Schmidbauer, Niessen, Weschke, & Krupp, 2025)**. The combination of knowledge, necessary skills, work styles, and organizational culture is referred to as the nurse organizational fit **(Rafi'i, Hanif, & Daud, 2025)**. Nurse's Links describes the capacity to establish a strong network of hospital connections. The advantages that can be achieved

increase with the number of interactions. A nurse's links to an organization are with patients and colleagues **(El-Ashry et al. , 2025)**.

A nurse's sacrifice refers to the concrete and intangible perks that a nurse loses if she leaves an organization. The potential loss of status, reputation, salary, opportunities for career growth, and retirement advantages are examples of organizational sacrifices **(Malalage, & Perera, 2025)**. Nurses will be more dedicated to their work if they have a higher degree of fit, are more connected, and make greater sacrifices **(Moussa, Zakaria, & Abd ElGhani, 2025)**. Inactivity or absence from work may be a withdrawal build, while job embeddedness can be a preservation or anti-withdrawal build and boost nurses' organizational commitment **(El-Ashry et al. , 2025)**. The level of organizational commitment that a nurse demonstrates in terms of their belief in and involvement with a specific organization **(Jun et al., 2025)**. A nurse's dedication to the organization is demonstrated by their loyalty and dedication to its growth, as well as their readiness to uphold its objectives, values, standards, and ethics **(Mohamed, Yousef, Abo Elmagd, & Saleh, 2025)**. Increased organizational commitment is associated with reduced workplace stress and

greater fulfillment in work. Higher commitment nurses are able to balance their professional and personal lives. Additionally, the safety and standard of patient care are significantly impacted by a nurse's commitment to an organization **(Ahmed, Mahmoud, & Helaly, 2025)**.

Normative commitment, affective commitment, and continuance commitment are the three dimensions used to assess organizational commitment. The strong bond that nurses have with their organization, their desire to see it achieve its goals, and their pleasures in belonging to it are all examples of affective commitment **(Tao, Liu, & Su, 2025)**. Continuous commitment grows when a nurse weighs the perceived cost of the effort, money, and time they put in the organization before departing **(Alshaibani, Aboshaiqah, & Alanazi, 2024)**.

On the other hand, normative commitment is an attitude of duty to still with an organization. If nurses believe in their continued employment is ethically and legally permissible, they are considerably more inclined to remain with the organization. A nurse is more likely to sense a normative-moral responsibility to dedicate herself to her hospital if she has a strong emotional bond with it **(Bell, & Sheridan, 2020)**.

The degree of fit between nurses and their workplaces is closely linked to their organizational commitment **(Eldefonso, Yakobus, & Abun, 2024)**.

Significance of study

The lack of nurses is one of the major issues facing the global healthcare sector. Medical organizations experience instability as a result of this shortage, which has an impact on their daily activities and care quality. Consequently, it is imperative to identify methods to enhance the ICNs' dedication to their job to improve the overall organization, particularly in the intensive care unit (ICU). For ICNs delivering successfully care for seriously ill patients entered the ICU requires skilled care, high levels of concentration, and accountability.

While working conditions are rapidly shifting, it is crucial to evaluate nurses' job embeddedness and investigate ways that improve it **(Song, Shi, Zheng, Lu, & Chen, 2024)**. Thus, the purpose of this study was to assess the relation between intensive care nurses' organizational commitment and job embeddedness

The aim of study was to: Assess relation between job embeddedness and organizational commitment among intensive care nurses.

Research questions:

1-What are the levels of job embeddedness among intensive care nurses?

2-What are the levels of organizational commitment among intensive care nurses?

3-What is the relation between job embeddedness and organizational commitment among intensive care nurses?

Subjects and Method**Study design:**

A descriptive- correlation study design was used in the present study. (Abujaber et al., 2024).

Setting:

The current study was carried out at Tanta University International Teaching Hospital which affiliated to the Ministry of Higher Education and Scientific Research in Intensive Care Units (ICUs) including; Pediatric, Cardiac, Heart & Thoracic surgery, Burns, Neonatal, and Medical ICUs.

Subjects:

All intensive care nurses (n=241) who worked in the previously mentioned setting and available at the time of data collection as follows: Pediatric (44) nurses, Cardiac(58)nurses, Heart& Thoracic surgery (17)nurses, Burns (22) nurses, Neonatal (55)nurses and Medical (45) nurses.

Tools of data collection

Two tools were used to accomplish aim of this study including:

Tool I: Intensive Care Nurses' Job embeddedness Questionnaire

This tool was developed by the investigator guided by Maier, (2022) and recent related literatures (Elbus, Elsaheed, & Eldeeb, 2023; Mahmoud & Obied, 2022) to assess job embeddedness among intensive care nurses.

It was consisted of two parts as follows:

Part 1: Personal Data: Such as age, gender, marital status, educational level, position, ICU name, years of experience and experience in current unit and sharing in activities or committee in hospital.

Part 2: Intensive Care Nurses' Job embeddedness questionnaire

It was consisted of 17 items categorized into three subscales as the following:

1-Intensive Care Nurses' Fit to Organization: included 6 items.

2-Intensive Care Nurses' Links to Organization: included 5 items.

3-Intensive Care Nurses' Organizational Sacrifice: included 6 items.

Scoring system:

Intensive care nurses' responses were measured on a five-point Likert scale ranging from (1-5) where (1) strongly Disagree, (2) Disagree, (3) Uncertain, (4) Agree and (5) Strongly Agree. The score of each dimension was summed up and converted to percent score. The

total scores summed up and classified into levels based on cut off points as follows:

-High level of job embeddedness $\geq 75\%$

-Moderate level of job embeddedness $60\% - < 75\%$

-Low level of job embeddedness $< 60\%$.

Tool II: Intensive Care Nurses' Organizational Commitment Questionnaire

This tool was developed by the investigator guided by **Perreira et al., (2018); Lundkvist & Amedi (2019)** and recent related literature (**Al-Dossary 2022); Wang et al. (2023)** to assess organizational commitment among intensive care nurses.

It consisted of 43 items categorized into three subscales:

-Affective Commitment: included 10 items.

-Continuance Commitment: included 19 items.

-Normative Commitment: included 14 items.

Scoring system:

Intensive care nurses' responses were measured on a five- points Likert Scale ranging from (1-5) where (1) Strongly Disagree, (2) Disagree, (3) Uncertain, (4) Agree, and (5) Strongly Agree. The score of each dimension was summed up and converted to percent score. The total scores summed up and

classified into levels according to cut off points as follows:

-High level of organizational commitment $\geq 75\%$.

-Moderate level of organizational commitment $60\% - < 75\%$.

-Low level of organizational commitment $< 60\%$

Method

-An official permission to conduct the study was obtained from the administrator of the previously mentioned settings.

-Ethical consideration:

-An approval from Scientific Research and Ethical Committee at Faculty of Nursing was obtained with code number 408-3-2024.

-The investigator 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.

-The right to terminate participation at any time was accepted.

-The nature of the study was not cause any harm for the entire sample.

-Assuring the nurses about the privacy and confidentiality of the collected data and explain that it was used for the study purpose only.

-The study tools were translated to Arabic and presented to a jury of five experts in the area of specialty to check their content validity. The experts were one professor and four assistant professors of Nursing

Administration from Faculty of Nursing, Tanta University.

-The experts' responses were represented 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 and adding others and simplifying work related words.

-The face validity value of Intensive care nurses' job embeddedness questionnaire was 96. 9%, Intensive care nurses' organizational commitment questionnaire was 98. 6%.

-A pilot study was carried out on a sample (10%) of the subject (n=24). A pilot study was carried out after the experts' opinion and before starting the actual data collection. The pilot study was done to test clarity, sequence of items, applicability, relevance of the questions and to determine the needed time to complete the questionnaire. The pilot study sample size wasn't excluded due to no major modifications were made. The estimated time needed to complete the questionnaire items from nursing staff was 20 – 30 minutes for each sheet.

-Reliability of tools was tested using Cronbach's Alpha Coefficient test. Reliability of Intensive care nurses' job embeddedness questionnaire questionnaire= 0. 905

and reliability of Intensive care nurses' organizational commitment questionnaire = 0. 954.

-Intensive care nurses' job embeddedness questionnaire and intensive care nurses' organizational commitment questionnaire were used to collect data from identified subjects.

-Data collection phase: the data were collected from intensive care nurses by the investigator. The investigator met the respondents' intensive care nurses in different areas under study during working hours to distribute the questionnaire. The subjects recorded the answer in the presence of the investigator to ascertain that all questions were answered. The data was collected over a period of six months started from the beginning of September 2024 until the end of March 2025.

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. The used tests were Chi-square test, Monte Carlo correction, F-test (ANOVA) and Pearson coefficient.

Results

Table (1): Shows distribution of ICNs' personal data. It clarifies that, slightly more than half (54. 4%) of ICNs had < 30 years old with the mean age score 29.31 ± 4.60 . most (87. 1 %, 86. 3 %) were female and married. As regard to educational level, more than half (63. 9 %) of intensive care nurses had bachelor degree, and one third (34. 4%) of them were technical. As for position, the majority (82. 2%) of ICNs were staff nurse. Added to that, the majority (83. 4%) of them had ≤ 10 years of experience with a mean score of 6.15 ± 4.73 . Moreover, the most (86. 7%) of intensive care nurses did not sharing in activities or committee in hospital.

Figure (1): Shows total levels of ICNs' job Embeddedness. The figure shows that the highest percentage (46.1% and 35.3%) of the ICNs had high and moderate levels of job embeddedness respectively. Also, nearly one-fifth (18.7 %) of them had a low level of job embeddedness.

Table (2): Denotes levels of the ICNs' job embeddedness dimensions. It clarifies that, more than half (66. 8% and 51. 0%) of ICNs had a high level of links to organization and fit to organization dimensions, respectively. On the other hand, more than one third (38. 2%) of them had a low level of

organizational sacrifice dimension of job embeddedness.

Figure (2): Reveals total levels of the ICNs' organizational commitment. It shows that, over sixty percent (62. 2%) of ICNs had a high level of organizational commitment. Also, more than one quarter (29. 0%) of them had a moderate level, while (8. 7%) of them had a low level of organizational commitment.

Table (3): Reveals levels of the ICNs' organizational commitment dimensions. It describes that, more than half (59. 8%, 58. 5%, and 55. 6 %) of the ICNs had a high level regarding normative, affective, and continuance organizational commitment dimensions, respectively. Also, 12. 4% and 10. 4% of them had a low level regarding affective and continuance organizational commitment, respectively.

Figure (3): Illustrates correlation between ICNs' job embeddedness and organizational commitment. This figure shows that a statistically significant positive correlation among ICNs' job embeddedness and organizational commitment at $p \leq 0.05$.

Table (1): Distribution of Intensive Care Nurses' personal data (n = 241)

Demographic data	No.	%
Age (years)		
<30	131	54. 4
30 – 40	105	43. 6
>40	5	2. 1
Min. – Max.	23. 0 – 48. 0	
Mean ± SD.	29. 31 ± 4. 60	
Sex		
Male	31	12. 9
Female	210	87. 1
Marital status		
Married	208	86. 3
Unmarried	33	13. 7
Educational level		
Secondary	1	0. 4
Technical	83	34. 4
Bachelor	154	63. 9
Post graduate	3	1. 2
Position		
Head Nurse	43	17. 8
Staff Nurse	198	82. 2
ICU Name		
Pediatric ICU	44	18. 3
Heart&Thoracic surgery	17	7. 1
Cardiac ICU	58	24. 1
Burn ICU	22	9. 1
Neonatal ICU	55	22. 8
Medical ICU	45	18. 7
Years of experience		
≤10	201	83. 4
>10	40	16. 6
Min. – Max.	0. 5 – 30. 0	
Mean ± SD.	6. 15 ± 4. 73	
Experience in current unit		
Min. – Max.	0. 08 – 30. 0	
Mean ± SD.	5. 24 ± 4. 64	
Sharing in activities or committee in hospital		
Yes	32	13. 3
No	209	86. 7

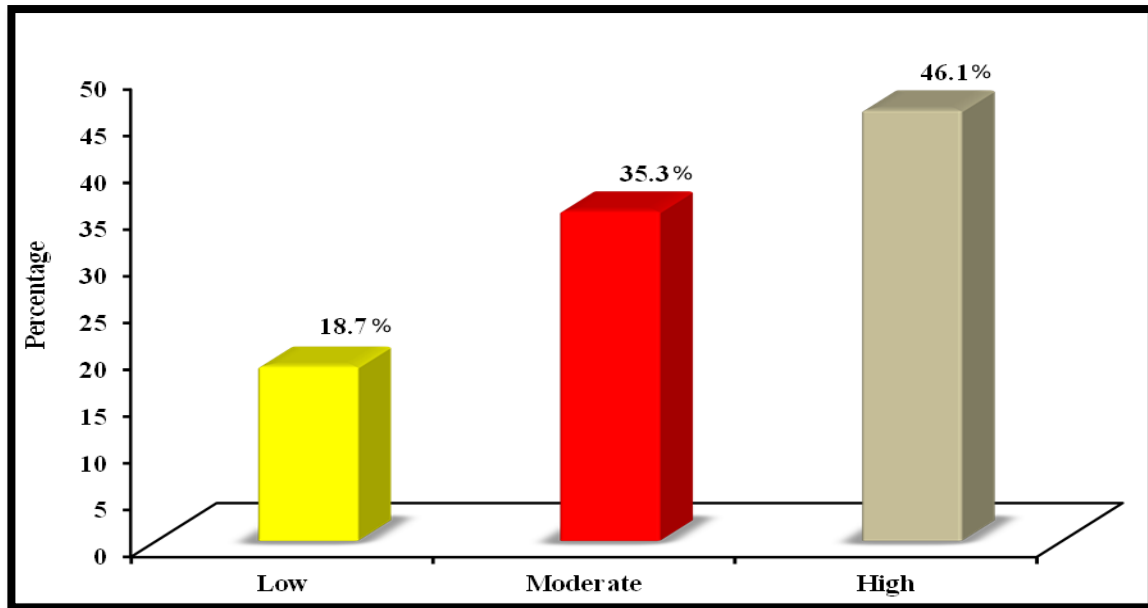


Figure (1): Total levels of Intensive Care Nurses' job embeddedness (n = 241)

Table (2): Levels of the Intensive Care Nurses' job embeddedness dimensions (n = 241)

ICNs' Job Embeddedness Dimensions	Levels of ICNs' Job Embeddedness Dimensions					
	Low (<60%)		Moderate (60 % - < 75%)		High (≥75%)	
	No.	%	No.	%	No.	%
ICNs' Fit to Organization	48	19.9	70	29.0	123	51.0
ICNs' Links to Organization	18	7.5	62	25.7	161	66.8
ICNs' Organizational Sacrifice	92	38.2	45	18.7	104	43.2
Overall	45	18.7	85	35.3	111	46.1

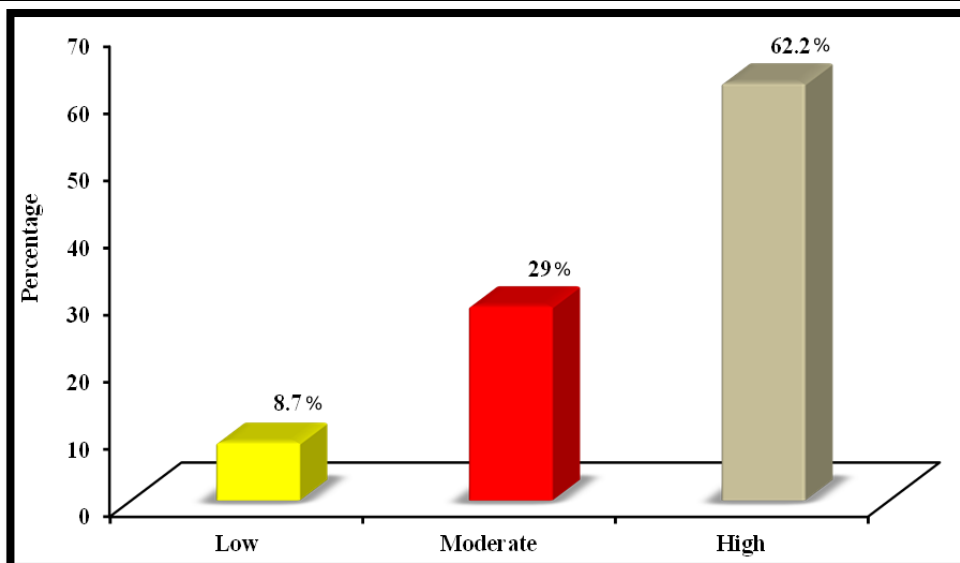
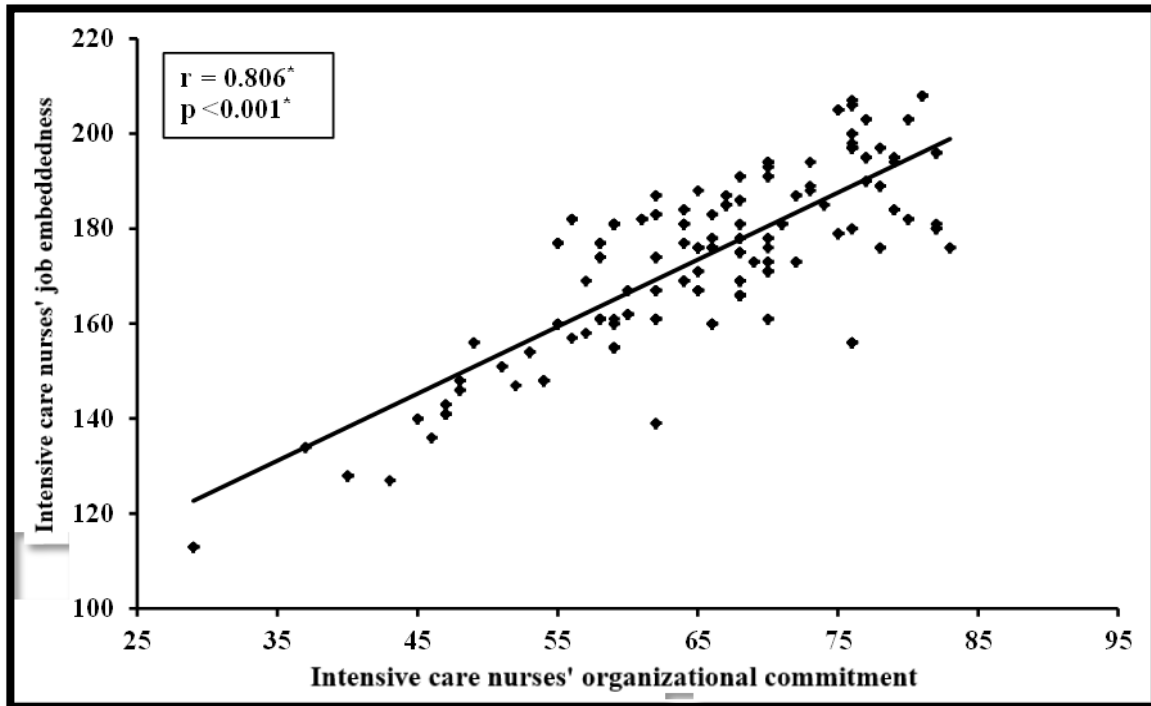


Figure (2): Total levels of the Intensive Care Nurses' organizational commitment (n = 241)

Table (3): Levels of the organizational commitment dimensions (n = 241)

ICNs' organizational commitment dimensions	Levels of intensive care nurses' organizational commitment dimension					
	Low (<60%)		Moderate (60 % - < 75%)		High (≥75%)	
	No.	%	No.	%	No.	%
Affective Commitment	30	12. 4	70	29. 0	141	58. 5
Continuance Commitment	25	10. 4	82	34. 0	134	55. 6
Normative Commitment	10	4. 1	87	36. 1	144	59. 8
Overall	21	8. 7	70	29. 0	150	62. 2



r: Pearson coefficient*: Statistically significant at $p \leq 0.05$

Figure (3): Correlation between Intensive Care Nurses' job embeddedness and organizational commitment (n = 241)

Discussion

Intensive care nurses (ICNs) face challenges in providing care for severely sick patients, besides that dealing with significant responsibilities (Palmryd, Rejnö, Alvariza, & Godskesen 2025). Healthcare organizations are now interested in addressing the issue of developing and retaining nurses to establish a productive workplace.

Nurses who are well-embedded are anticipated to be more committed to their organizations, productive, and motivated. (Felder et al., 2024). Therefore, the objective of this investigation aimed to investigate the relationship between organizational commitment and the job embeddedness of intensive care nurses.

Intensive care nurses' job embeddedness

According to present investigation, more than three quarters of intensive care nurses reported high and moderate job embeddedness levels. A high level of links to the organization and fit to the organization dimensions may be the reason for this, as more than half of the ICNs exhibited these characteristics. Consequently, nurses are anticipated to perform at their best when they are in good health, feel connected, and are willing to make sacrifices.

These findings conform to **Moussa, Zakaria, & Abd ElGhani (2025)**, who revealed that high and moderate levels of job embeddedness were observed in most of subjects who were examined. Also, **Mohammed, Osman, Elmeghawri, & Ismael (2024)** indicated that the levels of job embeddedness among the bulk of subjects were high and moderate. Contrary with these results, **Gab-Alla, Safan, & Elshall (2024)** found that job embeddedness of over two-thirds of the subjects under investigation was low, while nearly one-third of them exhibited a high level of job embeddedness. Also, **Mahmoud & Obied (2022)** who discovered that a significant proportion of intensive care nurses

exhibited a low level of overall job embeddedness.

The results of the present study indicated that a slightly more than half of ICNs exhibited a high level of fit to the organization dimension. This can be due to presence of stimulating supportive workplace where their job utilizes their skills and talents well, feel good about professional growth and feel a good match for hospital. Accordingly, ICNs who work in a surrounding with standards, goals, and priorities that equal with those of nurses and match their anticipation. Also, allow them to develop professionally and personally, they are more probable to embed in their jobs.

The present study's findings are supported by **Abd Elnaby, Ghoniemy, & Ismail (2025)**, who revealed that the studied staff nurses had a high level of fit to organization. Likewise,

Mohammed et al. (2024); Elbus et al. (2023) and Elsayed & Abdel-Ghani (2022) confirmed that ICNs exhibited a strong organizational fit. In contrast with these findings, regarding fit dimension, **El_Emam, Hamoda, Zahran, & Sorour (2024)** found that a low level of hospital work fit was observed in over two-thirds of the nursing staff. Also, **Gab-Alla et al. (2024)** reported a low level of fit dimension as staff nurses received inadequate

support from nurse manager and as a result, were not embedded in their jobs.

Regarding ICNs' link to organization dimension, the results of the current study demonstrated that more than half of ICNs reported a high level. This is due to the majority of ICNs work effectively in their group, work closely with their coworkers. Also, for a long time they are working in hospital and satisfying with job in fulfilling their personal needs. Accordingly, closing ties and connections between co-workers, effective teamwork can enforce ICNs' bonding to organization. Also, strong relations with leadership and perceived organizational support are important elements that strengthen ICNs' link to the organizational.

These finding were evidenced by, **Moussa et al. (2025)** whose study exhibited that the highest percentage of participants reported organizational link. This could be owing to nurses from where they work closely together as a team, interact frequently, and have strong relationships among themselves have a strong link to the organization. Also, **El-Sayed, Asal, Shaheen, & Abdelalim (2023)** stated a high level of subjects' agreement about links to organization. On contrary, **El_Emam et al. (2024)** & **Gab-**

Alla et al. (2024) stated a low level of nurses' links to organization. Also, **Mahmoud & Obied (2022)**, who exposed that the majority of nurses represented a low level of link to organization and related that to the humble affiliation between work colleagues, the work environment not boosting staff to increase any innovative knowledge and skills.

Regarding organizational sacrifice dimension of job embeddedness, the existing investigation results demonstrated that, more than one third of ICNs had a low level regarding organizational sacrifice. This could occur when they aren't well compensated financially and morally for their level of performance. As a result, poor compensation leads to reduced nurses' productivity and performance, higher absenteeism, turnover and negative organizational culture.

The results of the current investigation conform to **Gab-Alla et al. (2024)**, who claimed that a low level of organizational sacrifice may be caused by inadequate sources of income for nurses, especially in light of price increases, and poor working circumstances for nurses, such as rigid policies and systems at university hospitals, including lack of ability to transition to another workplace without

substitute. Also, **Mahmoud& Obied (2022)** showed that the absence of adequate incentives, salaries, a career ladder in nursing, and a lack of community support for nurses may be the cause of a low level of sacrifice.

On contrary, **Elbus et al. (2023)**, who discovered that over half of the nurses exhibited a high level of organizational sacrifice in the job embeddedness dimension. The rationale behind this was that nurses were afforded a significant amount of flexibility in their work, were respected by others, and were rewarded for their performance. Additionally, they were willing to make significant sacrifices if they were to leave their jobs. Also, **El-Sayed et al. (2023)** stated that high percent of nurses reported a high level of organization sacrifice and stated that the nurses having a high level of job embeddedness are more committed to their job and their feeling of appreciation for their efforts at work gives them the motivation to give their best.

Intensive care nurses' organizational commitment

The results of this study revealed that over half of intensive care nurses exhibited a high level of organizational commitment, while over one-quarter of them exhibited a more moderate level. This can be explained by the fact that more than

half of the ICNs exhibited a high level of affective, continuance, and normative commitment dimensions of organizational commitment. Also, the ICU nurses' organizational commitment is critically associated with organizational support regarding nurses' professional growth, job satisfaction, leadership quality, which fosters nurses' intention to stay and commitment. Additionally, low staff burnout, supportive coworkers, and flexible scheduling boost long-term organizational loyalty. Additionally, the high level of organizational commitment could contribute to the fact that nurses are willing to put out effort on support of the organization and believe that their personal values align with the organization's values. The current findings were compatible with, **Abdel Latif, El-Demerdash, & Hasanin (2023)** who found that staff nurses' organizational commitment increased after head nurse participation in shared governance program. Also, **Mohamed, Shazly, & Kamel (2023)** illustrated that as perceived by the staff nurses, there was a high level of organizational commitment. Furthermore, **Callado, Teixeira, & Lucas (2023)**; **Albasal,Eshah, Minyaw, Albashtawy,& Alkhawaldeh (2022)** found that the

nurses feel highly committed to their organization.

In contrast to these results, **Ahmed, Mahmoud, and Helaly (2025)** showed that the majority of the nurses who were examined exhibited a moderate level of organizational commitment. Also, **Saleh (2024)** showed that over one fifth of staff nurses exhibited a high level of organizational commitment, while less than half exhibited a moderate level of commitment.

The present study's findings regarding affective commitment dimension indicated that more than half of intensive care nurses exhibited a high level of commitment. This may be due to ICNs have a strong emotional engagement to their jobs, work closely with their coworkers and for a long time they working in this hospital. also positive work environments foster ICNs deeper emotional ties and building affective bonds to organization.

In the same line of these findings, **Elsayed et al. (2024)** found highly significant improvement in level of nurses' affective organizational commitment through implementing organizational cynicism management educational program. Also, **Abdelhaleem, Fakhry & El Azab (2023)** illustrated that the staff nurses' most prevalent type of commitment was affective.

On contrary, **Essa, Abood, & Thabet (2021)** revealed that there was a moderate level of agreement between the staff nurses at the study setting regarding affective organizational commitment. The findings may be attributed to the anxiety of staff nurses to resign from their positions and become jobless, particularly in light of their diverse nationalities and origins. Also, **Zakaria & Abo Shaheen (2021)** found that the mean score for affective commitment was the lowest, and over half of the ICU nursing staff exhibited a moderate level of commitment. Furthermore, **Ali et al. (2020)** showed that a moderate level of affective commitment was observed in nearly half of the staff nurses.

Regarding continuance organizational commitment dimension, the study results revealed that more than half of intensive care nurses had a high level of continuance commitment.

This can be rationalized by high percent of ICNs were satisfied with their job in fulfilling their personal needs. Moreover, clear career progression within the organization, as well salaries improvement and financial incentives can make staying more beneficial than leaving.

These findings supported by **Al-Oweidat, Shosha, Baker, &**

Nashwan (2023) who demonstrated that nurses had moderate levels of continuous organizational commitment and agreed that they would be disadvantaged if they leave their organization. As well, **Asaad, Shazly, & Abd-elazeem (2022)** whose study findings indicated that a high continuance commitment was exhibited by three-quarters of nurses, which is indicative of the significance they place on their job as a source of income and the scarcity of better work opportunities.

In contrast, **Ali et al. (2024)** who discovered that the level of continuous commitment among nurses was low. Also, **Saeed, Abd Elazeem, & Badran (2023)** revealed that, three fifths of the studied sample had a low level of organizational commitment and indicated that these finding could be due to the salaries of the study subjects not good and there is no promotion system.

Regarding normative organizational commitment dimension, the study results revealed that more than half of the ICNs had a high level regarding normative organizational commitment dimension. This can be rationalized by ICNs sense of duty and responsibility and so on, use their full energy to fulfill their tasks. Also, ICNs development and promotion associated with accepting

organizational ideals and organizational instruction which increases the sense of normative commitment. In addition to, the high length of experience at work or association with their organizations reinforces obligation and strengths normative ties.

The findings of the present investigation were consistent with **Asaad et al. (2022)** who discovered that a significant proportion of nurses exhibited a high level of normative commitment, which was indicative of their moral and ethical commitment to their profession and workplace. As well, **Albasal et al. (2022)** demonstrated that normative commitment was the highest level among the organizational commitment aspects. In contrast, **Saleh (2024)** found that more than half of the studied subjects had a low level of normative commitment, and indicated that when staff nurses consistently witness clear instances of their employer's dedication to their well-being, their normative commitment is likewise high. Also, **Hamidi, Barari, Sahebdel, & Bayat (2024)** found that a low level of normative commitment was observed in less than two-thirds of the staff nurses who were studied, while approximately one-fifth of them exhibited moderate to high levels.

Correlation between intensive care nurses' job embeddedness and organizational commitment

The existing study results presented statistically significant positive correlation between intensive care nurses' job embeddedness and organizational commitment. This may be associated with job embeddedness, which is regarded as an indicator of organizational commitment. Nurses who are engaged, motivated, and focused on their work are said to be committed to their work. Nurses are more committed to their work when they are more embedded. Adding to that, this may occur in supportive settings with sufficient resources and positive relationships, especially in the high-stress setting of ICNs which make nurses more dedicated to their work.

This finding go in the same line with **Haryati, Widodo, & Widodo (2024)** reported that there was a substantial correlation between job embeddedness and organizational commitment, and the two variables significantly influenced the organizational citizenship behavior of the study subjects. Also, **Saeed & Jun (2022)** reported that job embeddedness is a critical factor in fostering a sense of connection and commitment among study subjects.

Conclusion

Based on the findings of the present study it was concluded that: The highest percentage of ICNs had high and moderate level of job embeddedness. Also, over sixty percent of ICNs had a high level of organizational commitment and more than one quarter of them had a moderate level. Adding to that, a highly statistically significant positive correlation was found between ICNs' job embeddedness and organizational commitment.

Recommendations

In the light of the findings obtained from the present study, the following recommendations were suggested:

For hospital administration

Assess frequently the intensive care level of job embeddedness and organizational commitment for development.

-Create a healthy work environment to increase intensive care effectiveness and performance.

-Give continuing education program and workshops for intensive care nurses to equip them with update knowledge skills to promote nurses job embeddedness and organizational commitment.

-Adopt nurses' contribution in decision making related to their job.

-Establish clear reward criteria and keep ICNs informed about it.

For head nurses

- Provide supportive working environment including continuous training programs and feedback.
- Offer chances for ICNs to grow and progress.
- Ensure flexibility, equity and respect ICNs' shift preferences to minimize turnover.
- Establish culture of workplace, loyalty and commitment among nurses.
- Encourage nurses and empower them to improve their level of education to enrich their job.
- Conduct weekly meetings to discuss and satisfy nurse's needs.
- Empower newly nurses and provide them with opportunities for training on their required job.

For intensive care nurses

- Follow nursing care standard, teamwork and communication skills.
- Communicate their mission and values clearly for reinforcing congruence between personal and organizational values.
- Access to modern equipment and psychological support services to reduce stress and attachment to their roles.

Further researches

- Replicate this study in other contexts to increase the generalizability of the findings.
- Explore effect of nurse's job embeddedness and organizational

commitment on their performance and patient outcomes.

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Relation between Job Security and Work Attraction of Nursing Staff

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Abstract

Background: Job security is a basic requirement for nursing staff as it supports their financial wellbeing, motivation and attraction in the workplace. **Aim of the study:** Assess the relation between job security and work attraction of nursing staff. **Research Design:** A descriptive correlational research design was used. **Setting:** The study was conducted in Egypt at Tanta International Teaching Hospital, includes inpatient departments namely, (Medical, Cardiac and Chest, Orthopedic, Neurological surgery, Vascular, Dialysis, Pediatric Surgery and Oncology units). **Subjects:** All (n=310) nursing staff working at the previous mentioned units. **Tools:** Two tools were used for data collection, Nursing Staff's Perception regarding Job Security and Work Attraction Questionnaire. **Results:** More than sixty percent (61.3%) of nursing staff had a low level of job security and near to fifty percent (47.7%) of them had a low level of work attraction. **Conclusion:** There was a positive statistical correlation between overall job security and work attraction among nursing staff. **Recommendations:** Healthcare facility management should provide educational programs, seminars and workshops for nursing staff for professional development and improving skills to enhance job security and promoting work attraction. Nursing manager should provide constructive criticism, compensation and recognition which motivate nursing staff to perform well, which raises workplace security and attraction.

Keywords: Job Security, Nursing Staff, Work Attraction

Introduction

Nursing staff plays a crucial role in the efficient operation of health system since they provide direct patient care. Vision 2030 places a lot of emphasis on the healthcare sector, with the goal of achieving greater operational efficiency and sustainability **(Al-Dossary, 2022)**. The effectiveness and profitability of any hospital are greatly impacted by the turnover of nursing staff **(Sorn, Fienena, Ali, Rafay, & Fu, 2023; Goyal & Kaur, 2023)**. Nursing staff who work in hospitals that offer job security feel more secure in their careers, exhibit less stress and burnout, become more attractive and satisfied with their professions, and perform better at work **(Falatah, Almuqati, Almuqati, & Altunbakti, 2021 & Al-Hyari, 2023)**. Job security is defined as what nursing staff expect from their work, including crucial aspects like long-term career chances, general working conditions, and advancement opportunities **(Wahyuni, Musnadi, & Nurdin, 2020)**. Job security has positive outcomes for nursing staff, contributing to better work-life balance, job retention, attraction, and commitment **(Ray & Pana, 2021)**. Job security involves four dimensions personal, workplace,

economic, and professional security. Personal security means a strong sense of fulfillment, kindness, attempting to assist others, equality, decision-making authority, belief in one's own principles, and decision making ability **(Abo Salih, El Demerdash, Ahmed, & Mahmoud, 2023)**. Workplace security is an advanced work environment free from any physical hazards to nursing staff, including the availability of necessary supplies and equipment and appropriates enough coaching and training on how to utilize those **(Alowayni et al., 2023)**. Economic security refers to sufficient pay and union security being assured and the capacity of the hospital's nursing staff to charge for their labor **(Rehman, Azhar, & Javaid, 2024)**. Professional security is referred to as developing nurses' skills and abilities, considering their life goals, and creating goals for nursing staff to realize and utilize their full potential **(Maqableh, Helalat, & Nor, 2023)**. Therefore, security of work conditions may affect the commitment, attraction, retention, and loyalty of nursing staff toward their hospital **(Hakami, Almutairi, Al Otaibi, Al Otaibi, & Al Battal, 2020)**. Work attractions are strategies for finding and keeping qualified

nurses, especially in regions with high nursing staff turnover. According to nursing staff, the hospital that is dedicated to providing high-quality ongoing training programs, welcoming professionals with thoughtful mentoring, and caring for its nursing staff by encouraging teamwork and work-life balance, as well as preventing burnout syndrome and providing intellectual development motivation, is attractive **(Fernández, Basco, & Raurell, 2025)**. Interest, social, economic, development, and application values are main five dimensions of work attraction. Interest value evaluates nursing staff's openness to working for the hospital that provides an innovative and forward-thinking work environment and produces high quality services. Social value evaluates the desire for a pleasant and enjoyable workplace as well as positive interactions with coworkers and superiors **(Sánchez, Torres, Navarro, & Losada, 2020)**. Economic value evaluates attraction in terms of pay, benefits, prospects for advancement, and work stability. Development value evaluates the attraction of works that offer experience recognition, confidence, and self-worth that can further one's

career. Applications value is related to acceptance, the chance to use and exchange knowledge, and a customer focused and compassionate atmosphere **(Abdallah & Mostafa, 2021)**.

Significance of the study

Nursing staff are looking for jobs at organizations that offer workers job security and appropriate work needs **(Ofre & Andow, 2023)**. The success of every organization depends on job security, which is the guarantee that a person will keep their position without running the risk of losing it. A healthy work environment, job satisfaction, and security are important for attracting and retaining nursing staff in the organization because they affect their motivation and level of production **(Badran & Khaled, 2021)**. Job security is also important for social life since it helps to ensure social wellness and values while reducing nursing staff anxiety about their future at work **(Al-Romeedy & Zaki, 2018)**. In order to attract and retain current nursing staff and reduce their recruitment expenses, job security is very crucial **(Basalamah & As'ad, 2021)**. Therefore, this study aims to assess the relation between job security and job attraction of nursing staff.

Aim of the study

Assess the relation between job security and work attraction of nursing staff.

Research questions:

1-What are the levels of job security and work attraction of nursing staff?

2-What is the relation between job security and work attraction of nursing staff?

Research design:

A descriptive-correlational research design was used in this study.

Study setting:

This study was conducted in Egypt at Tanta International Teaching Hospital, includes inpatient departments namely, Medical, Cardiac and Chest, Orthopedic, Neurological Surgery, Vascular, Dialysis Unit, Pediatric Surgery and Oncology Units.

Subjects:

The subjects of this study included all (N=310) nursing staff working in the previous departments.

Tools of data collection: Two tools were used for data collection:

Tool I: Nursing Staff's Perception regarding Job Security Questionnaire

This tool was modified by the researcher guided by relevant literature (Egcas, 2017; Dhanpat, Manakana, Mbacaza, Mokone,

&Mtongana, 2019) to assess nursing staff perception regarding job security.

It involved two parts as follows:

Part one: Nursing staff's personal and work related data such as department, position, age, marital status, qualification, and years of experience.

Part two: Nursing Staff's Perception regarding Job Security.

This part included 31 items divided into four dimensions as follows, personal security (8 items), workplace security (9 items), economic security (8 items), and professional security (6 items).

Scoring system:

Nursing staff responses were measured on a five points Likert Scale ranging from (1 - 5) as strongly disagree = 1, disagree = 2, neutral = 3, agree = 4 and strongly agree = 5. The total scores are calculated by cut-off points and summing scores of all categories. The total scores represent varying levels as follows:

-High level of job security $\geq 75\%$

-Moderate level of job security $60\% - < 75\%$

-Low level of job security $< 60\%$.

Tool II: Nursing Staff's Perception regarding Work Attraction Questionnaire:

This tool was modified by the researcher guided by relevant literature (**Puri, 2018 & Berman, 2021**) to assess nursing staff perception regarding work attraction. It included 37 items divided into five domains as follow, interest value (7 items), social value (14 items), economic value (5 items), development value (6 items), and application value (5 items).

Scoring system:

Nursing staff responses were measured on a five points Likert Scale ranging from (1 - 5) as strongly disagree = 1, disagree = 2, neutral =3, agree = 4 and strongly agree = 5. The total scores are calculated by cut off points and summing scores of all categories. The total scores represent varying levels as follows:

- High level of work attraction $\geq 75\%$.
- Moderate level of work attraction $60\% - < 75\%$.
- Low level of work attraction $< 60\%$.

Method

-An official permission to conduct the study was obtained from the Dean of Faculty of Nursing Tanta University to the Administrator of Tanta International Teaching Hospital.

-Ethical considerations: Approval from Scientific Research and Ethical

Committee at Faculty of Nursing was obtained (618-4-2025).

-The nature of the study did not cause any harm for the entire sample.

-Assuring the nursing staff about the privacy and confidentiality of the collected data and explain that it was used for the study purpose only.

-Tools of data collection were developed and translated into Arabic language by the researcher based on recent literature review.

-The study tools were presented to a jury of five experts in the area of specialty to check content validity of each tool.

-Necessary modification was done including; clarification, omission of certain items and adding others and simplifying work related words.

-The face validity value of tool (I) was 96.9 % and tool (II) was 97%.

-The suitable statistical test was used to test the tools for its reliability.

-Reliability of tools was tested using Cronbach's Alpha Coefficient test. Reliability of tool (I) was 0.953 and tool (II) was 0.978.

-A pilot study was carried out on a sample (10%) of nursing staff (n= 31) nurses, to check and ensure the clarity of the tools, identify obstacles and problems that may be countered during data collection. The pilot was

excluded from the total study subjects.

-Data collection phase: the data were collected from nursing staff by the researcher. The researcher met the respondents' nursing staff in different areas under study during working hours to distribute the questionnaire. The subjects recorded the answer in the presence of the researcher to ascertain that all questions were answered. The data was collected over period of three months started from 5/8/2025 until 5/11/2025

Statistical analysis of the data:

It 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 used tests were

1-Chi-square test

For categorical variables, to compare between different groups.

2-Student t-test

For normally distributed quantitative variables, to compare between two studied groups.

3-Pearson coefficient

To correlate between two normally distributed quantitative variables.

Results

Table (1): Demonstrates distribution of nursing staff regarding their personal characteristics and work related data (n = 310)

As noticed in this table, about (12.6%) of nursing staff worked in Medical, Cardio and Chest, Orthopedic, Vascular, Dialysis and Oncology departments, while 12.3% of them worked in Neurological surgery and Pediatric surgery departments. Regarding their position, high percentage (69.7%) of them were nurses, while 30.3% of them were head nurses. The age of nursing staff ranged from 20 to 59 years. The majorities (71.9%) of nursing staff were married and 28.1 % of them were not married. Regarding their qualifications, high percentage (42.3%) of them had baccalaureate degree, while only 28.7% had nursing technical diploma, 22.6% had secondary nursing diploma and 6.4 % had post graduated studies. 32.3% of them had less than five years of experience,

while 29% of them had from five to ten years of experience and 38.7% of them had more than 10 years of experience with Mean $\pm$ SD 11.42 ± 9.66 . The majority (84.5%) of nursing staff attended educational program or workshops, while 15.5% of them didn't attend the program or workshops.

Figure (1): Shows Overall levels of nursing staff perception regarding job security

As evident from the figure more than sixty percent (61.3%) of nursing staff had a low level of job security. While 28.1% and 10.6% of them had a moderate and high level of job security, respectively.

Table (2): Presents Levels of nursing staff perception regarding job security dimensions

The table noticed that the highest percent (71.9%, 53.6%, 52.6% & 49.4%) of nursing staff had a low level of all dimensions related to job security.

Figure (2): Illustrates Overall levels of nursing staff perception regarding work attraction

As evident from the figure near to fifty percent (47.7%) of the nursing staff had level of work attraction. While, 31.3% and 21% of them had moderate and high levels of work attraction, respectively.

Table (3): Shows Levels of nursing staff perception regarding work attraction dimensions

The table showed that equal percent (49.4%) of nursing staff had a low level of work attraction related to economic and development value. In addition to more than forty percent (47.4%, 42.9%, & 42.3%) of them had a low level of work attraction related to interest, social, and application value, respectively.

Figure (3): Clarifies Correlation between nursing staff perception of job security and work attraction

As noticed from this figure there is a positive statistically correlations among overall job security and overall work attraction among nursing staff ($p \leq 0.05$, $p < 0.001$).

Table (4): Represents Relation between levels of nursing staff perception regarding job security and their personal characteristics and work related data

This table showed that there wasn't statistically significant relation between nursing staff job security and their personal characteristics except regarding their working department and position at ($p = 0.008^*$) and ($p = 0.047^*$), respectively.

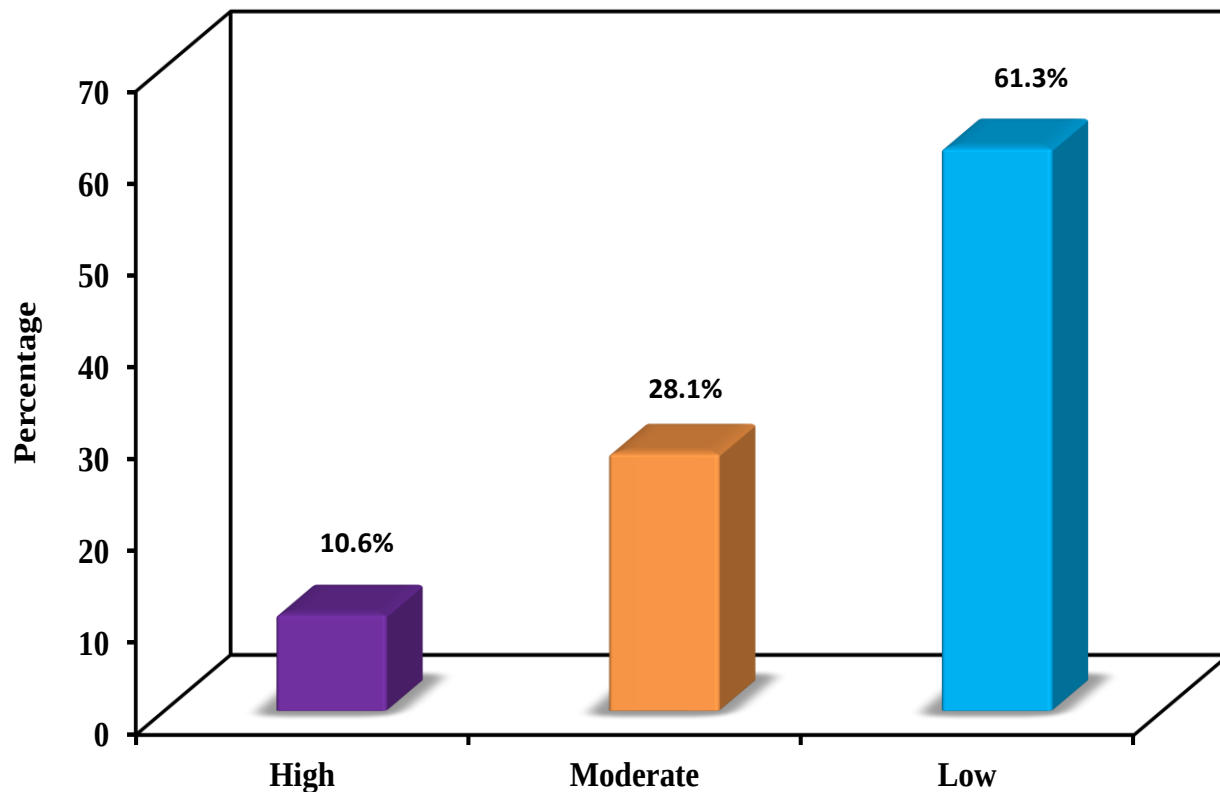
Table (5): Illustrates Relation between levels of nursing staff

work attraction and their Personal characteristics and work related data.

This table showed that there wasn't statistically significant relation between nursing staff work attraction and their personal characteristics except regarding their qualification and attending educational program or workshops at ($p=0.017^*$) and ($p=0.009^*$), respectively.

Table (1): Distribution of nursing staff regarding their personal characteristics and work related data (n = 310)

Nursing staff personal data	No.	%
Department		
Medical	39	12.6
Cardio and chest	39	12.6
Orthopedic	39	12.6
Neurological surgery	38	12.3
Vascular	39	12.6
Dialysis	39	12.6
Pediatric surgery	38	12.3
Oncology	39	12.6
Position		
Head nurse	94	30.3
Nurse	216	69.7
Age (years)		
<30	147	47.4
30 – 40	94	30.3
>40	69	22.3
Min – Max.	20.0 – 59.0	
Mean ± SD.	33.23 ± 8.72	
Marital Status		
Married	223	71.9
Not married	87	28.1
Qualification		
Secondary Nursing Diploma	70	22.6
Nursing Technical Diploma	89	28.7
Baccalaureate Degree	131	42.3
Post graduated studies	20	6.4
Years of Experience		
<5	100	32.3
5 - 10	90	29.0
>10	120	38.7
Min – Max.	1.0 – 42.0	
Mean ± SD.	11.42 ± 9.66	
Attending educational program		
Yes	262	84.5
No	48	15.5



Nursing staff perception regarding job security

Figure (1): Overall levels of nursing staff perception regarding job security

Table (2): Levels of nursing staff perception regarding job security dimensions (n = 310)

Job security dimensions	Levels of nursing staff perception regarding Job Security					
	High		Moderate		Low	
	No.	%	No.	%	No.	%
Personal security	67	21.6	77	24.8	166	53.6
Workplace security	54	17.4	93	30.0	163	52.6
Economic security	37	11.9	50	16.2	223	71.9
Professional security	79	25.4	78	25.2	153	49.4

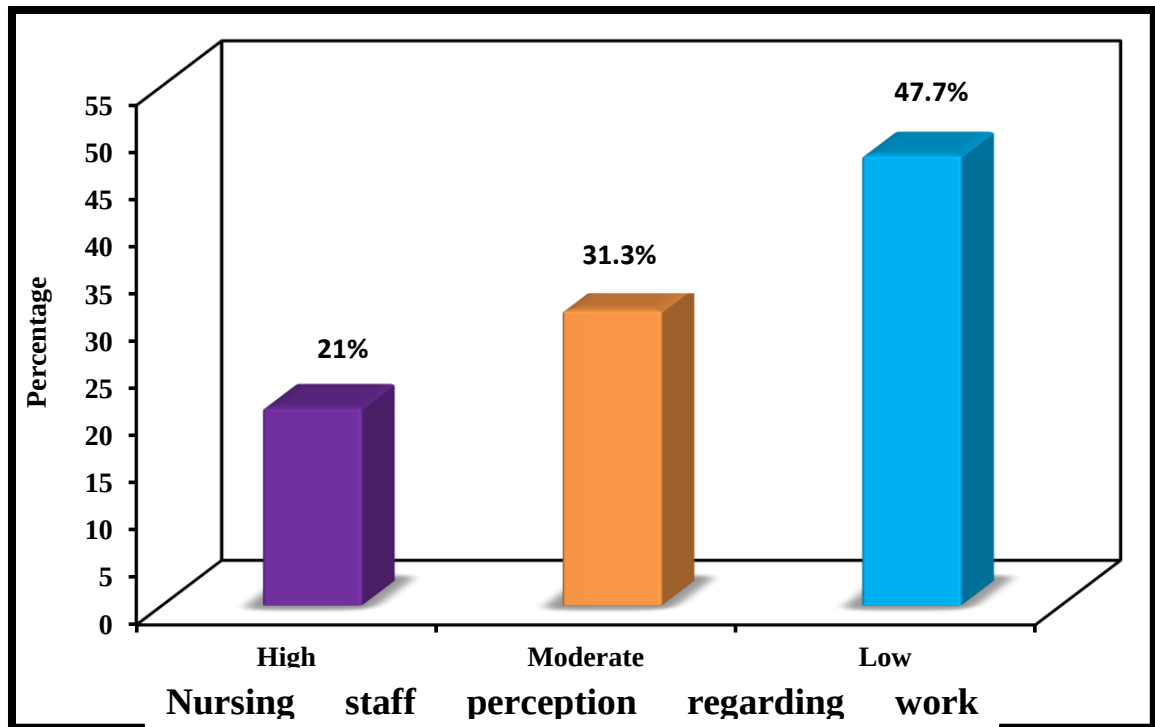


Figure (2): Overall levels of nursing staff perception regarding work attraction (n=310).

Table (3): Levels of nursing staff perception regarding work attraction dimensions (n = 310).

Work attraction dimensions	Levels of nursing staff perception regarding work attraction					
	High		Moderate		Low	
	No.	%	No.	%	No.	%
Interest value	96	31.0	67	21.6	147	47.4
Social value	85	27.4	92	29.7	133	42.9
Economic value	76	24.5	81	26.1	153	49.4
Development value	110	35.4	47	15.2	153	49.4
Application value	113	36.4	66	21.3	131	42.3

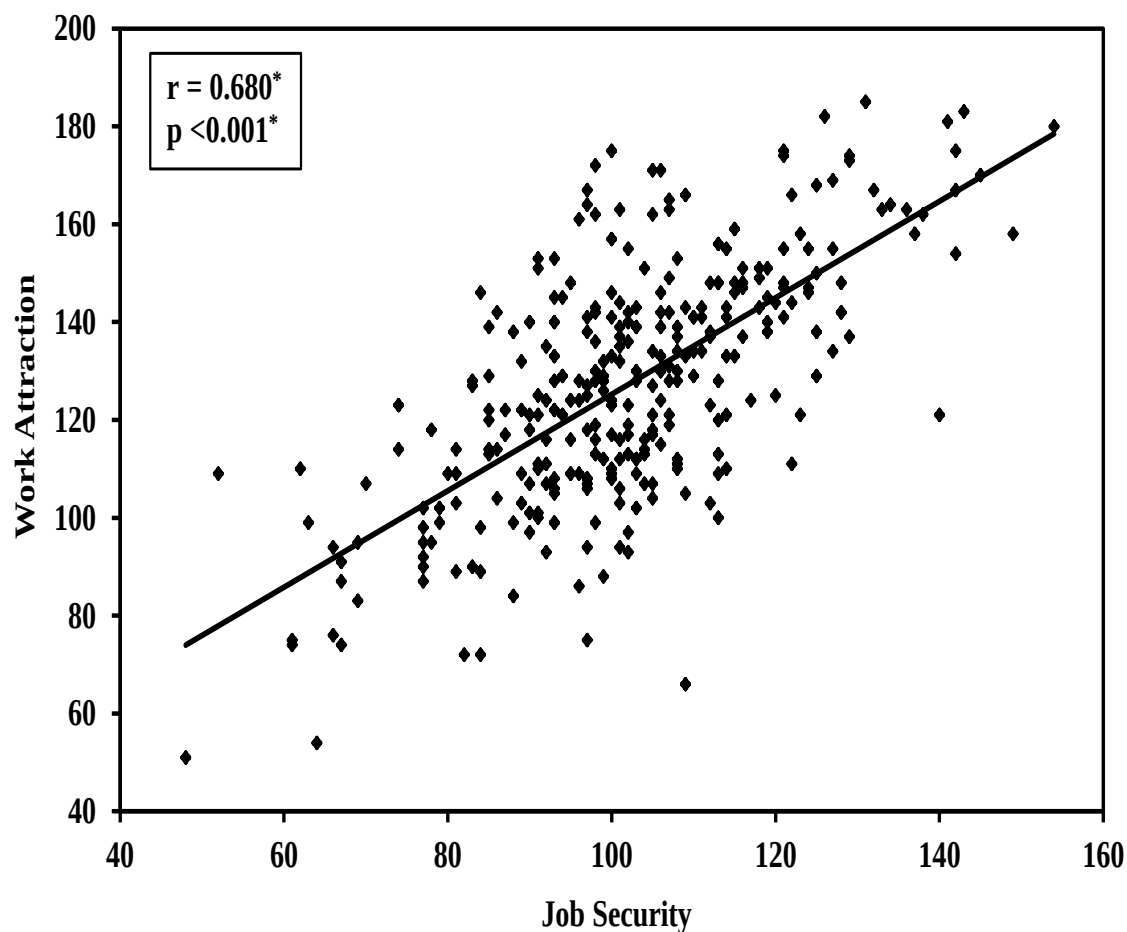


Figure (3): Correlation between nursing staff perception of job security and work attraction (n = 310).

Table (4): Relation between levels of nursing staff perception regarding job security and their personal characteristics and work related data

Personal characteristics and work related data	Levels of Job Security						χ^2	p
	Low (n = 190)		Moderate (n = 87)		High (n = 33)			
	No.	%	No.	%	No.	%		
Department								
Medical	21	11.1	10	11.5	8	24.2	28.404*	^{MC} p=0.008*
Cardio and chest	24	12.6	6	6.9	9	27.3		
Orthopedic	21	11.1	17	19.5	1	3.0		
Neurological surgery	27	14.2	9	10.3	2	6.1		
Vascular	27	14.2	10	11.5	2	6.1		
Dialysis	25	13.2	9	10.3	5	15.2		
Pediatric surgery	28	14.7	8	9.2	2	6.1		
Oncology	17	8.9	18	20.7	4	12.1		
Position								
Head nurse	52	27.4	35	40.2	7	21.2	6.123*	0.047*
Nurse	138	72.6	52	59.8	26	78.8		
Age (years)								
<30	89	46.8	38	43.7	20	60.6	4.379	0.357
30 – 40	62	32.6	26	29.9	6	18.2		
>40	39	20.5	23	26.4	7	21.2		
Marital Status								
Married	134	70.5	67	77.0	22	66.7	1.751	0.417
Not married	56	29.5	20	23.0	11	33.3		
Qualification								
Secondary Nursing Diploma	49	25.8	17	19.5	4	12.1	11.736	0.068
Nursing Technical Diploma	46	24.2	27	31.0	16	48.5		
Baccalaureate Degree	80	42.1	38	43.7	13	39.4		
Post graduated studies	15	7.9	5	5.7	0	0.0		
Years of Experience								
<5	59	31.1	26	29.9	15	45.5	4.730	0.316
5 – 10	59	31.1	22	25.3	9	27.3		
>10	72	37.9	39	44.8	9	27.3		
Attending educational program or workshops								
Yes	159	83.7	75	86.2	28	84.8	0.293	0.864
No	31	16.3	12	13.8	5	15.2		

 χ^2 : Chi square test

MC: Monte Carlo test

p: p value for Relation between **Levels of Job Security** with **Personal and work related data***: Statistically significant at $p \leq 0.05$

Table (5): Relation between levels of nursing staff work attraction and their personal characteristics and work related data

Personal characteristics and work related data	Levels of Work Attraction						χ^2	p
	Low (n = 190)		Moderate (n = 87)		High (n = 33)			
	No.	%	No.	%	No.	%		
Department								
Medical	17	11.5	11	11.3	11	16.9	22.501	0.069
Cardio and chest	12	8.1	12	12.4	15	23.1		
Orthopedic	17	11.5	15	15.5	7	10.8		
Neurological surgery	15	10.1	15	15.5	8	12.3		
Vascular	20	13.5	10	10.3	9	13.8		
Dialysis	21	14.2	10	10.3	8	12.3		
Pediatric surgery	24	16.2	9	9.3	5	7.7		
Oncology	22	14.9	15	15.5	2	3.1		
Position								
Head nurse	44	29.7	29	29.9	21	32.3	0.154	0.926
Nurse	104	70.3	68	70.1	44	67.7		
Age (years)								
<30	74	50.0	44	45.4	29	44.6	5.801	0.215
30 – 40	46	31.1	33	34.0	15	23.1		
>40	28	18.9	20	20.6	21	32.3		
Marital Status								
Married	100	67.6	74	76.3	49	75.4	2.692	0.260
Not married	48	32.4	23	23.7	16	24.6		
Qualification								
Secondary Nursing Diploma	31	20.9	24	24.7	15	23.1	15.475*	0.017*
Nursing Technical Diploma	36	24.3	35	36.1	18	27.7		
Baccalaureate Degree	64	43.2	36	37.1	31	47.7		
Post graduated studies	17	11.5	2	2.1	1	1.5		
Years of Experience								
<5	50	33.8	28	28.9	22	33.8	3.711	0.447
5 – 10	48	32.4	27	27.8	15	23.1		
>10	50	33.8	42	43.3	28	43.1		
Attending educational program								
Yes	117	79.1	83	85.6	62	95.4	9.323*	0.009*
No	31	20.9	14	14.4	3	4.6		

 χ^2 : Chi square test

MC: Monte Carlo test

p: p value for Relation between **Levels of Work Attraction** with **Personal and work related data***: Statistically significant at $p \leq 0.05$

Discussion

Job security plays a significant role in enhancing workplace performance and the production of high-quality services. Through increased nursing staff retention and attraction, investments in hospital specific skills and productivity, and systemic impacts including social unrest, patient confidence, and saving behavior (Oweidat et al., 2025). Any healthcare organization that wants to develop high performing work teams must make sure that nursing staff can assist groups in resolving problems and communicate effectively. Nursing staff's commitment and attraction are positively impacted by staff security and motivation to accomplish work goals and lead the team to success (Mohamed, Mohamed, & Hussein, 2022).

Nursing staff's perception regarding job security

The results of the present study indicated that more than sixty percent of nursing staff had a low level of job security. This means that nursing staff are exposed to job insecurity in their hospitals. This is related to nursing staff not having the freedom to choose their professional duties, lack of attention to nurses' feedback, opinions and

comments. In addition to decrease in recognition for suggestions for the improvement of services. This result was supported by Xiong et al., (2024) who indicated that nursing staff have low perception of overall job security. Also, Abo Salih, El Demerdash, Ahmed, & Mahmoud, (2023) found, almost two thirds of nursing staff members had a low level of overall job security. This outcome could be caused by the nursing staff's supervisors' unfair acts and interactions with staff and some nursing staff stated that the dismissal of doctors and ignoring of department heads negatively affected their sense of job security because it is commonly believed that nursing staff are merely facilitators and lack cognitive abilities. While, the current results contradictory with Fawzy, Hassan, & Mohamed, (2024) who indicated that nursing staff have high level of the overall job security, as nursing staff' capacity for flexibility is a strong force for positive organizational transformation that contributes to conversations about healthcare as a whole for giving healthcare professionals a safe, secure, and healthy workplace that helps the hospital accomplish its goals. Also, Al-Hyari (2023) indicated that nursing staff have a

high level of overall job security, which is related to fairness and trustworthiness, interpersonal focus performance recognition, and reward, monitoring and transformation, and an overall sense of belonging.

Nursing staff's perception regarding work attraction

The results of the present study indicated that nearly half of the nursing staff had a low level of work attraction. This means increasing the nursing staff's desire to leave the hospitals. This lack of work attraction is due to several factors such as: absence of a flexible work schedule, dissatisfaction with the job, and a perception that the work is uninteresting and ineffective communication in the workplace. This result supported by **Salminen Tuomaala, & Herttuala, (2023)** who found that a low levels of work attraction of staff. This finding was consistent with **Ojedoyin & Jegede, (2022)** who indicated that the higher percentage of nursing staff had low levels of work attraction. The present study finding disagreed with **Bashandy, Elshazly, & Ahmed, (2024)** who reported that the highest percentage of the nursing staff had a high level of perception regarding work attraction due to job

contentment, and a more harmonious and satisfying workplace.

Correlation between nursing staff job security and their attraction

The two variables in the current study had very positive statistically correlations between nursing staff perception of overall job security and work attraction. This result could be related to job security act as a significant component of increasing nursing satisfaction, engagement, retention and attraction to work. This finding was agreed with **Bashandy, Elshazly, & Ahmed, (2024)** who mentioned that high work attractiveness among nursing staff is indicative of a positive perception of their workplace, which includes elements like job security, opportunity for professional advancement, and general job happiness. In addition, **Al Doghan & Juhari (2024)** showed that to increase nursing staff attraction and productivity, it is essential to ensure nursing staff security at work.

Relation between nursing staff personal characteristics and work related data and job security

The results of the present study indicated that there wasn't statistically significant relation between nursing staff job security

and their personal characteristics and work related data except regarding their working setting. These findings are consistent with **Al-Harazneh, Al-Oweidat, & Nashwan, (2024)** who showed that sociodemographic traits did not significantly affect job security.

Relation between nursing staff personal characteristics and work related data and work attraction

The results of the current study showed that there wasn't statistically significant relation between nursing staff work attraction and their personal characteristics except regarding their level of education and workshops attendance. This result in line with **Mohamed, Mohamed, & Hussein, (2022)** who demonstrated that there was a very statistically significant positive association between work attraction, and nursing staff level of education.

Conclusion

The present study confirms that about more than sixty of nursing staff at Tanta International Teaching Hospital had a low level of job security and its dimensions. While, more than forty of nursing staff had low level of work attraction and its dimensions. Furthermore, there was a highly statistically significant positive correlation between nursing

staff job security and their work attraction.

Recommendations

For the health care facility's management

-Modify hospital regulations and policies to give nursing staff greater security at work.

-Developing an environment that is empowering and helpful, focuses on autonomy, promotes creativity, and balances staff and hospital goals to enhance work security and attraction.

For nurse manger:

-Enhance collaboration among staff and ethical behavior, which benefits staff security, attraction and engagement.

-Provide constructive criticism, compensation and recognition which motivate nursing staff to perform well, which raises workplace security and attraction.

For nursing Staff:

-Enhance nursing attraction by collaborating on nursing research.

-Boost job security by treating nursing staff like as part from health care organization.

For faculty members:

-During practical training in hospital must train about how deal with colleagues and supervisors with respect, humanity and accountability

for any mistakes under supervision of the leaders.

For future research:

-Study the effect of job security on nursing staff productivity and hospital competitiveness.

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Assessment of Nurses' Performance Regarding Early Rehabilitation of Burned Patients

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Abstract

Background: Early rehabilitation is essential to improve functional outcomes, prevent complications such as contractures and hypertrophic scarring, and enhance the quality of life. Nurses play a pivotal role in implementing early rehabilitation interventions, including positioning, mobilization, scar management, and patient education. **Aim:** to assess nurses' performance regarding early rehabilitation of burned patients. **Study design:** A descriptive research design was utilized. **Study setting:** Burn and plastic surgery unit, Tanta University Hospital. **Study subjects:** 54 nurses who are working at burn unit. **Tools:** Two tools were used. **Tool I:** comprises two parts: **Part One:** Socio -demographic characteristics of the studied nurses, **Part Two:** Nurses' knowledge regarding burn injuries questionnaire to assess nurses' knowledge regarding burn injury and early rehabilitation. **Tool II:** Nurses' Practices Observational Checklists to assess nurses' practices related to application of early rehabilitation management to burned patient. **Results:** More than half of the studied nurses (57.4%) had a high level of knowledge, while about quarter (24.1%) had a moderate level and less than fifth (18.5%) had a low level of knowledge, in addition; (70.4%) of nurses had satisfactory performance regarding anti-contracture positioning, while more than three-quarters of them 77.8% and 76% had satisfactory performance regarding Scar management and Rehabilitation Exercises respectively. **Conclusion:** nurses working in burn units demonstrated an overall satisfactory level of knowledge and practice regarding early rehabilitation of burned patients. **Recommendation:** Continuous supervision and regular evaluation of nurses' performance to ensure adherence to rehabilitation guidelines and ensure adequate resources and rehabilitation equipment.

Keywords: Burned Patients, Early Rehabilitation, Nurses' Performance.

Introduction

Burn injuries remain a major global public health concern due to their high rates of morbidity, mortality, and long-term disability. They may result from thermal, chemical, electrical, or radiation exposure, and their severity depends on burn depth, total body surface area affected, and timeliness of treatment. Globally, burn injuries account for approximately 180,000 deaths annually, with the majority occurring in low- and middle-income countries, highlighting the substantial worldwide burden of this form of trauma. (Williams, Shahrokhis, Johnson, & Nguyen, 2024). Non-fatal burns are also a leading cause of prolonged hospitalization, psychological distress, and long-term functional impairment, necessitating comprehensive rehabilitation strategies (World Health Organization, 2023).

Burns disrupt the protective function of the skin the largest organ responsible for thermoregulation, fluid balance, and defense against infection thereby predisposing patients to complications such as fluid loss, infection, and impaired thermoregulation (Shahrokhi, Brown, Lee, Garica, and Patel, 2023). The severity of tissue damage and resulting complications depend on burn depth, total body surface

area involved, and associated systemic responses. Extensive burns trigger inflammatory cascades that may lead to hypovolemia, metabolic disturbances, and multi-organ dysfunction, further complicating recovery and increasing healthcare demands (World Health Organization, 2023).

Despite advances in acute burn care and improved survival rates, many patients experience long-term physical limitations, scarring, contractures, and psychosocial difficulties. Consequently, rehabilitation has become a critical component of burn management, beginning as early as the patient's stabilization phase. Early rehabilitation interventions including mobilization, range-of-motion exercises, positioning, and patient education have been associated with improved functional outcomes, prevention of joint contractures, and reduced hospital stay (Cartotto, Johnson, Rood, & Lorello, 2024).

Burn rehabilitation requires a multidisciplinary approach involving nurses, physiotherapists, occupational therapists, and mental health professionals. Among these, nurses play a pivotal role due to their continuous patient contact and responsibility for initiating early mobilization, pain management, wound care, and patient education.

However, barriers such inadequate training, heavy workloads, and limited resources may hinder effective implementation of early rehabilitation practices, particularly in acute care settings (**Cartotto et al., 2023**). Therefore, strengthening early rehabilitation practices is essential to reduce long-term disability, improve functional recovery, and enhance the overall quality of life among burn survivors. Investigating current rehabilitation practices and identifying gaps in care delivery may contribute to optimizing multidisciplinary interventions and improving patient outcomes. Evidence indicates that early mobilization and rehabilitation interventions in burn patients are safe and contribute to improved recovery outcomes when initiated promptly after stabilization (**Martinez, & Chen, 2023**).

Significance of the Study

Burn injuries remain a significant cause of long-term disability and impose substantial socioeconomic burdens, including prolonged hospitalization, loss of productivity, and high healthcare costs. Early rehabilitation has been recognized as a critical component of burn care; as it helps prevent complications such as contractures, muscle wasting, and hypertrophic scarring, while promoting functional recovery and improving quality of life. Recent

systematic evidence highlights that early, structured rehabilitation programs delivered by multidisciplinary teams significantly improve functional outcomes among burn survivors (**Asuquo, Ekpo, Ngim, & Agbor, 2022**).

Nurses play a pivotal role in the early rehabilitation of burned patients because they are directly involved in implementing essential interventions such as positioning, early mobilization, range-of-motion exercises, splinting, scar management, and patient education. Clinical practice guidelines emphasize that early mobilization and rehabilitation should begin during the acute phase of burn management and require consistent implementation by nursing staff to ensure optimal outcomes (**Cartotto et al., 2024**). Therefore, nurses' performance in early rehabilitation is a key determinant of recovery and prevention of long-term complications.

Despite the recognized importance of early rehabilitation, available literature indicates limited research specifically examining nurses' knowledge and practices regarding early rehabilitation of burned patients. Recent studies have demonstrated that structured nurse-led rehabilitation programs significantly improve functional outcomes and quality of life among

burn patients, underscoring the need to evaluate nursing performance in this area (**Brusselaers, Monstrey, Vogelaers, Hoste, & Blot, 2020**). Assessing nurses' performance is essential to identify gaps in knowledge and practice and to guide the development of targeted educational interventions.

The findings of the present study are expected to provide evidence for improving nurses' performance in early rehabilitation of burned patients. This may contribute to the development of evidence-based educational programs, enhancement of clinical practice guidelines, and improvement of rehabilitation outcomes. Ultimately, strengthening nurses' performance in early rehabilitation may reduce complications, promote functional recovery, and enhance quality of life among burn survivors (**Martinez, & Chen, 2023**).

Method

Research Design

A descriptive research design was utilized to assess nurses' performance regarding early rehabilitation of burned patients.

Setting

The study was conducted in the burn and plastic surgery unit at Tanta University Hospital.

Subjects

All nurses (n = 54) working in the previously mentioned setting and

providing direct care for burned patients during the study period were included.

Tools for Data Collection

Two tools were developed by the researcher after reviewing relevant literature and constructed in Arabic form.

Tool I: Nurses' Knowledge Structured Questionnaire which comprises two parts

Part I: Socio-demographic characteristics which includes: Code, age, sex, level of education, year of graduation, and years of experience in the burn unit.

Part II: Nurses' knowledge regarding burn injuries

This part was developed by the researcher after reviewing of recent related literatures (**Mohammed et al., (2021) & Cartotto et al., 2024**) to assesses nurses' knowledge related to: Anatomy and physiology of skin, Causes, degrees of burn, and Clinical manifestations of burn and role of nurse in each burn stage in addition to early rehabilitation components, timing, scar management, and Anti-contracture positioning

Scoring System for Knowledge

(1) Score was given for correct

(0) Score was given for incorrect or don't know answer

Total scores are converted into percentages and classified as:
≥ 80% = High level of knowledge.

60 %–< = 80%: Moderate level of knowledge.

< 60% =Low level of knowledge.

Tool II: Nurses' Practice Observational Checklist:

This tool was developed by the researcher after reviewing of recent related literatures (**Mohammed et al., (2021) & Cartotto et al., 2024**) to assess nurses' practice related to early rehabilitation of burned patients, it includes three main parts:

- Anti-contracture positioning: which comprise steps related to contracture prevention positioning according to the site of burn.

- Scar management procedure: which include steps related to applying scar massage, use of pressure garments, and splints.

- Rehabilitation exercises according to burn site: such as stretching exercises, aerobic walk exercises, and muscles strengthening exercises.

Scoring system:

Three point Likert scale was used to evaluate the nurses' practices ranging from 0 to 2, where 0 means that the skill was not performed, 1 means incomplete performance and 2 denote that the step has been done completely.

The total scores of nurses' practice was summed up and then converted to percent which classified as follow:

Unsatisfactory level of practice: = < 75 %.

Satisfactory level: = $\geq$ 75 %.

Method

-Obtaining approval:

Official Permission to carry out the study was obtained from Faculty of Nursing, Tanta University and was submitted to the responsible authorities from burn unit in Tanta university hospital, Egypt.

-Ethical consideration:

The approval of scientific research ethical committee faculty of nursing Tanta university was obtained with a code No: (514/8/2024)

- Nature of the study doesn't cause any harm or pain to the entire subjects

- Written informed consent was obtained from the nurses to participate in the study after explaining the purpose of the study.

- Confidentiality and privacy was assured.

- The nurses were informed that they have the right to refuse participation or withdrawn from the study at any time.

Tools validity:

- The tools of the study was developed by the researcher after reviewing of recent related literatures.

- The content validity of the developed tools was tested for clarity and applicability by five experts in the field of medical

surgical nursing to ensure its validity and minor modifications was done.

Pilot study:

A pilot study was done on 10% of the nurses (6 nurses) to assess the feasibility and applicability of the tools and since minor modifications was done, pilot study samples were included in the study.

Reliability of the tools:

Tool I and II were tested for reliability by using Chronbach alpha test. It was as following; Tool I Part one (Nurses' Socio-demographic data) was scored 0.862 with good reliability, Tool I Part two (Nurses knowledge) was scored 0.915 with excellent reliability; Tool (II) (Nurses Practice) was scored 0.893 with good reliability.

-Data was collected at morning and afternoon shifts from the nurses in the burn unit using tool 1 and tool II

-Duration of data collection was 7 Monthes.

-Tool I was given to all nurses to asses their knowledge while they were observed individually during their working hours to assess their practices using tool II.

Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 27.0. (Armonk, NY: IBM Corp, released 2020) Categorical data were summarized as numbers and percentages. For continuous data, normality was

assessed using the Shapiro-Wilk test for ≤ 50 cases. Significance of the obtained results was judged at the 5% level.

Results:

Table (1): Illustrates the distribution of the studied nurses according to their socio-demographic characteristics. It

was observed that the highest percentage of nurses were aged 21–<30 years, representing 38.9%, followed by those aged 30–<40 years (33.3%), while the lowest proportion were within the age group 40–<50 years (27.8%).

Regarding sex, the majority of the sample were females, accounting for nearly three-quarters (72.2%), whereas males constituted only 27.8%, indicating female predominance in nursing workforce.

Concerning marital status, the distribution was almost equal, with slightly more than half of nurses being single (51.9%) compared to married nurses (48.1%). **As for educational level**, the highest proportion held a Bachelor degree (40.7%), followed by those with a technical institute qualification (38.9%), while the lowest percentage held a diploma degree (20.4%). **Regarding nurses' years of experience** in the burn unit, more than half (57.4%) had less than 10 years of experience, whereas 42.6% had 10 years or more.

Table (2): Demonstrates Nurses' Total Knowledge Scores Regarding Early Rehabilitation of Burn Injuries.

It illustrates that more than half of the study group nurses (57.4%) had a high level of knowledge, while about quarter (24.1%) had a moderate level and less than fifth (18.5%) had a low level of knowledge.

Tool (3): Illustrates total nurses practice level regarding early rehabilitation of burned patients,

it presented that less than three-quarters (70.4%) of nurses had satisfactory performance regarding anti-contraction positioning, while more than three-quarters of them 77.8% and 76% had satisfactory performance regarding Scar management and Rehabilitation Exercises respectively. On the other hand the same table presented that around fourth of the nurses 22.2%, 24% had unsatisfactory level of performance related to; Scar management and Rehabilitation Exercises of burn site respectively. Concerning total overall practice, about three-quarters (74.0%) of nurses demonstrated satisfactory total practice, while around one-quarter (26.0%) had unsatisfactory performance.

Table (4): presented Correlation between Nurses' total knowledge and total Practice level. The findings reveal that 80.6 % of nurses

with satisfactory total practice level have high total knowledge level while near to two third (60%) of nurses with unsatisfactory total practice level have low total knowledge level indicating a positive relationship between total knowledge and total practice scores of nurses with statistically significant difference where $P=0.024$.

Table (5): Demonstrates Correlation between Socio-demographic Characteristics and Knowledge Level of the studied nurses.

It proved that nurses between age group of 30 – < 40, females, married, and who have < 10 years of experience as a nurse in general have the highest level of knowledge with high statistically significant difference since $P= 0.001$ each. Additionally, all nurses (100%) who have low knowledge level were between age group 21 – < 30, females, single, have < 10 years of experience as a nurse in general and who have no previous training of early rehabilitation of burned patient with highly statistically significant differences since $P= 0.001, 0.001, 0.001, 0.006, 0.001, 0.038,$ and 0.034 respectively

Table (6): Shows Correlation between Socio-demographic Characteristics and Total Practice of the studied nurses. It presented that less than fourth and same

percent (21.4%) of the studied nurses who aged 30 – < 40, married, have bachelor degree of nursing and who have ≥ 10 years of experience in burn unit have unsatisfactory practice level with no significant difference while the highest percent of nurses with satisfactory practice level were those who aged 30 – < 40 (37.5%), married (57.5%), female (65%), holding bachelor degree of nursing (47.5%), have < 10 years of experience as a nurse in general (57.5%), have < 10 years of experience in burn unit (80%) and who have no Previous Training of early burn rehabilitation (65%). In addition the only significant differences between nurses' total practice level and their socio-demographic characteristics were found between sex and marital status where $P=0.045$ and 0.020 respectively.

Table (1): Distribution of Nurses' Socio demographic Data

Socio demographic data		N (54)	%
Age	21 – < 30	21	38.9
	30 – < 40	18	33.3
	40 – < 50	15	27.8
Sex	Male	15	27.8
	Female	39	72.2
Marital status	Married	26	48.1
	Single	28	51.9
Education	Diploma degree	11	20.4
	Technical institute	21	38.9
	Bachelor degree	22	40.7
Years of experience in Burn unit	< 10 years	31	57.4
	≥ 10 years	23	42.6
Previous Training on early rehabilitation of burned patient	No	35	64.8
	Yes	19	35.2

Table (2): Nurses' Total Knowledge Scores Regarding Early Rehabilitation of Burn Injuries.

Total Knowledge scores		N (54)	%
Total knowledge	High	31	57.4
	Moderate	13	24.1
	Low	10	18.5

Table (3): Total nurses practice level regarding early rehabilitation of burned patients

Practices level		N (54)	%
Anti-contracture positioning	Unsatisfactory	16	29.6
	Satisfactory	38	70.4
Scar management	Unsatisfactory	12	22.2
	Satisfactory	42	77.8
Rehabilitation Exercises	Unsatisfactory	13	24
	Satisfactory	41	76
Total practice level	Unsatisfactory	14	26
	Satisfactory	40	74

Table (4): Correlation between Nurses' total knowledge and total Practice level

Total practice	Total Knowledge						χ^2	P value
	Low (n=10)		Moderate (n=13)		High (n=31)			
	N	%	N	%	N	%		
Unsatisfactory (n=14)	6	60	2	15.4	6	19.4	7.495	0.024*
Satisfactory (n=40)	4	40	11	84.6	25	80.6		

Table (5): Correlation between nurses' total Knowledge level and their socio-demographic characteristics

Socio-demographic characteristics	Knowledge of study group						χ^2	P value
	Low (n=10)		Moderate (n=13)		High (n=31)			
	N	%	N	%	N	%		
Age								
21 – < 30	10	100	9	69.2	2	6.5	34.499	0.001*
30 – < 40	0	0	2	15.4	16	51.6		
40 – < 50	0	0	2	15.4	13	41.9		
Sex								
Male	0	0	9	69.2	6	16.4	16.077	0.001*
Female	10	100	4	30.8	25	80.6		
Marital status								
Married	0	0	3	23.1	23	74.2	20.982	0.001*
Single	10	100	10	76.9	8	25.8		
Education level								
Diploma degree	5	50	1	7.7	5	16.1	14.380	0.006*
Technical institute	0	0	4	30.8	17	54.8		
Bachelor degree	5	50	8	61.5	9	29		
Years of experience as a nurse in general								
< 10 years	10	100	11	84.6	10	32.3	19.374	0.001*
≥ 10 years	0	0	2	15.4	21	67.7		
Years of experience in burn unit								
< 10 years	10	100	12	92.3	21	67.7	6.547	0.038*
≥ 10 years	0	0	1	7.7	10	32.3		
Previous Training of early burn rehabilitation								
No	10	100	8	53.8	18	58.1	6.734	0.034*
Yes	0	0	6	46.2	13	41.9		

Table (6): Correlation between nurses' total practice level and their socio-demographic characteristics

Socio-demographic characteristics	Total practice of study group				χ^2	P value
	Unsatisfactory (n=14)		Satisfactory (n=40)			
	N	%	N	%		
Age						
21 – < 30	7	50	14	35	1.408	0.495
30 – < 40	3	21.4	15	37.5		
40 – < 50	4	28.6	11	27.5		
Sex						
Male	1	7.1	14	35	4.011	0.045*
Female	13	92.9	26	65		
Marital status						
Married	3	21.4	23	57.5	5.405	0.020*
Single	11	78.6	17	42.5		
Education level						
Diploma degree	5	35.7	6	15	3.992	0.136
Technical institute	6	42.9	15	37.5		
Bachelor degree	3	21.4	19	47.5		
Years of experience as a nurse in general						
< 10 years	8	57.1	28	57.5	0.001	0.981
≥ 10 years	6	42.9	17	42.5		
Years of experience in burn unit						
< 10 years	11	78.6	32	80	0.013	0.909
≥ 10 years	3	21.4	8	20		
Previous Training of early burn rehabilitation						
No	9	64.3	26	65	0.002	0.962
Yes	5	35.7	14	35		

Discussion:

Rehabilitation for burn patients is critical for enhancing recovery, offering benefits such as preventing contractures and joint stiffness, maximizing functional independence, and minimizing psychological distress. Starting rehabilitation early, every so often upon admission improves mobility, accomplishes scar tissue, repairs muscle strength, and significantly increases the overall quality of life and social restoration (Holavanahalli et al., 2020).

Regarding to Socio-demographic Characteristics of the Studied Nurses. As related to age of the studied nurses, the present study revealed that the highest proportion of nurses were aged between 21–<30 years. This may be due to the increasing recruitment of newly graduated nurses in burn units to meet workforce demands and staff shortages. Younger nurses are often more physically capable of managing the intensive workload associated with burn care.

This finding was **consistently with Ahmed et al. (2021)**, who reported that the majority of nurses working in burn and critical care units were younger adults. Similarly, **Mohamed et al. (2022)** found that nurses aged below 30 years constituted the largest percentage of

their study sample .In contrast, this finding was inconsistent with **Kamran et al. (2020)**, who reported that most nurses working in burn units were older and had longer years of experience. This inconsistency may be due to differences in staffing policies, healthcare systems, and employment patterns between countries and different health care settings.

In relation to sex, the present study showed that the majority of nurses were females. This finding may be attributed to the fact that nursing is traditionally a female-dominated profession, particularly in developing countries .This result was consistently with **Carr, Phillips, & Bowling, (2021)**. Who reported female predominance among nurses caring for burn patients. **Likewise, Hassan et al. (2021)** indicated that females represented more than two-thirds of the nursing workforce in burn units. On the other hand, this finding was inconsistent with a study conducted by **Lee et al. (2021)**, who found a nearly equal distribution between male and female nurses. This discrepancy may be due to cultural differences and variations in gender roles within the nursing profession across different regions.

Nurses' Knowledge Regarding Early Rehabilitation of Burned Patients The present study revealed

that more than half of the studied nurses have a high level of knowledge regarding early rehabilitation of burned patients. This may be explained by continuous exposure to burn cases and accumulation of practical experience over time. This finding is consistent with **Gittings et al. (2020)**, who emphasized that nurses working in specialized burn units tend to acquire substantial knowledge related to rehabilitation principles through clinical practice. **Similarly, Smolle et al. (2021)** reported that nurses demonstrated adequate knowledge regarding scar management and long-term burn complications. The findings of the present study revealed that the majority of nurses demonstrated satisfactory knowledge regarding scar management in burn rehabilitation. Most nurses were able to identify the purpose of scar massage, pressure garments, and skin care in preventing hypertrophic scar formation.

This finding is in agreement with **Parry, Lee, Shahrokhi, & Jeschke (2023)** who reported that nurses working in burn units usually demonstrate adequate knowledge regarding scar management due to their direct involvement in wound care and rehabilitation procedures. **Similarly, Esselman (2020)** stated

that scar management techniques such as massage, pressure garments, and moisturizers are essential components of burn rehabilitation that nurses frequently apply in clinical practice.

However, this finding disagrees with **Carr, Phillips, & Bowling (2021)** who found that many nurses had insufficient knowledge regarding advanced scar management techniques among burn patients. This difference may be attributed to variations in training programs, clinical exposure, and availability of rehabilitation protocols in burn units.

Nurses' Practice Regarding Early Rehabilitation of Burned Patients

Regarding nurses' practice, the present study demonstrated that about three quarter of nurses showed satisfactory practice related to early rehabilitation, particularly in scar management and rehabilitation exercises. This may be attributed to the repetitive nature of these practices and their integration into routine nursing care. The findings of the present study revealed that the three-quarters of nurses demonstrated satisfactory practice regarding early rehabilitation of burned patients. This may be attributed to the fact that nurses working in burn units are frequently exposed to burn cases in their daily clinical practice, which enhances

their practical skills through repeated experience. In addition, the presence of clinical guidelines and collaboration with the multidisciplinary team may contribute to improving nurses' performance in burn rehabilitation care.

This result may also be due to continuous interaction with burn patients during routine nursing care, which allows nurses to gain practical experience in applying rehabilitation procedures such as positioning, scar management, and rehabilitation exercises.

This finding was **consistent with Schneider et al. (2020)**, who reported that nurses demonstrated better performance in practical rehabilitation skills compared to theoretical knowledge. Additionally, **Elsherbiny & Ahmed, (2023)**, found that hands-on experience significantly improved nurses' compliance with rehabilitation protocols. However, unsatisfactory practice observed in some aspects of anti-contracture positioning is inconsistent with international rehabilitation guidelines. This inconsistency may be due to heavy workload, shortage of splinting materials, and limited supervision during clinical practice.

The present study revealed a statistically significant positive

relationship between nurses' total knowledge and their total practice regarding early rehabilitation of burned patients. This finding indicates that nurses who possessed higher levels of knowledge demonstrated more satisfactory practices, while those with lower knowledge levels were more likely to show unsatisfactory performance. This result is **consistent with Hassan et al. (2021) and Schneider et al. (2020)**, who reported that adequate theoretical knowledge is a fundamental prerequisite for safe and effective nursing practice in burn rehabilitation. These authors emphasized that understanding the principles of early rehabilitation enhances nurses' ability to apply appropriate positioning, scar management, and rehabilitation exercises accurately.

Similarly, Gittings et al. (2020) highlighted that nurses with sufficient knowledge regarding the timing and components of early rehabilitation were more compliant with evidence-based rehabilitation protocols, leading to improved functional outcomes for burned patients. On the other hand, this finding is **inconsistent with Alqahtani et al. (2021)**, who reported no significant relationship between nurses' knowledge and practice. This inconsistency may be

due to differences in study design, assessment methods, and reliance on self-reported practices rather than direct observational checklists used in the present study.

Relationship between Nurses' Knowledge and Socio-Demographic Characteristics .The present study demonstrated statistically significant relationships between nurses' knowledge level and age, sex, marital status, educational level, years of experience, and previous training related to early burn rehabilitation. Higher knowledge levels were observed among nurses with higher educational qualifications, longer years of experience in burn unit , and those who had received prior training .This finding is **consistently with Smolle et al. (2021)**, who reported that educational background and clinical experience significantly influence nurses' cognitive competence in burn care and rehabilitation.

The present study revealed a statistically significant relationship between nurses' socio-demographic characteristics and their knowledge level regarding early rehabilitation of burned patients. The findings indicated that nurses aged between 30–40 years, females, and married nurses demonstrated higher knowledge levels. This may be

attributed to the fact that nurses within this age group usually have more clinical experience and greater exposure to burn patient care, which enhances their knowledge and professional competence.

This finding is consistent with the study conducted by **Greenhalgh (2019)** and **Esselman (2018)**, who reported that nurses with greater clinical experience and longer years of work tend to demonstrate higher levels of knowledge regarding burn management and rehabilitation. **Similarly, Mohammed et al. (2021)** reported that female nurses represented the majority of the nursing workforce in burn units and often showed higher levels of knowledge due to their frequent involvement in direct patient care.

On the other hand, this finding is inconsistent with the study conducted by **Singh et al. (2019)**, which found no significant relationship between nurses' socio-demographic characteristics and their knowledge level regarding burn management. This discrepancy may be attributed to differences in study settings, sample size, and the availability of training programs for nurses in different healthcare

Additionally, Mohamed et al. (2021) found that nurses who attended training programs showed significantly higher knowledge

scores compared to those who did not. Conversely, the finding that younger and less experienced nurses had lower knowledge levels is **inconsistent with** some studies conducted in developed healthcare systems. This inconsistency may be due to limited access to continuous education, lack of simulation-based training, and insufficient emphasis on rehabilitation concepts during undergraduate nursing education in the current study setting.

Relationship between Nurses' Practice and Socio-Demographic Characteristics Regarding nurses' practice, the present study revealed limited significant associations between practice level and socio-demographic characteristics. Significant differences were observed only in relation to sex and marital status, where female and married nurses have satisfactory practice levels while no statistically significant relationship was found between practice level and age, educational level, years of experience, or previous training. This finding is consistent with **Elsherbiny, & Ahmed, (2023)** who reported that nursing practice in burn units is largely guided by standardized protocols and routine clinical exposure rather than individual demographic characteristics. Nurses often acquire

practical skills through repeated performance and teamwork, regardless of their educational level. However, this result is **inconsistent with Kamran et al. (2020)**, who found that nurses with longer years of experience demonstrated significantly better rehabilitation practices. This inconsistency may be **due to** differences in workload, staffing patterns, and availability of clear rehabilitation guidelines across different healthcare settings.

Finally, the present study confirms that practice appeared to be less affected by these factors and more dependent on routine clinical exposure and protocol-based care. These findings highlight the importance of enhancing nurses' knowledge through continuous education and structured training programs to improve rehabilitation practices and patient outcomes.

Conclusion

Based on the findings of the present study, it can be concluded that: Nurses working in burn units show an overall satisfactory level of knowledge and practice regarding early rehabilitation of burned patients. Overall, the findings emphasize the critical role of nurses in early burn rehabilitation and highlight the importance of continuous education and structured training programs to enhance nurses'

competencies and improve patient outcomes.

Recommendations:

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

Recommendations for Nursing Practice

-Burn units should adopt standardized evidence-based protocols for early rehabilitation of burned patients, with special emphasis on anti-contracture positioning, scar management, and rehabilitation exercises.

-Continuous supervision and regular evaluation of nurses' performance should be implemented to ensure adherence to early rehabilitation

Recommendations for Nursing Education

-Early burn rehabilitation concepts should be integrated more comprehensively into undergraduate and postgraduate nursing curricula.

-Regular in-service training programs, workshops, and hands-on skill sessions should be conducted for nurses working in burn units.

-Educational materials such as booklets, posters, and clinical guidelines should be provided to reinforce nurses' knowledge and skills related to burn rehabilitation.

Recommendations for Nursing Administration

-Hospital administrators should encourage and support nurses' participation in continuous professional development and training programs related to burn care and rehabilitation.

-Periodic assessment of nurses' knowledge and practice should be carried out to identify learning needs and training priorities.

-Establishment of multidisciplinary rehabilitation teams involving nurses, physiotherapists, and occupational therapists is strongly recommended to enhance patient care.

-Adequate resources such as splints, pressure garments, and rehabilitation equipment should be available in burn units.

Recommendations for Future Research

-Further studies are recommended to evaluate the effectiveness of structured educational programs on nurses' knowledge and practice regarding early burn rehabilitation.

-Longitudinal studies should be conducted to assess the impact of improved nursing rehabilitation practices on long-term functional outcomes of burned patients.

-Replication of the current study on larger and more diverse samples is recommended to enhance generalizability of the findings.

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Relation between Entrepreneurial Leadership Style and Green Work Behaviors among Intensive Care Nurses

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Abstract

Background: Cultivating an entrepreneurial leadership is crucial for encouraging green work behaviors, that emphasize resource conservation and eco-friendly behaviors. **Aim of the study:** Assess the relation between entrepreneurial leadership style and green work behaviors among intensive care nurses. **Design:** A descriptive-correlation research design was used. **Setting:** In all intensive care units at Tanta International Teaching Hospital. **Subjects:** All (n=410) intensive care nurses. **Tools:** Two tools for data collection were used, Entrepreneurial leadership style questionnaire, and Green work behaviors questionnaire. **Results:** More than sixty percent (65.9%) of intensive care nurses had low perception level of entrepreneurial leadership style, and more than half (54.9%) of them had a moderate level regarding green work behaviors. **Conclusion:** There was a positive statistically correlation between entrepreneurial leadership style and nurses' green work behaviors. **Recommendations:** Health care management Provide head nurses with training courses, and seminars on the value of entrepreneurial leadership to assist organizations in achieving sustainability objectives. Create specialized plans for intensive care nurses and their leadership to apply strengths based feedback techniques that support green nurse behaviors and organizational sustainability.

Keywords: Entrepreneurial Leadership, Green Work Behavior, and Intensive Care Nurses.

Introduction

Intensive care units are settings characterized by many challenges, of environmental problems and health issues, such as; intensive care units generate more solid wastes and more energy consumption **(Pojiltov & Mainela, 2025)**. Thus nursing leadership is an essential part of healthcare systems, serving as the driving force for enhancing patient care, staff performance, and overall organizational progress **(Duffy, Browne, & Connolly, 2025)**. One contemporary nursing leadership style is entrepreneurial leadership. It's a modern style of leadership that gained more attention with in nursing context **(Badawy, Shaban, Elsayed, & Hashim, 2025)**.

Entrepreneurial leadership plays a very significant function in producing effective decisions in day to day operations inside the practice work environment **(Ansong, Adu, Ansong, & Andoh, 2025)**. It is viewed as entrepreneurial leader ability to imagine and foresee possibilities, preserve flexibility, think strategically, and be eager to engage with others for creating choices that would redesign the organization **(Abd Elhamid, Ahmed, & Elshazly, 2025)**.

A head nurse with entrepreneurial skills can recognize potential chances, gather crucial resources and

management expertise, and take calculated risks to enhance quality care, processes, and services. Thus, they need to acquire specific skills, such as; problem solving, leadership, communication, and decision making abilities to improve and refine these abilities during nursing education through innovative curriculum, as well as the presence of university administration **(Chularee, Tapin, Chainok, & Chiaranai, 2024)**.

Risk-taking, pro-activeness, innovativeness, autonomy, competitive aggressiveness, taking ownership, and self-confidence are main dimensions of entrepreneurial leadership style **(Irawan, Mansor, & Ramlee, 2023)**. Risk-taking, indicates head nurses' ability to become involved uncertainty and assume a load of responsibility for the approaching. Pro-activeness reflects a head nurse's ability to identify the chance and take actions instead of waiting. Innovativeness refers to the capacity of head nurses to offer and execute fresh concepts, tactics and procedures in order to improve nursing services **(Lee, Kim, & Kim, 2025; Rojas-Perez, Martinez, & Lopez, 2024)**.

Autonomy represents the personal achievement of head nurses in moving forward by making independent judgment concerning

care. Competitive aggressiveness refers to the head nurses' behavior characterized by assertive to achieve high quality care and enhance team performance (**Martins, et al., 2025**). Taking ownership refers to head nurses' ability to be counted upon and the preparedness to take responsibility for their choices make (**Wandhe & Deshmukh, 2024**). Self-confidence is the head nurses judgment of their capability to successfully accomplish specific goals, it's how thinking about herself and her abilities (**Abujaber, et al., 2024 & Allobaney, Eshah, Abujaber, & Nashwan, 2022**). Entrepreneurial nurse leaders motivate nurses to participate sustainable and eco-friendly practices, such as; conserving energy. Green development of the health system is a very intricate, interconnected and linked issue. The demand for green healthcare has risen and grown more critical (**Braithwaite et al., 2024**). Therefore, promoting environmentally green behaviors and competencies, improving safety at work and advancing sustainable performance are identified as the primary focus of healthcare organizations in coping with these challenges properly while preserving sustainable development (**Ismail,**

Abu Almakarem, Abd Elsalam, & Mohamed, 2024).

Green nurse behaviors refer to acts of nurses that are consistent with the concepts of ecologically sustainable development (**EL-kafafy, Ibrahim, & Edrees, 2025**). Its dimensions consist of working sustainability, avoiding harm, conserving resources, influencing others, and taking initiative. Working sustainability means the capability of nurses to turn healthcare practices into eco-friendly with providing quality care. Avoiding harm refers to reducing harm to the environment and human health by adopting green work behaviors, such as; reducing medical waste and using eco-friendly devices (**Nyapati, Truijens, van Os, & Baars, 2026**). Conserving resources means protecting both human and non-human resources, in addition to minimizing waste, includes conserving water, energy and other resources within health care institution and teaches patients on protecting supplies. Influencing others refers to persuading and forming decisions of colleagues, patients and society to embrace eco-friendly behaviors. Taking initiative entails acting proactively to enhance organizational sustainability and adopting green work behaviors (**Zhang, Lin, Lai, & Chen, 2026**).

Significance of study

The entrepreneurial leadership style of nurse managers is becoming increasingly crucial in enhancing organizational development, effectiveness and work engagement which they inspire nurses to think creatively in order to grasp the demands of the health care organization (Nguyen, Huynh, Lam, Le, & Nguyen, 2021). Health care sector faces increasing pressure to adopt sustainable practices, the role of intensive care nurses in promoting green work behavior has become crucial (Aboelyazid, Diab, & Elshall, 2024).

According to (Kurniawan, Smith, & Jones, 2022), found that entrepreneurial leaders enhance the commitment of healthcare professionals to green practices and improving environmental outcomes such as; proper waste segregation, which directly contribute to sustainable healthcare environments. So, entrepreneurial leadership style and nurses' green behaviors are very important aspects for any organization to reach the desired objectives and quality of human and work life. Therefore, this study aims to assess the relation between entrepreneurial leadership style and green work behaviors among intensive care nurses.

Aim of the study

This study aims to: Assess the relation between entrepreneurial leadership style and green work behaviors among intensive care nurses.

Research questions:

- 1-What are the levels of entrepreneurial leadership style as perceived by intensive care nurses?
- 2-What are the levels of green work behaviors as perceived by intensive care nurses?
- 3-What is the relation between entrepreneurial leadership style and green work behaviors among intensive care nurses?

Study design:

A descriptive-correlation of research study design was used in this study.

Setting:

This study was conducted in all intensive care units, at Tanta International Teaching Hospital, Egypt, including namely; Internal Medicine, Pediatric, Anesthesia, Cardiothoracic, Intermediate Care Unit, and Neonatal intensive care units.

Subjects:

All (n=410) nurses working in previously mentioned setting, at time of data collection.

Tools of data collection:

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

Tool I: Entrepreneurial Leadership Style Structured Questionnaire

This tool was modified by the researcher based on **Ahmed, El-Demerdash, & Shokeer, (2022); Bagheri, & Harrison, (2020) & Herron, & Herron, (2018)** to assess intensive care nurses' perception about entrepreneurial leadership style. It consisted of two parts as the following:

Part (1): Nurses' personal and work related data, included; age, gender, unit, marital status, qualification, years of experience, and if there's management support.

Part (2): Entrepreneurial Leadership Style Questionnaire:

This part included 52 items divided into seven dimensions as follows, risk-taking (8 items), pro-activeness (10 items), innovativeness (10 items), autonomy (7 items), competitive aggressiveness (5 items), taking ownership (5 items), and self-confidence (7 items).

Scoring system: Nurses responses were measured on a five points Likert Scale ranging from (1- 5) as strongly disagree = 1, disagree = 2, neutral =3, agree = 4 and strongly agree =5. The total scores were calculated by statistical cut-off points and summing scores of all categories. The total scores represent varying levels as follows: -High

level of entrepreneurial leadership style $\geq 75\%$, - Moderate level of entrepreneurial leadership style 60% - < 75% , -Low level of entrepreneurial leadership style < 60%.

Tool II: Green Work Behaviors Structured Questionnaire:

This tool was developed by the researcher guided by **EL-kafafy, Ibrahim, & Edrees, (2025); Norton, Parker, Zacher, & Ashkanasy, (2015) & McConnaughy's, (2014)** to assess green work behaviors of nurses. It included 22 items divided into five dimensions as follows, working sustainability (4 items), avoiding harm (4 items), conserving resources (7 items), influencing others (3 items) , and taking initiative (4 items).

Scoring system:

Nurses responses were measured on a five points Likert Scale ranging from (1 - 5) as 1= Never, 2 = Seldom, 3= Sometimes, 4= Often, and 5= Always. The total scores were calculated by statistical cut-off points and summing scores of all categories. The total scores Represent varying levels as follows: -High level of green work behaviors $\geq 75\%$, -Moderate level of green work behaviors 60% - <75%.-Low level of green work behaviors: < 60%.

Method

Official permission was obtained from the Dean of Faculty of Nursing to the authoritative personnel of all intensive care units at Tanta International Teaching Hospital.

Ethical considerations:

- Approval from Scientific Research and Ethical Committee at Faculty of Nursing was obtained code no. (617-4-2025).
- The researcher introduced her-self 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.
- The nature of the study did not cause any harm for the entire sample.
- Assuring the nurses about the privacy and confidentiality of the collected data and explain that it was used for the study purpose only.
- Tools of data was developed and translated into Arabic by the researcher based on recent literature review.
- The study tools were presented to a jury of five expertises in the area of specialty to check content validity of each tool.
- Necessary modification were done including; clarification, omission of certain items and adding others and simplifying work related words. The face validity value of tool (I) was 97.42% and tool (II) was 97.37%.

- The suitable statistical test was used to test the tools for its reliability. Reliability of tools was tested using Cronbach's Alpha Coefficient test. Reliability of tool (I) was 0.960 and tool (II) was 0.826.

A pilot study was carried out on a sample (10%) of nurses (n= 41) intensive care nurses, to check and ensure the clarity of the tools, identify obstacles and problems that may be encountered during data collection. The pilot was excluded from the total study subjects.

Data collection phase: the data were collected from nurses by the researcher. The researcher met the respondents' nurses in different areas under study during working hours and distributed the questionnaire. The subjects recorded the answer in the presence of the researcher to ascertain that all questions were answered. The data was collected at period of three months started from 5/8/2025 until 5/11/2026.

Statistical analysis of the data

The statistical analysis of the data was performed using IBM SPSS software version 27.0 (Armonk, NY: IBM Corp, released 2020). 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 used tests were

1. Chi-square test for categorical variables, to compare between different groups.

2. F for one way (ANOVA) for normally distributed quantitative variables, to compare between more than two groups.

Results

Table (1): Demonstrates distribution of personal characteristics and work related data of intensive care nurses (n=410).

As noticed in this table, the age of more than seventy percent of intensive care nurses (72%) was from 25 to less than 35 years old, and ranged from 22:43 years less than 25 years old was 19.5%, and from 35 years old and more was 8.5% with mean $\pm$ SD. 5.43 ± 4.16 . The majority (82.4%) of them was females, and 17.6% were males. About 16.8% of them worked in Cardiothoracic and Intermediate Care Units, while 16.6% of them worked in Internal Medicine, Pediatric, Anesthesia, and Neonatal intensive care units. The majority (93.7 %) of them were married, and 6.3% of them were not married. Regarding their qualifications; more

than sixty percent of ICU nurses (60.2%) had baccalaureate degree, and 31% of them had associated nursing degree, while 8.8% of them had post graduated studies. Regarding to their years of experiences with mean $\pm$ SD. 5.43 ± 4.16 . More than half of intensive care nurses (53.4%) have less than 5 years of experience, 36.6% of them have from 5 to 10 years of experience, and 10% of them have more than 10 years of experience. More than sixty percent (63.4%) of them feeling management support from their supervisor, while 36.6% hadn't. High percent (77.1%) of them had training programs about waste management, while 16.9% had training program about eco-friendly behavior, and 6% had green team to promote and monitor eco-friendly practices.

Figure (1): Shows Levels of intensive care nurses perception regarding entrepreneurial leadership style.

As evident from the figure more than sixty percent (65.9%) of intensive care nurses had a low level of perception regarding entrepreneurial leadership style. While 26.8%, and 7.35% of them had a moderate, and high perception level of entrepreneurial leadership style, respectively.

Table (2): Clarifies Levels of intensive care nurses perception regarding entrepreneurial leadership style dimensions (n = 410)

The table noticed that the highest percent more than sixty percent (67.6%, 63.7%, and 62.2%) of intensive care nurses had a low perception level of entrepreneurial leadership style dimensions related to innovativeness, risk-taking, and pro-activeness, respectively.

Table (3): Represents Mean scores and ranking of intensive care nurses perception regarding entrepreneurial leadership style dimensions (n=410).

This table clarified the ranking of overall average mean scores and ranking of nurses' perceptions of entrepreneurial leadership style dimensions. It is noticed that the dimension of taking ownership with mean scores percent $\pm$ SD 61.12 $\pm$ 18.28 had the highest mean score, followed by autonomy with mean scores percent $\pm$ SD 59.92 $\pm$ 16.07, then self-confidence with mean scores percent $\pm$ SD 58.74 $\pm$ 19.64, followed by risk-taking with mean scores percent $\pm$ SD 56.93 $\pm$ 14.37, then pro-activeness with mean scores percent $\pm$ SD 54.62 $\pm$ 14.43, then, competitive aggressiveness with mean scores percent $\pm$ SD 54.39 $\pm$ 18.03. Finally,

innovativeness had the least mean scores percent $\pm$ SD 51.40 $\pm$ 15.25.

Figure (2): Illustrates Levels of intensive care nurses green work behaviors

As evident from the figure more than fifty percent (54.9%) of intensive care nurses had a moderate level of green work behaviors. While, 25.4%, and 19.8% of them had low and high levels of green work behaviors, respectively.

Table (4): Shows Levels of intensive care nurses green work behaviors dimensions (n = 410).

The table shows that, the majority more than sixty percent (64.1%) of them had a high level of conserving resources, while, 58.5%, 55.6%, and 46.6% of them had a low level of avoiding harm, influencing others, and taking initiatives, respectively.

Table (5): Donates Mean scores of intensive care nurses green work behaviors dimensions (n = 410).

The table shows that the highest mean scores percent of intensive care nurses perception of green work behaviors was for conserving resources with mean score percent $\pm$ SD 75.21 $\pm$ 11.12, followed by mean scores percent was for working sustainability with mean scores percent $\pm$ SD 67.23 $\pm$ 13.81, then mean scores percent was for taking initiatives with mean scores percent $\pm$ SD 61.33 $\pm$ 19.74, then influencing

others with mean scores percent $\pm$ SD 60.04 $\pm$ 20.42. Finally, avoiding harm had the least mean scores percent $\pm$ SD 56.60 $\pm$ 16.57.

Figure (3): Correlation between entrepreneurial leadership style and green work behaviors

As noticed from this figure, there was a positive statistically significant correlation between intensive care nurses' perceptions of entrepreneurial leadership style and their initial green work behavior, where $r = 0.187$ and $p < 0.001$.

Table (1): Distribution of personal characteristics and work related data of intensive care nurses (n = 410)

Intensive care nurses personal characteristics and work related data	No.	%
Age (years)		
<25	80	19.5
25 – <35	295	72.0
≥35	35	8.5
Min – Max.	22.0 – 43.0	
Mean ± SD.	27.63 ± 3.98	
Gender		
Male	72	17.6
Female	338	82.4
Unit of work		
Internal Medicine ICU	68	16.6
Pediatric ICU	68	16.6
Anesthesia ICU	68	16.6
Cardiothoracic ICU	69	16.8
Intermediate Care Unit ICU	69	16.8
Neonatal ICU	68	16.6
Marital Status		
Married	384	93.7
Un married	26	6.3
Qualifications		
Associated Degree in nursing	127	31.0
Baccalaureate degree in nursing	247	60.2
Post-graduate studies	36	8.8
Years of experience		
<5	219	53.4
5 – 10	150	36.6
>10	41	10.0
Min – Max.	1.0 – 22.0	
Mean ± SD.	5.43 ± 4.16	
Is there a management support from your direct supervisor?		
Yes	260	63.4
No	150	36.6
If the answer is yes, what type of support?		
Implementing training about waste management.	296	77.1
Provide training and education about eco-friendly practices.	65	16.9
Establish green team to promote and monitor eco-friendly practices.	23	6.0
Other types, please explain.	0	0.0

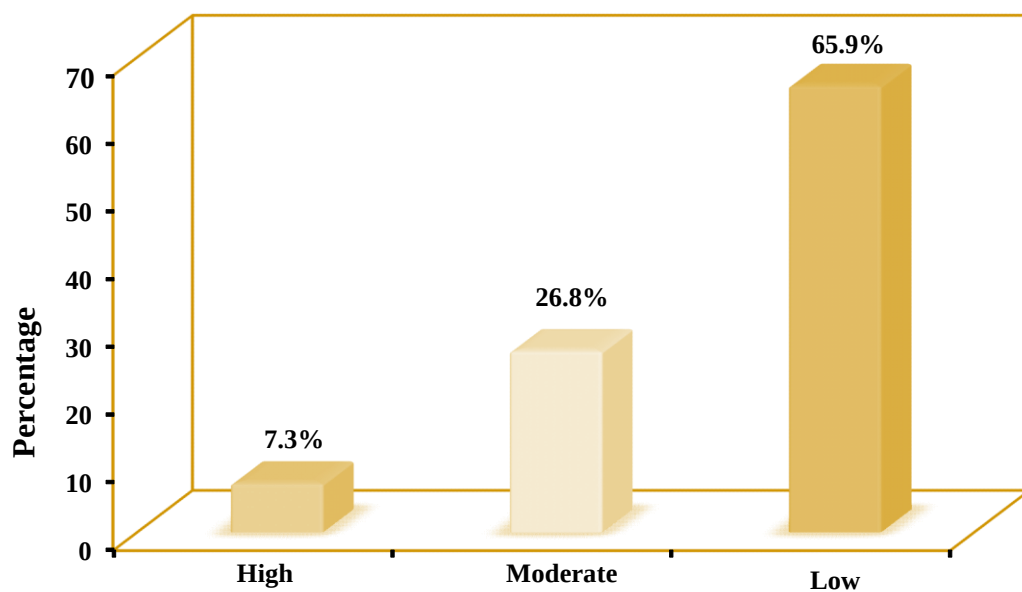


Figure (1): Levels of intensive care nurses perception regarding entrepreneurial leadership style.

Table (2): Levels of intensive care nurses perception regarding entrepreneurial Leadership style dimensions (n= 410)

Entrepreneurial leadership dimensions	Levels of intensive care nurses perception regarding entrepreneurial Leadership style dimensions					
	High		Moderate		Low	
	No.	%	No.	%	No.	%
Risk-taking	53	12.9	96	23.4	261	63.7
Pro-activeness	37	9.0	118	28.8	255	62.2
Innovativeness	31	7.5	102	24.9	277	67.6
Autonomy	85	20.7	133	32.5	192	46.8
Competitive aggressiveness	65	15.9	108	26.3	237	57.8
Taking ownership	108	26.4	133	32.4	169	41.2
Self-confidence	96	23.4	119	29.0	195	47.6

Table (3): Mean scores of intensive care nurses perception regarding entrepreneurial leadership style dimensions (n = 410)

Entrepreneurial leadership style dimensions	Score Range	Total Score		Average Score (1 – 5)	Percent Score	Rank
		Min. – Max.	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	
Risk-taking	(8 – 40)	14.0 – 40.0	26.22 $\pm$ 4.60	3.28 $\pm$ 0.57	56.93 $\pm$ 14.37	4
Pro-activeness	(10 – 50)	10.0 – 50.0	31.85 $\pm$ 5.77	3.18 $\pm$ 0.58	54.62 $\pm$ 14.43	5
Innovativeness	(10 – 50)	10.0 – 45.0	30.56 $\pm$ 6.10	3.06 $\pm$ 0.61	51.40 $\pm$ 15.25	7
Autonomy	(7 – 35)	9.0 – 35.0	23.78 $\pm$ 4.50	3.40 $\pm$ 0.64	59.92 $\pm$ 16.07	2
Competitive aggressiveness	(5 – 25)	7.0 – 25.0	15.88 $\pm$ 3.61	3.18 $\pm$ 0.72	54.39 $\pm$ 18.03	6
Taking ownership	(5 – 25)	5.0 – 25.0	17.22 $\pm$ 3.66	3.44 $\pm$ 0.73	61.12 $\pm$ 18.28	1
Self-confidence	(7 – 35)	9.0 – 35.0	23.45 $\pm$ 5.50	3.35 $\pm$ 0.79	58.74 $\pm$ 19.64	3
Overall	(52–260)	75.0 – 242.0	169.0 $\pm$ 25.67	3.25 $\pm$ 0.49	56.23 $\pm$ 12.34	

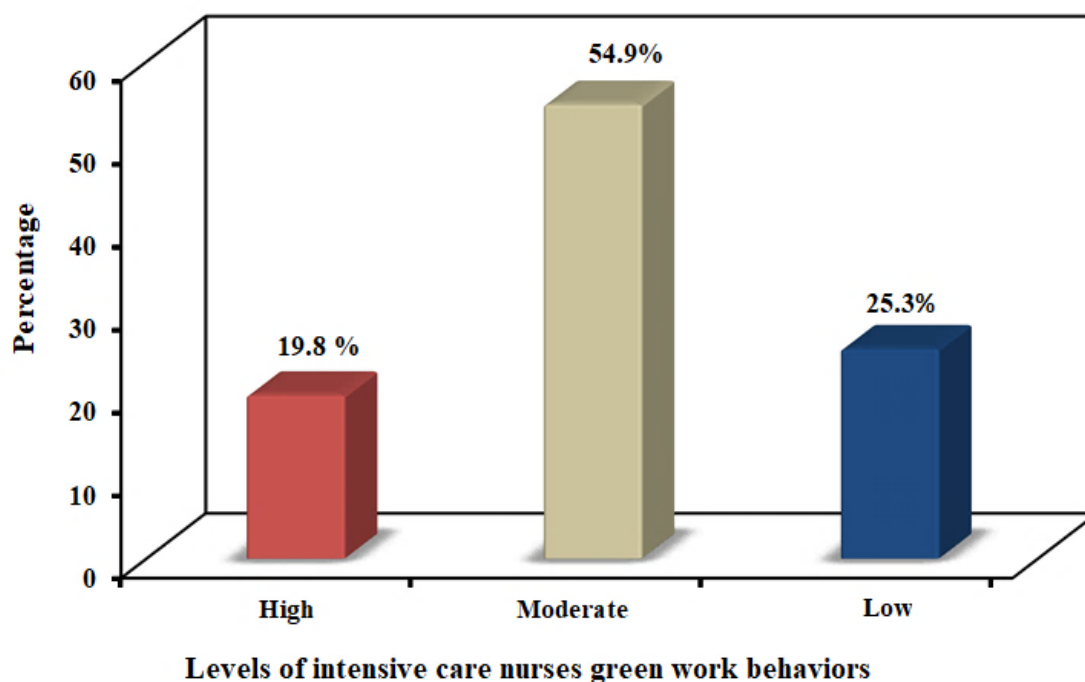


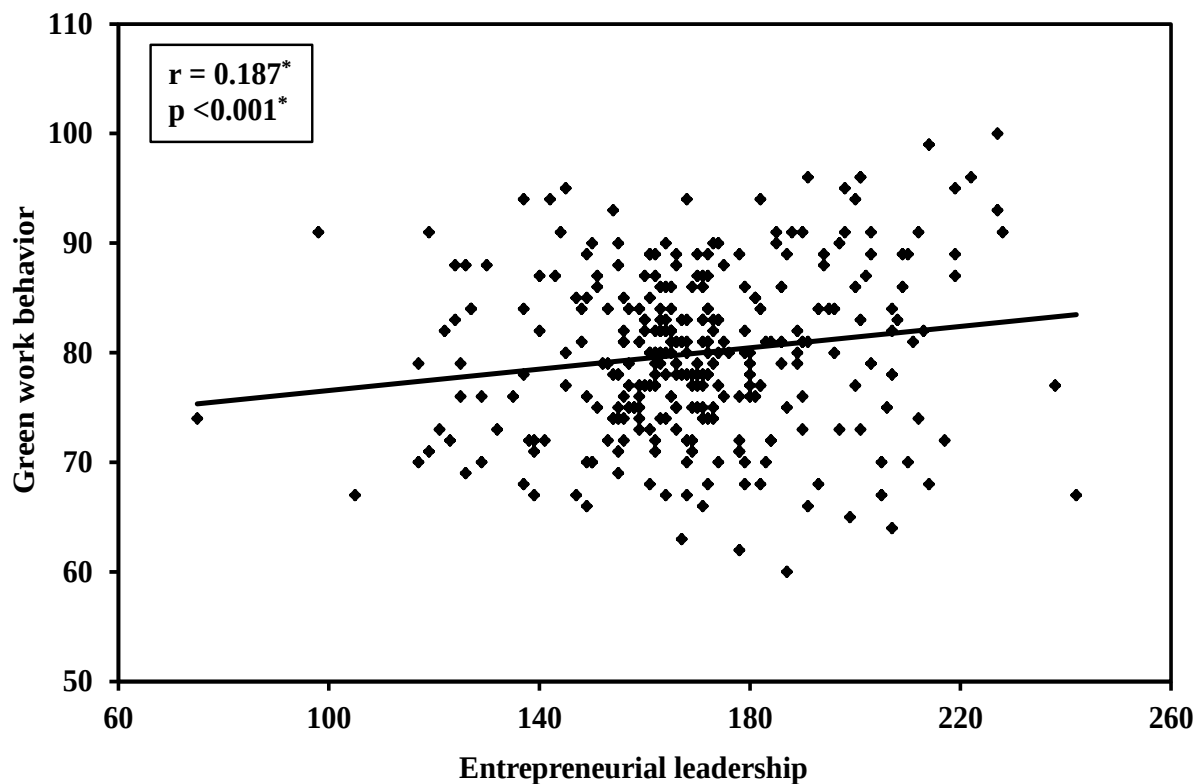
Figure (2): Levels of intensive care nurses green work behavior

Table (4): Levels of intensive care nurses green work behaviors dimensions

Green work behaviors dimensions	Levels of intensive care nurses green work behaviors					
	High		Moderate		Low	
	No.	%	No.	%	No.	%
Working sustainability	153	37.3	158	38.5	99	24.2
Avoiding harm	83	20.2	87	21.3	240	58.5
Conserving resources	263	64.1	103	25.2	44	10.7
Influencing others	127	31.0	55	13.4	228	55.6
Taking initiative	142	34.6	77	18.8	191	46.6

Table (5): Mean scores of intensive care nurses green work behaviors dimensions (n = 410)

Green work behaviors dimensions	Score Range	Total Score		Average Score (1 – 5)	Percent Score	Rank
		Min. – Max.	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	
Working sustainability	(4 – 20)	7.0 – 19.0	14.76 $\pm$ 2.21	3.69 $\pm$ 0.55	67.23 $\pm$ 13.81	2
Avoiding harm	(4 – 20)	7.0 – 19.0	13.06 $\pm$ 2.65	3.26 $\pm$ 0.66	56.60 $\pm$ 16.57	5
Conserving resources	(7 – 35)	20.0 – 35.0	28.06 $\pm$ 3.11	4.01 $\pm$ 0.44	75.21 $\pm$ 11.12	1
Influencing others	(3 – 15)	3.0 – 15.0	10.20 $\pm$ 2.45	3.40 $\pm$ 0.82	60.04 $\pm$ 20.42	4
Taking initiative	(4 – 20)	5.0 – 20.0	13.81 $\pm$ 3.16	3.45 $\pm$ 0.79	61.33 $\pm$ 19.74	3
Overall	(22 – 110)	60.0 – 100.0	79.89 $\pm$ 8.0	3.63 $\pm$ 0.36	65.78 $\pm$ 9.09	

**Figure (3): Correlation between entrepreneurial leadership style and green work behaviors**

Discussion

The healthcare sector is a major source of environmental contamination (AlKetbi & Rice, 2026). So it is challenging for head nurses to uphold eco-friendly, sustainable, and green work behaviors in an extremely complicated and intricate healthcare environment. In this context, the role of head nurses as entrepreneurial leadership is vital in promoting green and sustainable work behaviors (Neck, Neck, & Murray, 2025). As they are in a good position to think about new projects, technological advancements, and methods of working and thinking that will benefit the healthcare system (Thepna, Cochrane, & Salmon, 2023).

Part (I): Intensive care nurses' perception regarding entrepreneurial leadership style,

The results of the present study indicated that less than two-thirds of intensive care nurses perceive their entrepreneurial leadership at low level. These results may be explained by the fact that intensive care nurses are less familiar with the entrepreneurial leadership style, which is an innovative concept. Also, Clinical practices focus on old curriculum with traditional mentalities instead of learning

leadership skills. Additionally, unstable working environment, and lack of organizational support, and head nurses achieve tasks with restricted policies. Also, increasing work, and cognitive load on head nurses, makes them prefer to apply routine rather than applying entrepreneurial skills, such as creativity, risk taking, and innovativeness.

These findings are consistent with a study conducted by Mohamed, (2024); Borimnejad, Mardani-Hamooleh, & Khachian, (2023), found that most head nurses had low level toward entrepreneurial skills and abilities, due to traditional nature of nursing education, that concerned deeply on clinical experience rather than skills. On the other hand, Aboelyazid, Diab, & Elshall, (2024), showed that over half of the nurses in the study had a high perception level of their head nurses' entrepreneurial leadership.

Part (II): Intensive care nurses' Perception of green work behavior

The findings of the current study revealed that more than half of intensive care nurses had a moderate level of green work behaviors. These findings can be explained by nurses' sense of responsibility towards their work, and environment. Furthermore, a

key factor in influencing green work behaviors is management support. Nurses may view green work behaviors as optional rather than necessary if they are not explicitly implemented in organization policy or training programs.

The results of this study were consistent with those of **EL-kafafy, Ibrahim, & Edrees, (2025); Anwar, Jati, Yuliana, Ramdani, & Alpriansah, (2024)**, found that half of nurses had a moderate level of green work behaviors. In contrast with the current study's results, **El-sawah & Elkholy, (2024)**, found that a high degree of organizational sustainability was marginally correlated with nurses' overall perceptions of green work behaviors. Also, **Leppänen, Kvist, McDermottLevy, & Kankkunen, (2022)**, found that the dimension of sustainable development was poorly perceived among nurses and nurse managers.

Regarding Correlation between entrepreneurial leadership style and green work behavior

The current study had a positive statistically correlations between intensive care nurses' perception of entrepreneurial leadership style and their green work behaviors. From the researcher point of view that the empowering and encouraging

aspects of an entrepreneurial leadership style may be responsible for this outcome. Pro-activeness, initiative, autonomy, and risk taking are all encouraged by entrepreneurial leaders, and these traits make nurses more willing to adopt green work behaviors. Creating an environment where all nurses feel appreciated, respected, and included is another aspect of entrepreneurial leadership. This feeling of empowerment may increase nurses' motivation to make constructive contributions to maintain their workplace. An entrepreneurial leadership style among nurse leaders may result in increased job satisfaction, empowerment, engagement, and alignment with organizational values all of which can motivate nurses to embrace green work behaviors.

This finding is consistent with research by **Ahmad (2025)**, founded a highly statistically significant positive strong correlation between entrepreneurial leadership and working sustainability which is one dimension of green work behaviors, that entrepreneurial leaders provide sustainable resources and makes it easier for nurses to apply green behaviors in daily routine. In accordance with current finding,

Ageli, Alzubi, Aljuhmani, & Iyiola, (2025), found a highly statistically significant positive strong correlation between entrepreneurial leadership and creativity which is one dimension of green work behaviors, that entrepreneurial leaders create an environment that nurses feel safe, and valued to suggest new ideas.

As well as, **Aboelyazid, Diab, & Elshall, (2024),** demonstrated that there was a highly statistically significant positive strong correlation between total score of entrepreneurial leadership and total score of innovative work behavior among studied nurses.

Recommendations

Based on the findings of the current study, the following recommendations can be suggested:

For the health care facility's management:

- Raise head nurses' perceptions of entrepreneurial leadership through regular scientific congresses and seminars.

- Establish a supportive environment that stimulates creative ideation to promote self-confidence and pro-active risk-taking among head nurses.

For head nurses:

- Participate in additional training programs and workshops on entrepreneurial leadership style.

- Encourage tight mentorship programs for nurses' performance and behaviors, to support learning, foster professional development, and improve the caliber of nursing practices.

For ICU nurses:

- Inform management about the obstacles to integrating work behaviors at their place of employment.

- Follow the hospital's new policies that minimize adverse environmental effects.

For nursing education:

- Include green work behaviors and sustainable development in undergraduate and post graduate nursing curricula.

For further research:

- Conduct a longitudinal research study to examine how entrepreneurial leadership style and nurses' green behaviors effect on patient outcomes.

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Nurses' Readiness for Advanced Mobile Utilization in Relation to Nurses-Physicians Collaboration

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Abstract:

Background: Utilization of smart phones have become increasingly important in healthcare settings, offering opportunities to facilitate nurse-physician collaboration, timely sharing of patient information and enhanced clinical decision-making. **Aim:** Assess nurses' readiness for advanced mobile utilization in relation to nurses-physicians collaboration in Tanta Emergency Hospital and Hosh Issa Hospital. **Research design:** A descriptive-comparative design was used to carry out this study. **Setting:** The study was conducted at Tanta Emergency Hospital and Hosh Issa Hospital. **Subjects:** The study subjects consisted of all available nurses (n=638). **Tools:** Two tools were used: **Tool (I)** nurses' readiness for advanced mobile devices utilization questionnaire. **Tool (II)** nurse-physician collaboration questionnaire. **Results:** 82.7% of nurses at Tanta Emergency Hospital and 73.7% of nurses at Hosh Issa Hospital had a high level of total readiness for advanced mobile devices utilization. 95.6% of nurses at Tanta Emergency Hospital and 91.9% of nurses at Hosh Issa Hospital had a high level of total nurse-physician collaboration. **Conclusion:** There was a statistically significant positive correlation between nurses' readiness for advanced mobile device utilization and nurse-physician collaboration at Tanta Emergency hospital and at Hosh-Issa hospital. **Recommendation:** Establish protocols for secure and appropriate use of mobile devices in nursing care, develop proper infrastructure required for advanced mobile device utilization, conduct training sessions and workshops for nurses about advanced mobile utilization

Key words: Advanced mobile utilization, Collaboration, Nurses and physician, Readiness.

Introduction

Mobile technology has become increasingly common in recent years with its booming development across the globe, leading to the gradual adoption of mobile health. Advanced mobile devices utilization, also known as mobile health, it can be defined as the use of mobile wireless technologies for healthcare services, the use of mobile computing, medical sensors, and communication technologies for healthcare. Also it can be defined as a medical and public health practice supported by mobile devices such as mobile phones, personal digital assistants, wireless devices and patient monitoring devices. Advanced mobile devices have demonstrated improvement in patient-reported outcome measures, reduced use of health resources and improvement in the quality of patient care **(Jacob, Sanchez-Vazquez & Ivory, 2020)**.

Nurses use advanced mobile devices in order to monitor patients' health status, reduce medical errors, increase patient safety while prescribing medication, review vital signs of patients, help the patients to keep track of their health, and plan for patient care. Use of mobile health (m-health) makes the

information available to nurses for clinical practice, education, and research and facilitates the role of nurses as communicators **(Ashawan and Sagar, 2020)**. It includes six dimensions: technology readiness, technical skills, access to information, usefulness from using an advanced mobile device, motivation toward using an advanced mobile device, and attitude toward an advanced mobile device **(Rashed et al., 2017)**.

First; nurses' readiness toward advanced mobile device utilization refers to the extent to which nurses are prepared to effectively adopt and use advanced mobile technologies in clinical practice. Also, it is a crucial prerequisite for successful implementation of mobile health programs **(Tummalapalli et al., 2024)**. Second, technical skills for nurses to use advanced mobile device are the specialized knowledge and expertise nurses require to perform specific tasks it involves nurses' knowledge of advanced software programs, programming languages, and complex computer systems **(Maghsoudi, 2024)**. Third; access to information on advanced mobile devices refers to the ability of nurses to obtain, retrieve, or utilize data and knowledge about

mobile technology. Nurses use a variety of applications for drug reference, medical calculations and clinical guidelines (**O'connor and Andrews 2018**).

Fourth, usefulness of advanced mobile devices refers to the ability of nurses to improve patient care, enhance efficiency and support healthcare professionals through innovative technology (**Gonçalves-Bradley et al., 2020**). Fifth, motivation toward advanced mobile devices utilization refers to the reasons or driving forces that influence nurse's decision to adopt and regularly use these devices. It involves the desires, needs or goals that users aim to fulfill, such as staying connected, accessing information or benefiting from the latest technological features (**Kim et al., 2019**). Finally, attitude toward using advanced mobile devices refers to nurse's overall evaluation, feelings, and beliefs about these devices (**Adov et al., 2020**). Using advanced mobile devices fosters seamless, efficient collaboration between nurses and physicians, improving patient care and overall healthcare outcomes (**Javaid et al., 2024**).

Nurse-Physician Collaboration is a crucial element in delivering safe,

high-quality patient care. It refers to the professional interaction and teamwork between nurses and physicians to ensure coordinated, efficient and patient-centered healthcare. Both parties should possess equal decision-making capacity, responsibility, and power to manage patient care (**Dahlawi et al., 2023**). It includes three dimensions joint participation in the cure/care decision-making process, sharing of patient information, and cooperativeness (**Mohamed et al., 2021**).

First; joint participation in the care decision-making process refers to the way in which nurses and physicians work together with a person to reach a decision about care in consistent manner (**Kamel and Rashad 2019**). Second, sharing of patient information effectively can be enhanced by nurses and physicians' collaboration. As it ensures that care is coordinated and tailored to patient needs. Accurate and timely information exchange ensures a seamless transition of care between team members and can enhance continuity of care (**Roodbeen et al., 2020**). Finally; cooperativeness, which is essential for creating a positive and productive healthcare environment.

Cooperation enables nurses and physicians to leverage their unique expertise, improving patient outcomes and ensuring holistic care **(Bendowska and Baum 2023)**.

Significance of study:

Mobile device utilization has become thrived globally and the use of mobile devices in nursing for information sharing has become a striking global phenomenon. It has become an integral part of the life of many people **(Huang et al., 2021)**. Mobile devices have significantly improved communication and information sharing between nurses and physicians, benefiting both patient care and operational efficiency. Also it breaks down communication barriers between nurses and physicians, ensuring they collaborate more seamlessly. It fosters a more coordinated and efficient healthcare environment, data sharing, and decision-making support ultimately leads to better patient outcomes, quicker response times and stronger inter-professional relationships **(Spaulding et al., 2021)**. So, this study aims to assess nurses' readiness for advanced mobile utilization in relation to nurses-physicians collaboration.

Aim of the Study

Assess nurses' readiness for advanced mobile utilization in relation to nurses-physicians collaboration in Tanta Emergency Hospital and Hosh Issa Hospital.

Research Questions:

- 1-What are the levels of nurses regarding advanced mobile device utilization in nursing care in both hospitals?
- 2-What are the levels of nurses-physicians collaboration in both hospitals?
- 3-What is the relationship between nurse's readiness toward advanced mobile device utilization and nurse-physician collaboration in both hospitals?

Study design:

A descriptive-comparative design was used to carry out this study.

Study setting:

The study was conducted at Tanta Emergency Hospital which is affiliated with The Ministry of Higher Education and Scientific Research in Al-Garbia governorate and Hosh Issa Hospital which is affiliated with The Ministry of Health and Population in Al-Beheira governorate.

Subjects:

The study's subjects included a convenient sample of all (N = 638) nurses working at both hospitals who

accepted to participate at Tanta Emergency Hospital (n=341) and at Hosh Issa Hospital (n=297).

Tools of data collection:

Tool I: Nurses' Readiness for Advanced Mobile Devices Utilization Questionnaire:

It consisted of two parts as follows:

Part 1: this part classified into two parts as:

-Personal characteristics of nurses: It included the following items hospital name, age, sex, marital status, department, current position, educational level, years of experience in the current position, and years of experience in nursing work.

-Smart phone related data: having a smart phone, attendance previous digitalization courses, using smart phone for work purposes, hospital allowing personal telephone use in nursing care, the hospital needing to establish a policy for personal communication device use and feelings about advanced mobile devices.

Part 2: Readiness of Nurses for Advanced Mobile Device Utilization Questionnaire:

This tool was developed by the researcher and guided by (Muhanna, (2009), Liloyd, (2011), Johansson, (2014), Rashed et al.,

(2017). It used to assess nurses' readiness toward advanced mobile device utilization in nursing care.

It included 53 items distributed into 6 subscales as follows: technology readiness (7 items), technical skills (10 items), access to information from advanced mobile device (7 items), usefulness from using advanced mobile device (16 items), motivation (7 items) and attitudes toward advanced mobile device (6 items).

Scoring system:

Nurses' responses measured on a five points Likert Scale ranging from 5 to 1 where strongly agree =5, agree =4, neutral=3, disagree =2, strongly disagree =1. Total score was categorized according to statistical cutoff point into levels.

-High readiness for advanced mobile devices utilization level >75% (> 199 from the total score).

-Moderate readiness for advanced mobile devices utilization level 60% ≤ 75 % (159 ≤ 199 from the total score).

-Low readiness for advanced mobile devices utilization level < 60% (< 159 from the total score).

Tool II: Nurse-Physician Collaboration Questionnaire:

This tool was developed by the researcher guided by Ushiro, (2009),

Pakpour, (2019), Mohamed et al., (2021), and Al-Hamdan, (2021). It used to measure nurses' perception toward nurse-physician collaboration.

It included 18 items distributed into 3 subscales as follows: joint participation in the cure/care decision-making process (7 items), sharing of patient information (7 items) and cooperativeness (4 items).

Scoring system:

Nurses' responses measured on a five points Likert Scale ranging from 5 to 1 where strongly agree =5, agree =4, neutral=3, disagree =2, strongly disagree =1. Total score was categorized according to statistical cutoff point into levels.

Levels of Nurse-Physician Collaboration:

-High nurse-physician collaboration level >75% (> 6^Λ from the total score)

-Moderate nurse-physician collaboration level $75 \geq 60\%$ (< 6^Λ from the total score).

-Low nurse-physician collaboration level < 60% (< 5^Λ from the total score).

Result:

Table (1): Shows nurses' characteristics at both hospitals. Regarding Tanta Emergency Hospital, the age of nurses ranged

between 25 - 46 years old with mean age 31.23 ± 4.64 . Above two-fifths (45.2%) of nurses aged < 30 years old. High and equal percent (79.5%) of nurses were females and married. Around half (49.3%) of nurses had Associated degree in nursing. Regarding to current position above half (50.4%) of the participants were nurses. Above three fifths (60.7%) of nurses had between 5-10 years of experience in nursing with mean years of experience 8.69 ± 5.17 . Above half (54.5%) of nurses had between 5-10 years of experience in the current position with mean years of experience 6.64 ± 4.77 .

Regarding Hosh Issa hospital, the age of nurses ranged between 25 - 46 years old with a mean age 31.15 ± 3.81 . Above half (55.2%) of nurses' ages were between 30 - 35 years of age. High percent (80.1% and 80.1%) of nurses were married and females, respectively. Around half (49.5%) of nurses had an associated degree in nursing. About the current position above half (51.5%) of the participants were nurses. Above two-thirds (71.7%) of nurses had 5-10 years of experience in nursing work with mean years of experience of 8.46 ± 4.09 . Above half (69.7%) of nurses had between 5-10 years of experience in the current position,

with mean years of experience 6.34 ± 3.68 .

Table (2): Shows nurses' distribution according to the place of work at both hospitals.

Regarding Tanta Emergency Hospital, more than one quadrant (25.8%) of nurses were working in surgical department, less than fifth and equal percent (14.7%) of them were working in Traumatology intensive care unit and Emergency department.

Regarding Hosh Issa hospital, less than one-quarter (20.9%, 18.9% and 18.5%) of nurses were working in Pediatric department, General intensive care unit and Emergency department, respectively.

Table (3): illustrates nurses' data regarding smart phones at both hospitals.

Regarding Tanta Emergency Hospital (100%) of nurses had smart phone and didn't attend previous digitalization training courses. The majority (90.9 %, 90.0 % and 81.2 %) of nurses viewed that hospital allowed them to use personal smartphone in nursing care, used smartphone for work purpose and didn't believe that their hospital needed to establish a policy for personal communication device use at work respectively. Less than half (47.8%) of nurses felt strongly

positive about advanced mobile devices.

Regarding Hosh Issa hospital (100%) of nurses had smart phone and didn't attend previous digitalization training courses. The majority (91.2%, 82.5%, and 81.8%) of nurses viewed that hospital allowed them to use personal telephone in nursing care, used smart phone for work purpose and didn't believe that their hospital needed to establish a policy for personal communication device use at work, respectively. Less than half (44.8%) of nurses felt strongly positive about advanced mobile devices.

Figure (1): illustrates nurses' levels of total readiness for advanced mobile device utilization at both hospitals. At Tanta Emergency Hospital, Majority (82.7%) of nurses had high level and around one fifth (17.3%) of nurses had moderate level of readiness for advanced mobile utilization. Regarding Hosh Issa Hospital above two thirds (73.7%) of nurses had high level and about quarter (25.3%) of nurses had moderate level of readiness for advanced mobile utilization. There was a statistically significant difference between total levels of readiness for advanced

mobile device utilization at both hospitals as $p \leq 0.05$.

Table (4): Shows nurses' levels of readiness for advanced mobile device utilization subscale at both Hospitals.

Regarding Tanta Emergency Hospital, majority (94.4%, 87.4%, 86.2 %and 83%) of nurses had high levels regarding usefulness of using advanced mobile device, attitudes toward advanced mobile device, motivation and technology readiness subscales respectively. More than one third (39.9%) of nurses had moderate levels regarding technical skills subscale, while more than half (56%) of nurses had low level of technical skills subscale of advanced mobile device utilization.

Regarding Hosh Issa Hospital, majority (92.6%, 81.1% and 80.1%) of nurses had high levels regarding to usefulness of using advanced mobile device, motivation and technology readiness respectively. More than two fifths (40.1%) of nurses had moderate levels regarding technical skills subscale. Also, more than one fifth (22.2% and 20.9%) of nurses had moderate level regarding to attitudes toward advanced mobile device and access to information from advanced mobile device respectively. while more than half

(56.6%) of nurses had low level of technical skills subscale of advanced mobile device utilization.

There was no statistical significant difference between all subscales at both hospitals except regarding attitudes toward advanced mobile device utilization $p \leq 0.05$.

Figure (2): Clarfies nurse–physician collaboration total levels at both hospitals.

The majority (95.6% and 91.9%) of nurses had high level. While, less than one tenth (4.4% and 8.1%) of nurses had moderate level regarding total nurse–physician collaboration at both hospitals respectively. There was a statistical significant difference between total levels of nurse–physician collaboration at both hospitals as $p \leq 0.05$.

Table (5): Shows nurse–physician total levels of collaboration subscales at both hospitals.

Regarding Tanta Emergency Hospital, majority (91.2% and 85.3%) of nurses had high level regarding cooperativeness and sharing of patient information subscales respectively. While more than fifth (16.4%) of nurses had moderate level regarding joint participation in the cure/care decision-making process subscale.

Regarding Hosh Issa Hospital, majority (87.2% and 86.2%) of nurses had high levels about cooperativeness and joint participation in the cure/care decision-making process subscales respectively. While less than quadrant (21.5%) of nurses had moderate level on sharing of patient information there was no statistical significant difference between all subscales at both hospitals except for sharing of patient information $p \leq 0.05$.

Figure (3): Represents correlation between nurses' readiness for advanced mobile device utilization and nurse–physician collaboration at both hospitals. Regarding Tanta Emergency Hospital, the figure revealed that there was a statistical significant positive correlation between nurses' readiness for advanced mobile device utilization and nurse–physician collaboration at Tanta Emergency hospital ($p < 0.001^*$). About Hosh–Issa hospital, there was a statistical significant positive correlation between nurses' readiness for advanced mobile device utilization and nurse–physician collaboration ($p < 0.001^*$).

Table (1): Nurses' characteristics at both hospitals (N = 638)

Items	Tanta emergency hospital (n = 341)		Hosh Issa hospital (n = 297)	
	No.	%	No.	%
Age (years)				
<30	154	45.2	101	34.0
30 – 35	126	37.0	164	55.2
>35	61	17.9	32	10.8
Min – Max.	25.0 – 46.0		25.0 – 46.0	
Mean ± SD.	31.23 ± 4.64		31.15 ± 3.81	
Sex				
Male	70	20.5	59	19.9
Female	271	79.5	238	80.1
Marital status				
Married	271	79.5	240	80.8
Un married	70	20.5	57	19.2
Educational Level				
Associated degree in nursing	168	49.3	147	49.5
Bachelor in nursing science	102	29.9	77	25.9
Post graduate studies	71	20.8	73	24.6
Current position				
Supervisor	169	49.6	144	48.5
Nurse	172	50.4	153	51.5
Years of experience in nursing work				
<5	61	17.9	40	13.5
5 – 10	207	60.7	213	71.7
>10	73	21.4	44	14.8
Min – Max.	3.0 – 28.0		3.0 – 28.0	
Mean ± SD.	8.69 ± 5.17		8.46 ± 4.09	
Years of experience in the current position				
<5	118	34.6	71	23.9
5 – 10	186	54.5	207	69.7
>10	37	10.9	19	6.4
Min – Max.	1.0 – 28.0		1.0 – 28.0	
Mean ± SD.	6.64 ± 4.77		6.34 ± 3.68	

SD: Standard deviation

 χ^2 : Chi square test

t: Student t-test

p: p value for comparing between the two studied groups *: Statistically significant at $p \leq 0.05$

Table (2): Nurses distribution according to the place of work at both hospitals (N = 638).

Department	Tanta Emergency hospital (n = 341)		Hosh Issa hospital (n = 297)	
	No.	%	No.	%
Medical ICU department	29	8.5	0	0.0
Orthopedic department	43	12.6	14	4.7
Burn department	22	6.5	30	10.2
Neuropsychiatric department	41	12.0	0	0.0
Traumatology intensive care unit	50	14.7	0	0.0
Poison unit	19	5.6	0	0.0
Emergency department	49	14.7	55	18.5
Surgical department	88	25.8	14	4.7
Hemodialysis unit	0	0.0	38	12.8
General intensive care unit	0	0.0	56	18.9
Pediatric department	0	0.0	62	20.9
Obstetric department	0	0.0	14	4.7
Medical department	0	0.0	14	4.7

Table (3): Nurses' data regarding smart phones at both hospitals (N = 638)

Items	Tanta Emergency hospital (n = 341)		Hosh Issa hospital (n = 297)	
	No.	%	No.	%
Having a smart phone				
Yes	341	100.0	297	100.0
No	0	0.0	0	0.0
Attend previous digitalization courses				
Yes	0	0.0	0	0.0
No	341	100.0	297	100.0
Used smart phone for work purposes				
Yes	307	90.0	245	82.5
No	34	10.0	52	17.5
Hospital allow personal telephone use in nursing care				
Yes	310	90.9	271	91.2
No	31	9.1	26	8.8
Your hospital need to establish policy for personal communication device use				
Yes	64	18.8	54	18.2
No	277	81.2	243	81.8
Your feelings about advanced mobile devices				
Strongly negative	0	0.0	0	0.0
Negative	0	0.0	0	0.0
Neutral	31	9.1	48	16.2
Positive	147	43.1	116	39.1
Strongly Positive	163	47.8	133	44.8

SD: Standard deviation

 χ^2 : Chi square testp: p value for comparing between the two studied groups
significant at $p \leq 0.05$

*: Statistically

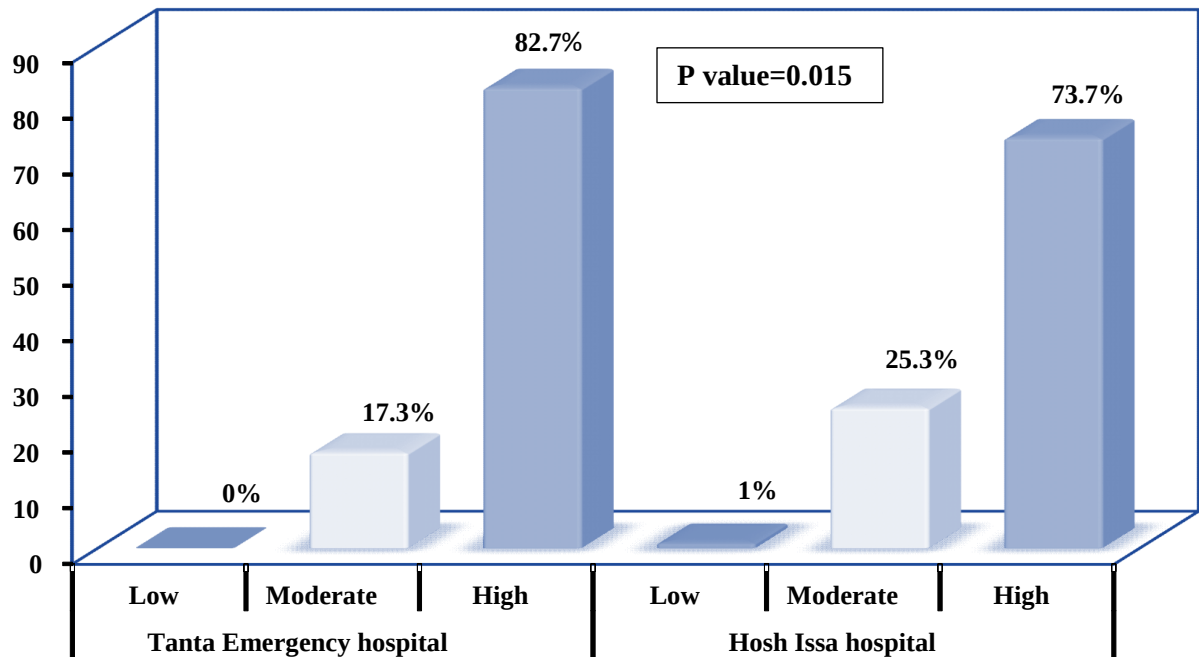


Figure (1): Nurses' levels of total readiness for advanced mobile device utilization at both Hospitals.

Table (4): Nurses' levels of readiness for advanced mobile device utilization subscales at both Hospitals (N = 638).

Subscales	Tanta Emergency hospital (n = 341)						Hosh Issa hospital (n = 297)						χ^2	p
	Low (<60%)		Moderate (60 – 75%)		High (>75%)		Low (<60%)		Moderate (60 – 75%)		High (>75%)			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Technology readiness	0	0.0	58	17.0	283	83.0	0	0.0	59	19.9	238	80.1	0.865	0.352
Technical skills	191	56.0	136	39.9	14	4.1	168	56.6	119	40.1	10	3.4	0.240	0.887
Access to information from advanced mobile device	0	0.0	72	21.1	269	78.9	3	1.0	62	20.9	232	78.1	3.461	^{MC} p=0.224
Usefulness of using advanced mobile device	0	0.0	19	5.6	322	94.4	0	0.0	22	7.4	275	92.6	0.889	0.346
Motivation	0	0.0	47	13.8	294	86.2	0	0.0	56	18.9	241	81.1	3.017	0.082
Attitudes toward advanced mobile device	1	0.3	42	12.3	298	87.4	2	0.7	66	22.2	229	77.1	11.722*	^{MC} p=0.001*

χ^2 : Chi square test

MC: Monte Carlo test

p: p value for comparing between the levels of two studied Hospitals

significant at $p \leq 0.05$

Agree = Strongly Agree + Agree

*: Statistically

Disagree = Strongly

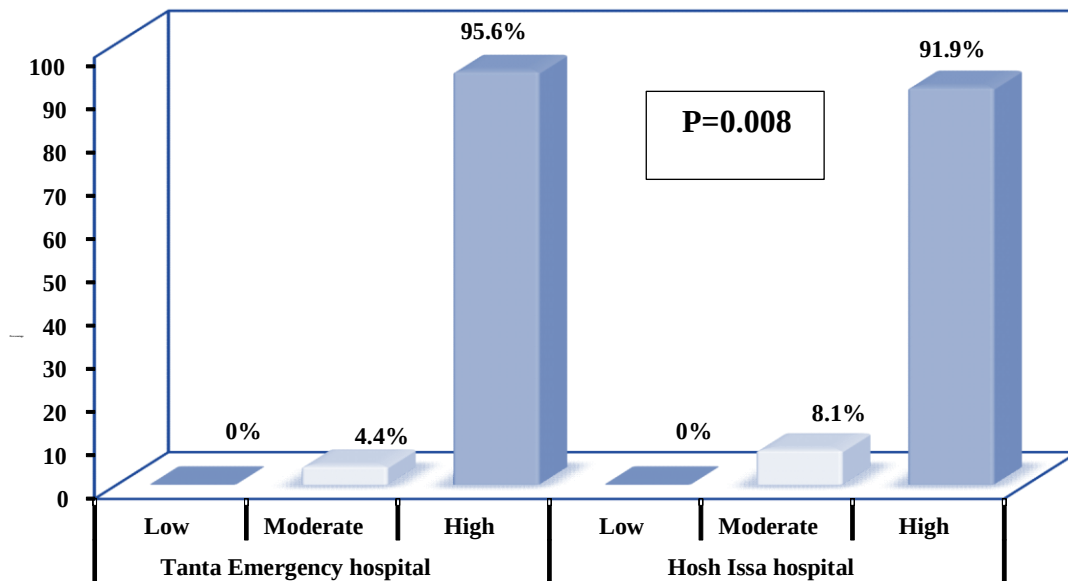


Figure (2): Nurse–physician collaboration total levels at both hospitals.

Table (5): Nurse–physician total levels of collaboration subscales at both hospitals (N = 638).

Subscales	Tanta Emergency hospital (n = 341)						Hosh Issa hospital (n = 297)						χ^2	p
	Low (<60%)		Moderate (60 – 75%)		High (>75%)		Low (<60%)		Moderate (60 – 75%)		High (>75%)			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Joint participation in the cure/care decision-making process	0	0.0	56	16.4	285	83.6	0	0.0	41	13.8	256	86.2	0.844	0.358
Sharing of patient information	0	0.0	50	14.7	291	85.3	3	1.0	64	21.5	230	77.4	8.869*	^{MC} p=0.009*
Cooperativeness	0	0.0	30	8.8	311	91.2	0	0.0	38	12.8	259	87.2	2.663	0.103

χ^2 : Chi square test

MC: Monte Carlo test

p: p value for comparing between the levels of two studied Hospitals

*: Statistically significant at $p \leq 0.05$

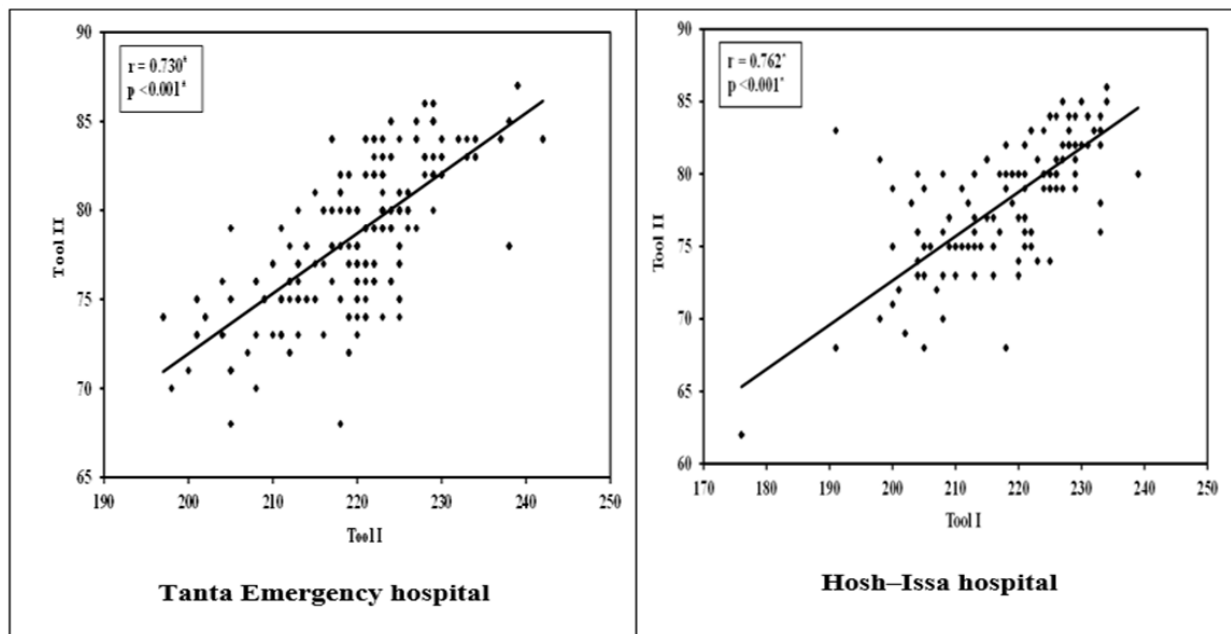


Figure (3): Correlation between nurses' readiness for advanced mobile device utilization and nurse-physician collaboration at both hospitals.

Discussion

Nurses' readiness for advanced mobile utilization

The findings of this study showed that at Tanta Emergency hospital nurses had a high level regarding readiness for advanced mobile device utilization. While, at Hosh Issa hospital above two-thirds of nurses had a high level of readiness for advanced mobile utilization. The findings revealed that there was a statistically significant difference between total levels of readiness for advanced mobile device utilization at Tanta Emergency and Hosh Issa hospitals. This difference may be attributed to several factors. Tanta Emergency Hospital, as a large

emergency and teaching-affiliated setting may have more established technological infrastructure, greater exposure to emergency and critical care demands and stronger institutional emphasis on rapid access to information and evidence-based practice. Such an environment can enhance nurses' readiness for advanced mobile utilization and may contribute to higher overall readiness levels. The nature of emergency care which requires quick decision-making and real-time information access may also increase nurses' dependence on and readiness for advanced mobile utilization.

This result was consistent with (Kürtüncü, Kurt, & Arslan, 2021)

stated that nurses had high level of mobile health applications acceptance in terms of using mobile applications. Most of the nurses expressed positive views on the use of mobile applications in the hospital setting. Also, **(Pan and Gao (2021))** support the present findings and show that a high level of nurses' behavioral intention to use a mobile nursing app was positively affected by performance expectancy as mobile advance nursing knowledge and nurses had high level of readiness to use it. Adding to that, **(Rashed et al., (2017))** stated that the highest percent of head nurses and more than two thirds of staff nurses had high level of readiness for advanced mobile device utilization in nursing care.

This result was inconsistent with, **(Alipour, Mehdipour, Zakerabasali, & Karimi, et al., (2025))** stated that majority of nurses tend to had low level of readiness for digital health literacy (DHL) and were reluctance to use these technologies which considered the main obstacles to using m-Health apps. Adding to that, **(Heponiemi et al., 2021)** not support the present findings and stated that use of mobile versions of EHR was associated with higher levels of time pressure and stress resulting from

poorly functioning information systems and nurses not ready to use it. **Nurses' agreement regarding nurses' readiness for advanced mobile utilization subscales at both hospitals.**

The findings of this study revealed that at Tanta Emergency and Hosh Issa hospitals majority of nurses had high levels regarding technology readiness subscale. The similarity of results at both hospitals can be justified as majority of nurses could consulted their colleagues on technological devices, nurses faced fewer problems than their colleagues in using advanced mobile devices in nursing care, enjoyed the challenge of figuring out high-tech gadgets, needed technical support when using advanced mobile devices inside the hospital and needed advanced mobile in emergency time. This result was in agreement with **(Coffetti et al., 2025)** found that technology readiness is positively associated with reciprocity behavior with nurses.

also, **(Rahardja et al., 2023)** reported that nurses with high technology readiness tend to have high attitudes towards technology.

This finding was incongruent with **(Chang et al., 2024)** stated that nurses' technology readiness had significant negative effects between

association between performance expectancy and behavioral intention. The findings of the current study showed that nurses had low level of technical skills subscale at Tanta Emergency and Hosh Issa hospitals. This may be due to the age of nurses ranged between 25-46 years old who had resistance to change. High percentage of nurses were females and married who couldn't attend digitalization courses may be due to their additional family responsibilities. Nurses couldn't access internet easily, used social media programs for work meetings, typed quickly on smart phone and respond for their colleagues messages, used suitable mobile applications for different types of information, used presentation software for patient education, used advanced mobile devices camera effectively and used appropriate advanced application as telegram to send large audio files. Along with these result **(Wenz and Keusch2023)** stated that nurses who had smartphones tend to had little technical skills and had lower levels of educational attainment. In the same line, **(Alqahtani, 2022; Serrano-Cinca et al., 2018)** showed that nurses had low levels and need to establish a specific training program.

Conversely, **(Alshammari and Alenezi 2023)** stated that nurses' technical training having a significant and positive impact on both overall job satisfaction and nurses' job satisfaction.

The current study findings showed that at Tanta Emergency and Hosh Issa hospitals more than one fifth of nurses had moderate level regarding to access to information from advanced mobile device subscale. This general similarity at both hospitals indicated that nurses could use advanced mobile devices to provide quick access to information and documents, reach up-dated and varied information which help them to perform their nursing duties in a satisfying manner, access valid and reliable information and used advanced mobile devices to up-date from their current information.

In agreement with this result, **(Mikuletič et al., 2024)** showed that nurses had high level of access to information as the integration of health information technology in nursing practice that has positive impact on nurses and brought about transformative changes in healthcare delivery.

Conversely, this result inconsistent with, **(Matthews et al., 2020)** who found that nurses had negative

association with excessive exposure to various information sources which creates information overload and problematic usage patterns.

The current study result indicated that Tanta Emergency and Hosh Issa hospitals the majority of nurses had high levels of usefulness from advanced mobile device utilization subscale. These results may be due to both hospitals allow nurses to use personal telephone in nursing care. Around half of nurses had associated degree in nursing, above half of nurses had between 5-10 year of experience in their current position who estimated value of the usefulness from advanced mobile device utilization in nursing care and uses smart phones for work purposes.

In the same line, **(Hussain et al., 2025)** stated that technology sophistication positively influences nurse' perceived usefulness, perceived ease of use and the intention to use technology among nurses. **(Sun et al., 2024)** also, supported the present findings and stated that nurses had higher levels of perceived usefulness demonstrate higher levels of technological interactivity, which further increased their willingness to use smart healthcare devices.

On the other hand **(Conte et al., 2023)** showed that majority of

frontline nurses had low level of perceived usefulness of new technologies and face barriers such as outdated infrastructure and low digital literacy which can undermine the perceived value of new technologies.

The present study results stated that at Tanta Emergency and Hosh Issa hospitals nurses possessed a high level of motivation toward advanced mobile device utilization subscale. These results may be due to the majority of nurses at both hospitals had less than 35 years and around half of nurses had associated degree in nursing who had a strong positive feeling about advanced mobile device which may be a cause to strengthen nurses' intrinsic motivation to adopt and effectively use advanced mobile technologies in their daily nursing activities.

Our result was similar to the previous study conducted by **(Amin et al ., 2025)** showed that nurses had positive motivation as they informed about and understand the rationale for technology use, expectations about technology benefits, use and impact in their work.

But the study result inconsistent with **(Jedwab et al., 2023)** stated that nurses had low level of motivation toward technology as hybrid systems and insufficient hardware can causes

nurses' dissatisfaction with technology which affect continuation of safe and high quality patient care delivery by nurses.

The result of the current study indicated that at Tanta Emergency hospital the majority of nurses had high levels of attitude toward advanced mobile device utilization. While, at Hosh Issa hospital more than one fifth of nurses had moderate level of attitude toward advanced mobile device utilization. The differences observed between the two hospitals may be attributed to several factors. Tanta Emergency Hospital, as a large emergency and teaching-affiliated setting may have greater exposure to technological advancements, stronger administrative support for digital transformation and more continuous training programs on mobile health applications. Such factors can positively influence nurses' perceptions, acceptance and overall attitudes toward using advanced mobile devices in clinical practice.

The study results gets agreement with **(Bimerew 2024)** stated that nurses had a positive attitudes toward digital health technology and tend to have higher level of usefulness of digital health technology to improve quality

of patient care are some of the enabling factors.

Conversely, **(Guillari, et al., 2024)** stated that nurses who are very unfamiliar with information technology tend to have negative attitude toward technology and less digitally literate nurses may be less likely to use it.

Nurses-Physicians collaboration

The findings of the present study revealed that at Tanta Emergency and Hosh Issa hospitals the majority of nurses had high level of nurses-Physicians collaboration and there was a statistical significant difference between total levels of nurse–physician collaboration at both hospitals. This may be attributed to both hospitals likely adopt a team-based approach to patient care, especially in acute and emergency settings where effective communication and coordination between nurses and physicians are essential for patient safety, rapid clinical decision-making. Adding to that presence of mutual respect and understanding between nurses and physicians, continuous interaction during patient rounds, case discussions and handovers can further strengthen professional relationships and collaborative practice.

This result was consistent with **(Kim et al., 2022)** showed that nurse–physician collaboration scores indicated relatively high levels of collaboration. This collaboration can promote a positive work environment where all healthcare providers feel valued and respected for their contributions.

Conversely, this result is inconsistent with **(Hossny et al., 2021)** declared that the nurses have the high score in poor level of satisfaction regarding quality of collaboration between nurses and physicians. Also, **(Elham and El-Hanafy 2018)** revealed that the level of collaboration between staff nurses and physicians is low, nurses and physicians aren't satisfied with their relationship.

Nurses' agreement regarding nurses-Physicians collaboration subscales at both hospitals:

The findings of the current study showed that at Tanta Emergency hospital more than fifth of nurses had moderate level. While, at Hosh Issa hospital the majority of nurses had high level of joint participation in the cure/care decision-making process subscale. The difference in the results between two hospitals could be due to Hosh Issa Hospital may promote a more participative management approach, encouraging nurses to

actively engage in clinical discussions, express their opinions and contribute to patient care planning. On the other hand, the presence of a moderate level among a proportion of nurses at Tanta Emergency Hospital may be related to the high workload and fast-paced nature of emergency care, where physicians may take rapid decisions due to critical patient conditions, leaving less opportunity for extensive joint discussion.

This result is similar with **(Arends et al., 2022)** declared that majority of nurses agree to have an essential role in shared decision making process and high level of nurses see their involvement is a valuable.

Conversely, these finding was contradicted with **(Mohsen et al., 2019)** revealed that limiting the autonomy of nurses had negative impact on the ability on care decision making and take action in situations where quick and critical decisions need to be made.

The findings of this study showed that at Tanta Emergency hospital majority of nurses had high level. While, at Hosh Issa hospital less than quadrant of nurses had moderate level on sharing of patient information this may be due to Tanta Emergency Hospital may utilize more structured

communication channels such as standardized reporting tools, electronic documentation systems and regular multidisciplinary rounds which facilitate effective and timely sharing of patient information among healthcare team members.

These findings similar to **(Woldring et al., 2023)** showed that nurse's role as communicator had high level of optimal information exchange between the patient and their informal network and majority of nurses work as collaborator which promote the principles of shared decision-making and support them in self-management. These findings inconsistent with **(Sasie et al., 2024)** showed that nurses had low level of effective information sharing as challenges which include issues like limited functionality of digital health systems, incompatible data formats and financial constraints and socio-cultural barriers constrain current practices. Also, **(Nair et al., 2022)** stated that nurses had low level for data sharing in some humanitarian settings as lack of trust and coordination between stakeholders.

The findings of this study revealed that at Tanta Emergency and Hosh Issa hospitals the majority of nurses had high level of cooperativeness subscale. This can be justified as the

presence of a supportive work environment in both hospitals that encourages teamwork and mutual respect among nurses and physicians. Also, nurses and physicians at both hospitals discussed what's up to date in healthcare setting, freely exchanged information or opinions about matters related to work, divided duties and consider each other when there is work load and defined plans for patient care at the beginning of work. These results accordance with **(Hossny and Sabra 2021)** showed that nurses who work in the workplace with character of civility climate had high level of a cooperative character and practice civil relationship among their employees.

Conversely, **(Almukhaini et al., 2022)** showed that there is low level of cooperation between nurses and physicians as physicians view them self in a position of greater power and authority than nurses. This can lead to a hierarchical rather than cooperative relationship where nurses have no choice but to be subordinate to physicians.

Correlation between nurses' readiness for advanced mobile device utilization and nurse-physician collaboration at both hospitals

According to the findings of the current study there was a statistical significant positive correlation between overall nurses' readiness for advanced mobile device utilization and nurse–physician collaboration at both hospitals this might be due to nurses with enough knowledge about advanced mobile device tend to become more ready to use it in nursing care. Moreover increased nurses' knowledge regarding concept, uses advantages of advanced mobile device help them to be more ready to use these new devices.

The result of the present study was matched with **(Ngusie et al., 2022)** explained that nurses had high level of readiness to their computer skills and knowledge about advanced mobile device application. These results lie in the same line with **(Dongmo et al., 2021)** suggested that nurses had high level of readiness are highly comfortable with leveraging digital technologies to manage medical care with sufficient infrastructure, technical support and healthcare professionals can quickly adopt new technologies to coordinate patient care.

Our results demonstrate the use of technology to facilitate physician–nurse collaboration at the bedside and beyond. With continued innovation

and integration, digital communication technologies are becoming effective tools for patient-centered, coordinated care in complex healthcare settings. Also, **(Clancy and Wehbe 2022)** declared that nurse–physician collaboration positively affect high-quality care can be provided to patients when nurses and physicians work collaboratively through teamwork. This can improve patient satisfaction and outcomes.

Correlation between the study variables and nurses personal characteristics:

The finding of the present study showed that there were no statistical significant relation between overall nurses' readiness for advanced mobile devices utilization and all nurses' characteristic data except for years of experience in the current position regarding to Tanta Emergency Hospital. At Hosh Issa Hospital there was no statistical significant relation between overall nurses' readiness for advanced mobile devices utilization and all nurses' characteristic data except for marital status. **(Hussein et al., 2024)** reported that years of experience were significantly correlated with total nursing informatics competency This supports the idea that specific characteristics like years of experience may

influence digital readiness more than other demographic data. **(Hussein et al., 2024)** added marital status and related social stability or responsibilities can, in some contexts, correlate with workplace attitudes and competencies which aligns with your result at Hosh Issa Hospital.

Regarding Tanta Emergency Hospital there was statistical significant relation between nurses' readiness for advanced mobile devices utilization and their work unit differences in readiness observed across units **(Rashed et al., 2017)** About Hosh Issa Hospital there were no statistical significant relation between nurses' readiness for advanced mobile devices utilization and their work unit. **(Karkonasasi et al., 2018)** showed no significant differences in technology adoption intentions across work units or demographics

According to Tanta Emergency Hospital there were no statistical significant relation between nurses' readiness for advanced mobile devices utilization and their data regarding smart phones. About Hosh Issa Hospital there were no statistical significant relation between nurses' readiness for advanced mobile devices utilization and their data regarding smart phones except for hospital allow personal telephone's use in

nursing care **(Gaur et al ., 2024)** demonstrated that while utilization patterns varied, not all demographic characteristics were significantly associated with smartphone use outcomes and only specific variables (agreement with a smartphone use policy) were statistically significant. There were no statistical significant relation between nurse–physician collaboration and nurses' characteristic data at both hospitals. **(Melkamu et al ., 2020)** demonstrated that demographic and individual nurse characteristics (such as age, sex, marital status, experience and working hours) were not significantly associated with measures of nurse–physician collaboration. There were statistical significant relation between nurse–physician collaboration and nurses' work unit at both hospitals **(Goda et al., 2018)** revealed that working department was significantly associated with collaboration perception levels.

Regarding Tanta Emergency Hospital there were no statistical significant relation between nurse,physician collaboration and nurses' data regarding smart phones. Regarding Hosh Issa Hospital there were no statistical significant relation between nurse–physician collaboration with nurses' data regarding smart phones

except hospital allow personal telephone's use in nursing care (**Jong et al ., 2020**) found that while nurses use smartphones to communicate clinical information their use is not consistently or statistically significantly associated with inter-professional collaboration outcomes.

Conclusion:

In the light of the recent study results, it can be concluded that at Tanta Emergency Hospital, majority of nurses had high level of readiness for advanced mobile utilization. At Hosh Issa hospital above two thirds of nurses had high level of readiness for advanced mobile utilization. Also the majority of nurses had high level of nurse–physician collaboration at both Hospitals. There was a statistical significant positive correlation between nurses' readiness for advanced mobile device utilization and nurse–physician collaboration at both hospitals.

Recommendations

For hospital management:

Develop proper infrastructure required for advanced mobile device utilization in nursing care, establish protocols for secure and appropriate use of mobile devices in clinical care.

Nurses need to:

-Attend training programs and workshops about advanced mobile

device utilization, participate in training programs to learn more technical skills in the unit level and seek life – long learning, even in non-nursing related specialties and seek new technologies to be mentally stimulating.

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Relation between Intensive Care Nurses' Professionalism and Safety Competencies

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Abstract

Background: Nurses' professionalism and safety competencies are basic components of high-quality of patient care, particularly within Intensive Care Units where patient conditions are critical and require precise, timely, and ethically grounded interventions. **Aim:** To assess the relation between intensive care nurses' professionalism and safety competencies. **Design:** A descriptive correlational design was used. **Setting and subject:** All (n=335) nurses working in intensive care units at Tanta University Main Hospital. **Tool:** Two tools for data collection were used, Nurses' Professionalism Scale and Nurses' safety Competencies Questionnaire. **Results:** More than sixty percent (60.3%) of nurses had a high level of overall professionalism and more than fifty percent (56.4%) of them had a moderate level of overall safety competencies. **Conclusion:** There was a significant positive correlation between nurses' professionalism and their safety competencies. **Recommendations:** Hospital management needs to conduct more workshops and educational programs for nurses on professionalism and safety competencies to increase their knowledge and skills for promoting safety culture and advancement of nursing profession.

Key words: Intensive Care Units, Nurses, Professionalism, and Safety Competencies.

Introduction

Intensive care unit is a specialized setting with specialized well trained nursing professionals for providing high quality nursing care and maintains patient safety. Professionalism is necessary for nurses to help them behave in ways that benefit patients and all health care systems **(Foster, 2022)**. It includes specialized and systematic body of knowledge, guidelines and standards for behavioral conduct in nursing professions **(Ahmed & Ibrahim, 2023)**.

Professionalism is a multi-dimensional concept including accountability, self-improvement, professional attitude, advancement of the nursing profession and professional membership. Accountability is nurses' responsibility for their decisions, actions and the consequence of those actions **(Sherman & Cohn, 2019)**. Self-improvement refers to nurses' ability to engage in life-long learning and development **(Kakemam et al., 2022)**. Professional attitude involves nurses' attitude towards their profession, nursing services, patient satisfaction and how they align these attitudes with hospital goals and standards **(Rekisso, Mengistu, Wurjine, 2022)**. Advancement of nursing profession involves

continuous improvement for high quality of patient care. Professional membership is nurses' ability to establish their identity as a nursing professional and exchange their experiences with other professionals **(Ichikawa et al., 2020)**.

Therefore, high-quality patient care and safe practices are required for professional nurses to have safety competencies for reducing adverse effects associated with healthcare **(Mostafa, Mostafa, 2024)**. Nurse safety competencies are characterized by using knowledge, skills and attitudes concerning safety, which are required for the provision of safe health care **(Torkaman, Momennasab, Yektatalab, & shahrbabaki, 2022)**. Nurses' safety competencies have six competencies, such as safety culture, teamwork, effective communication, and risk management, optimization of human and environmental factors, and identification and reporting of adverse events. Safety culture refers to understanding the values, attitudes and norms important to health care organizations and choosing behaviors are appropriate for patient safety. Teamwork is essential for efficient and safe collaborative practice. Effective communication is an important aspect of nurse- patient-relationships

that affects patients' perceptions of health care quality (**Han & Roh, 2020**).

Safety risk management is process composed of identifying the hazards, assessing, and controlling it (**Sanford et al., 2021**). Optimization the human and environmental reflect the achievement of best performance of safety competencies for potential outcomes. Identification and reporting of adverse events involves recognizing and responding effectively to the occurrence of an adverse event and prevent recurrence (**Farokhzadian et al., 2022**).

Significance of the study

Nurses in the intensive care units are more likely experience safety issues than nurses in other departments. So, nurses' professionalism plays a significant role in intensive care units as they shape and affect the nature of nurses' knowledge, behaviors, skills and attitudes that contribute to deliver safe nursing care within work environment (**Kakemam et al., 2022**). Thus, this study was directed to assess the relation between intensive care nurses' professionalism and safety competencies.

Aim of the study:

To assess the relation between intensive care nurses'

professionalism and safety competencies.

Research questions:

-What are the levels of nurses' professionalism?

-What are the levels of nurses' safety competencies?

-What is the relationship between nurses' professionalism and safety competencies?

Research design:

A descriptive correlational study design was used.

Setting:

The study was conducted in intensive care units at Tanta University Main Hospitals including Cardiac, Neonates, Neurology, Pediatric, Medical and Chest ICUs.

Subjects:

Included all (335) nurses are working in previously mention settings at time of data collection.

Tools of data collection

Two tools were used data collection

Tool I: Nurses' Professionalism Scale.

It included two parts: **Part 1:** Nurses' personal data included age, marital status, qualification, hospital department, years of experience and attendance of educational program.

Part 2: Nurses' Professionalism Scale. It was developed by **Ichikawa et al., (2020)** and modified by the researcher to assess levels of nurses' professionalism through 35 items divided into five

dimensions: accountability (11 items), self- improvement (6 items), professional attitude (7 items), advancement of nursing profession (6 items) and professional membership (5 items).

Nurses' responses were measured on a five points Likert Scale ranging from (1 to 5) as strongly disagree=1, disagree=2, neutral=3, agree=4 and strongly agree=5. The total scores calculated by cut off points and summing scores of all categories. The total scores represent varying levels: High level >75%, moderate level 60%-75% and low level of professionalism <60%.

Tool II: Nurses' Safety Competencies Questionnaire. It was developed by Frank & Brien, (2008) and modified by the researcher to assess levels of nurses' safety competencies through 49 items divided into six dimensions: nurse safety culture (8 items), teamwork (6 items), effective communication (11 items), safety risk management (9 items) optimization human and environmental factors (10 items) and identification and reporting of adverse events (5 items).

Nurses' responses were measured on a five points Likert Scale ranging from (1 to 5) as strongly disagree=1, disagree=2, neutral=3, agree=4 and strongly agree=5. The total scores

calculated by cut off points and summing scores of all categories. The total scores represent varying levels as follows: High level >75%, moderate level 60%-75% and low level of nurses' safety competencies <60%.

Method

-An official permission was obtained from the Dean of Faculty of Nursing Tanta University and the authoritative personnel of Tanta University Main Hospitals.

-Approval from the Scientific Research and Ethical Committee at Faculty of Nursing was obtained with code (2023-12-345).

-Nurses consent to participate in the study was obtained after they informed them about nature of the study with the right to withdraw at any time without penalty.

-Tools I and II were modified and translated to Arabic and presented to a jury of five experts in the area of specialty to check their content validity. The face validity value of tool I was 96.0% and 96.9% for tool II.

-Reliability of the tool was ascertained by measuring the internal consistency of its items using Cronbach Coefficient Alpha Test which tool I= 0.895 and 0.737 for tool II.

-A pilot study was carried out on sample 10% (n=35) of nurses, and

they excluded from the main study sample during actual collection of data. The pilot study was done to test clarity, sequence of items, applicability, and relevance of the questions.

-Data collection phase: the researcher distributed tools on nurses individually at their work setting during the morning and afternoon shifts. The researcher met nurses in the waiting area of their department to explain the aim of the study and distribute the questionnaire sheet for them. The subjects recorded the answer in the presence of the researcher to clarify any questions needed. The time needed to complete the questionnaires was 15 – 20 minutes and data was collected over a period of 3 months (from June to September 2024).

Results

Table (1): Shows distribution of nurses' personal data. It was observed that more than half (57.6%) of nurses aged between 30-40 years, with mean age score $31.13 \pm 5.20\%$. The majority (80.6%) of nurses were married and more than one third (42.4%) of them had bachelor's degree. 27.5% and 24.5% of nurses worked in Pediatric Hospital ICU and Medical Hospital ICU, respectively. In relation to years of experience more than one-

third 37.4% of them had 10-15 years of experience with mean (9.53 ± 5.02) and high percentage (78.5%) of them attended educational program about professionalism and safety competencies.

Figure (1): Demonstrates levels of overall nurses' professionalism. As evident from the figure more than sixty percent (60.3%) of nurses had a high level of professionalism. While 36.1% of them had a moderate level and only 3.6% had low level of overall professionalism.

Table (2): Shows levels of nurses' professionalism dimensions. The table shows that more than half (56.7%, 54.6%) of nurses had a moderate level of professional membership and professional attitude dimensions of professionalism. As well as that, more than half (54.9, 53.1%) of them had a high level of professionalism related to accountability and self-improvement dimensions. While nearly to half (49.9%) of them had a high level of professionalism related to advancement of nursing profession dimension.

Figure (2): Illustrates overall levels of nurses' safety competencies. It shows that more than one third (46.3%) of nurses had a high level of overall safety competencies. While 43.6% of them

had a moderate level and only 10, 1% had low level of nurses' safety competencies.

Table (3): Shows levels of nurses' safety competencies dimensions. It shows that more than half (59.7%) of nurses had high level of teamwork competency. While, more than half (54.3%) of them had low level of optimization human and environmental factors of safety competencies. Nearly half (48.7%-48.4%- 46.3%) of them had high level of effective communication and identification, reporting of adverse events and nurse safety culture competencies, respectively. While more than one third (41.5%) of nurses had moderate level of safety risk management competencies.

Figure (3): Clarifies correlations between nurses' professionalism and their safety competencies. As noticed from the figure there are positive significant statistical correlations between nurses' professionalism and their safety competencies at ($p < 0.001$ & $r = 0.765$).

Table (1): Distribution of nurses' personal data. (n = 335)

Nurses' personal data	No.	%
Age (years)		
<30	127	37.9
30 – 40	193	57.6
>40	15	4.5
Min. – Max.	21.0 – 45.0	
Mean ± SD.	31.13 ± 5.20	
Marital status		
Married	270	80.6
Un married	65	19.4
Qualification		
Diploma of secondary nursing school	11	3.3
Diploma of technical institute nursing	142	17.0
Bachelor's degree in nursing	125	42.4
Postgraduate studies	57	37.3
Hospital department		
Cardiac ICU	71	21.2
Neonates ICU	7	2.1
Neurology ICU	65	19.4
Pediatric Hospital ICU	92	27.5
Medical Hospital ICU	82	24.5
Chest Hospital ICU	18	5.3
Years of experience		
<10	174	51.9
10 –15	125	37.4
>15	36	10.7
Min. – Max.	1.0 – 25.0	
Mean ± SD.	9.53 ± 5.02	
Attending educational program		
Yes	263	78.5
No	72	21.5

SD: Standard deviation

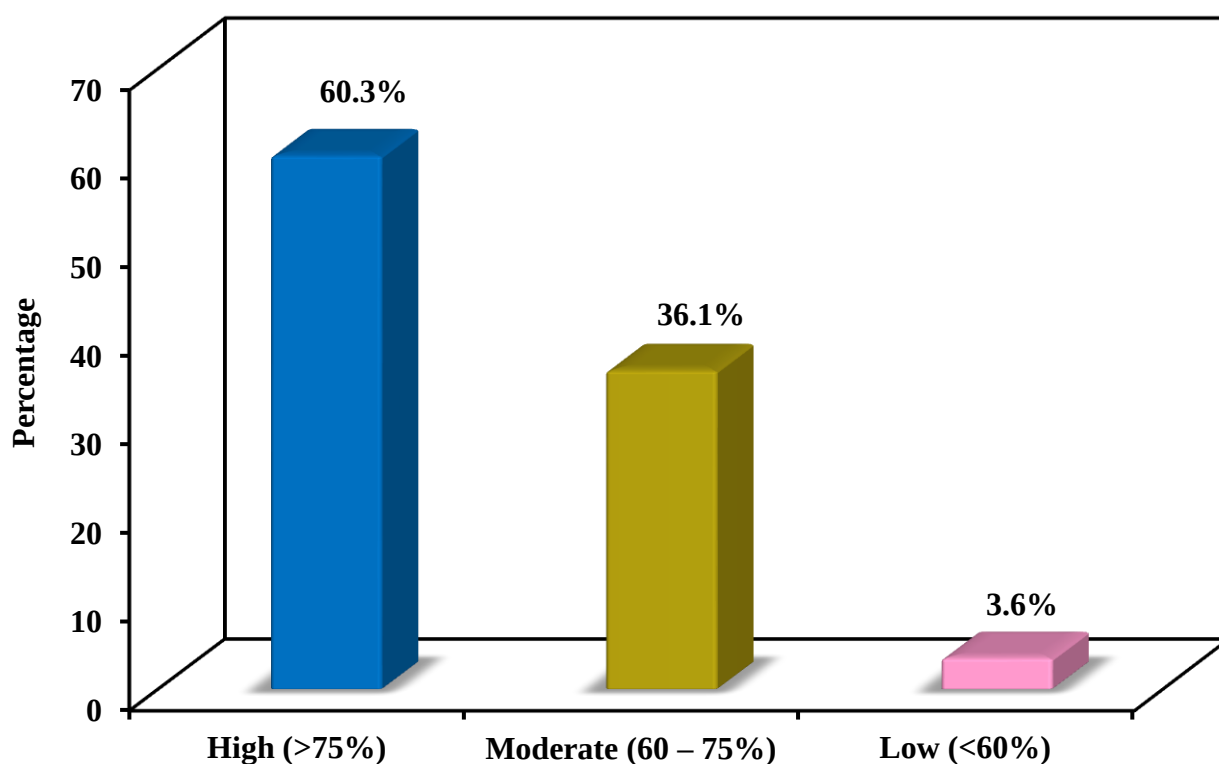


Figure (1): Levels of overall nurses' professionalism (n=335)

Table (2): Levels of nurses' professionalism dimensions (n = 335)

Nurses' professionalism dimensions	Levels of nurses' professionalism					
	High		Moderate		Low	
	No.	%	No.	%	No.	%
Accountability	184	54.9	148	44.2	3	0.9
Self -improvement	178	53.1	126	37.6	31	9.3
Professional attitude	134	40.0	183	54.6	18	5.4
Advancement of nursing profession	167	49.9	81	24.2	87	26.0
Professional membership	76	22.7	190	56.7	69	20.6
Overall	202	60.3	121	36.1	12	3.6

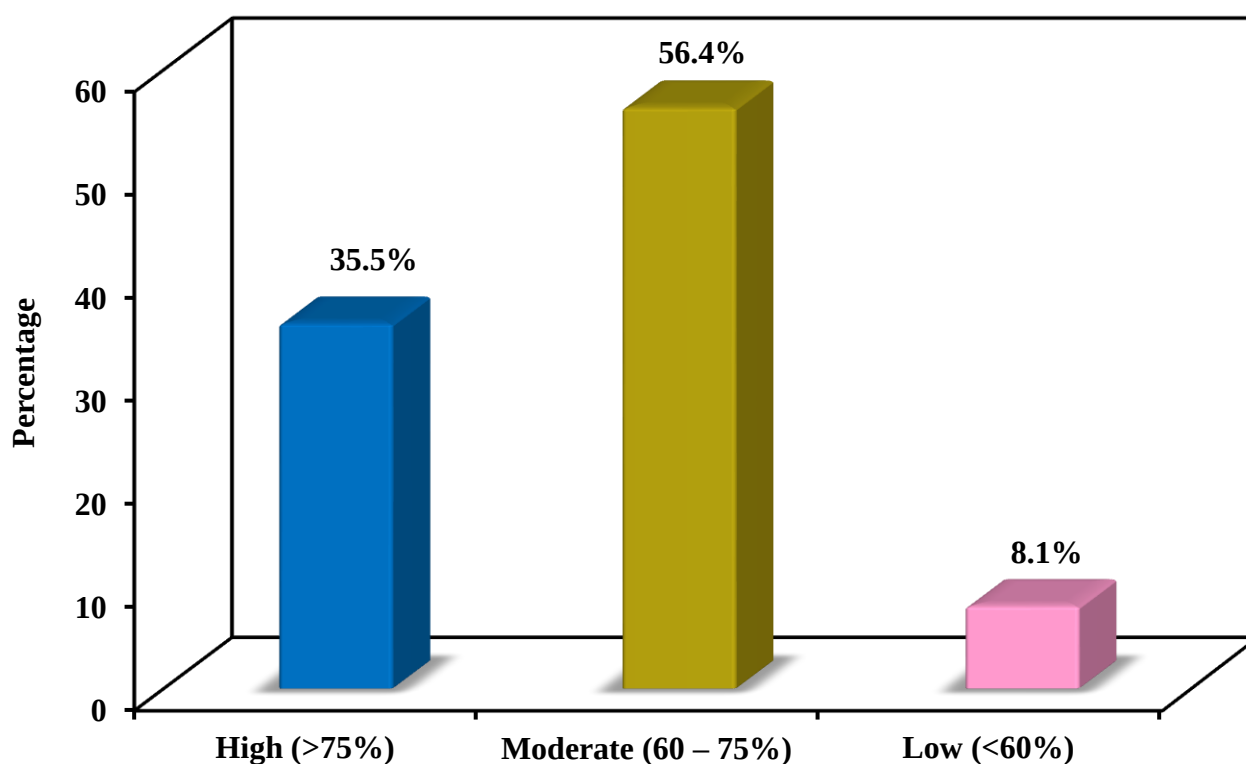


Figure (2): Overall levels of nurses' safety competencies (n = 335)

Table (3): Levels of nurses' safety competencies dimensions (n = 335)

Nurses' safety competencies dimensions	Levels of nurses' safety competencies					
	High		Moderate		Low	
	No.	%	No.	%	No.	%
Nurse safety culture	155	46.3	146	43.6	34	10.1
Teamwork	200	59.7	104	31.0	31	9.3
Effective communication	163	48.7	133	39.7	39	11.6
Safety risk management	77	23.0	139	41.5	119	35.5
Optimization of human and environmental factors	60	17.9	93	27.8	182	54.3
Identification and reporting of adverse events	162	48.4	148	44.2	25	7.5
Overall	119	35.5	189	56.4	27	8.1

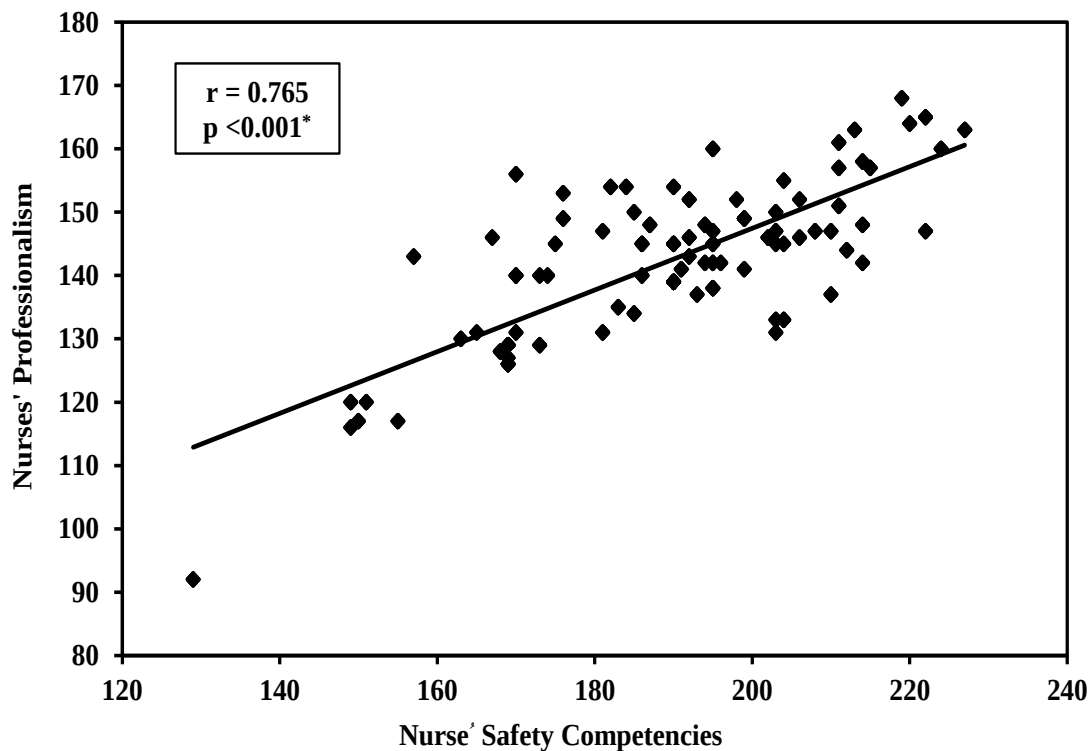


Figure (3): Correlation between nurses' professionalism and their safety competencies.

Discussion

In the highly complex and high-stakes environment such as intensive care unit, professionalism and safety competencies are essential qualities for nurses to ensure optimal patient care **Lee & Dahinten, (2020)**.

Nurses' professionalism

The results of the present study showed that more than sixty percent of nurses had a high level of overall professionalism. From the researcher points of view, this may be due to training and continuous education at Tanta University Main Hospitals which gives them experience in gaining new skills and knowledge related to professionalism and safety

competencies to become aware of their accountability as professional nurses, respect the integrity and human rights of patients and their families as well as ensure reporting errors that may cause harm to critically ill patients.

This finding agreed with the study results which were performed by **Shehata, El-Sayed, Shokir, & Mahmoud, (2024)** and **Bekalu & Wudu, (2023)** who revealed that more than half of nurses had a high level of professionalism. The present study finding is incongruent with **Wang, Wang, & Lu, (2023)** who affirmed that nurses' opinions of their profession were considerably

inadequate which indicated low professionalism. Additionally, **Abate et al. (2021)** in their study revealed that more than half of nurses had a moderate level of nurses' professionalism.

Concerning levels of nurses' professionalism dimensions, the present study results demonstrated that more than half of them had a high level of accountability. The result is confirmed by that all nurses agree that they are aware of their responsibility as professional nurses in ICU and the majority of them agree in taking professional responsibility in emergency and not emergency work conditions, keeping nursing records to comment their tasks clearly and reporting the errors that may cause harm to patients, as well as they work according to acceptable standards to provide safe quality nursing care and bear any negative consequences of their professional decisions and actions

These finding results consistent with **Hussein & Abou Hashish, (2023)** and **Perveen (2022)** confirmed that most of nursing staff believed that they were accountable for their actions. In addition, findings result of **Rahmatollahi & Mohamadi Zenouzagh, (2021)** proved that the majority of nursing staff had a high level of professional accountability. The current results are contradictory

with **Rubio et al., (2019)** study finding who revealed that low percentage of nurses had lack of professional accountability and not being accountable for their negligence which evidence on poor standards of care.

Also, the present study results demonstrated that more than half of nurses had a high level of self-improvement as evidenced by high percentage of them agree that they have a career vision as professional nurse, up to date their nursing knowledge to improve how they do in their work, seek guidance from experts at work to gain new skills, focus on continuous education and engage in lifelong learning.

This result consistent with **Ni, Wu, Bao, Li, & You, (2022)** who revealed that more than half of nurses actively engage in self-improvement activities demonstrate higher professional competence and confidence in clinical practice. In contrast, **Van der heijden et al., (2019)** indicated that heavy workload and job stress may limit nurses' engagement in self-improvement, leading to lower levels of professional growth.

The present study results demonstrated that more than half of nurses had a moderate level of professional attitude. From the researcher points of view, this may

be due to impact of high acuity patient care, workload and nursing shortage at Tanta University Main Hospital that hinder them full expression of professional behavior. Thus, this result reflects the need for fostering a positive health care environment to strengthen nurses' commitment to ethical practice and compassionate in their role and ensuring patient safety.

This result was congruent with findings results of **Chongloi Prashant & Devagourou, (2024)** who reported that nurses demonstrate high importance for professional values, with protecting patient health and safety ranked as the top priority. Similarly, study results of **Chen Zhou, Zhao, (2020)** revealed a scoring rate of professional attitudes among nurses reflecting a moderate level.

The current study results revealed that nearly half of nurses had a high level of advancement of nursing profession as evidenced by the majority of them agree that they improve the quality of nursing care for their patients through implementing nursing practices standards, and attended workshops and conferences related to evidence-based nursing practices. Also, high percent of nurses agree that they share their expertise with colleagues who benefit from it at work.

This finding is supported by **Alharsan, (2025)**, found in their study of results a high level of nurses' engagement in professional development. Also, **Hariyati et al., (2017)** found that almost all nurses understand the importance of continuing professional development and its benefits to improve competence.

The current study results illustrated that more than half of nurses had a moderate level of professional membership reflecting that administrative support, culture of teamwork and communication in critical care environments that provided by hospital administration. Nurses' ability to establish their identity as professional nurses indicates a sense of confidence and recognition of their expertise within the healthcare team. Thus, this result reflects the need for providing opportunities for networking, continuing education, leadership growth, and policy involvement to enhance nurses' professional membership.

This result was congruent with **Asl Taghinejad, Parizad, & Jasemi, (2022)** who found that nurses' professional membership had moderate levels.

Nurses' safety competencies

Considering overall levels of nurses' safety competencies, the current

study illustrated that more than fifty percent of them had a moderate level of nurses' overall safety competencies, while more than one third of them had a high level. This study result is surprising because of the present of four separate teams in Tanta University Main Hospitals of infection control, educational training of quality as well as occupational safety and health team that focus on safety and education. But, the result from the researcher's points of view may be due to the complexity of critically ill patients, shortage of staff and high work loads that those nurses experienced that can contribute moderate level of nurses' competencies performance.

This result was found congruent with findings result **Torkaman et al. (2022)** who signified nurses' safe competencies were at a moderate level. Also, Karanikas, **Weber, Bruschi, & Brown, (2022)** and **Alreshidi, Alrashidi, Alanazi, & Alshammeri, (2021)** revealed that nurses across different regions consistently demonstrated a moderate level of safety competencies.

Concerning levels of nurses' safety competencies dimensions, the current study demonstrated that nearly half of nurses had a moderate level of safety culture as evidenced by the majority of nurses agree that

the hospital administration sets ideal standards for safety culture and encourage them following these rules in their work to achieve safe nursing practices. This finding results of **Foster (2022)** found that nurses expressed safety culture awareness and engagement in organizations with clear protocols. **Muftawu & Aldogan, (2020)** in their study displayed that more than half of nurses perceived that overall response of the patient safety culture was positive. In contrast with the findings of **Kakemam et al., (2021)** who reported that nurses' perception regarding safety culture was low and showed a fragile safety culture in the majority of the domains.

The present study results showed that more than half of nurses had a high level of teamwork competency. This reflects the critical importance of collaboration in the ICU setting, where patient care often involves a multidisciplinary team. Effective teamwork is essential for ensuring patient safety, improving outcomes, and responding quickly to emergencies. This result was agreed with **Kakemam et al., (2021)** results who revealed that nurses' perception of teamwork was high. **And El morsri, et al., (2020)** found that more than half of nurses had high teamwork competency.

The present study results revealed that nearly half of nurses had a high level of effective communication competency. From the researcher's point of view, this result is confirmed by the majority of nurses agree that they communicate for help from colleagues when dealing with modern technology, use verbal and non-verbal communication techniques effectively to prevent adverse events, respect privacy and maintain confidentiality, supervisor communicate with them when they have problem on work safety, can easily obtain information related to the task of their work unit, provide clear and comprehensive information at transition or handoff of patients to another department, and listen carefully to their colleagues while they are talking, indicating that the importance of communication for nurses in preventing errors, improving patient outcomes, and maintaining a safe environment. The result of this study was in the same line **Shin, Kim, & Lee, (2023)** reported that nearly half of ICU nurses demonstrated high communication competency. Similarly, **Al-Mahmoud et al., (2022)** and **Park et al., (2021)** revealed that about half of nurses had high communication safety competency.

The current study showed that more than one third of nurses had a moderate level of safety risk management competency due to the majority of nurses agree that they monitor their performance data to assess risk and improve outcomes, as well as review and update risk assessment reports manually and securely. This result was in the same line with the study results of **Hwang & Kim, (2020)** and **Aboshaiqah, Baker, Qasim, & Rashdan, (2019)** who revealed that nurses working in intensive care units demonstrated moderate safety risk management competencies, Conversely, **El-Sayed & Sleem, (2020)** found that nurses working in critical care units exhibited a low level of safety risk management competencies, especially in risk assessment and hazard reporting.

The present study showed that more than half of nurses had low level of optimization human and environmental factors competency related to that more than half of nurses had neutral in their agreement about the hospital administration provides adequate resources in work environment and nearly to half neutrally sets safety guidelines for nurses. From the researcher points of view, this result may be due to limited access to advanced health information systems, budget

constraints in the effective use of these technologies.

According to study findings of **Jennings, Outhwaite, Granek, & Haq, (2025)** noted that more than half of nurses' struggle with managing human limitations in high-pressure settings like the ICU. Similarly, **Kohanová & Bartoníčková, (2024)** found that nurses reported insufficient resources and poor unit layout as barriers to optimizing environmental safety.

The current study results illustrated that nearly to half of nurses had a high level of identification and reporting of adverse events competency. From researcher point of view, this result may be related to nursing professionals who have the security and ability to perform the notifications. Hospitals that work on raising awareness and patient safety have good responses from practitioners regarding records. This result was similar to result of **Abuosi et al., (2022)** showed timely and reliable reporting of adverse events is critical for organizational learning and the improvement of more dependable healthcare systems. On the contrary, these results were in line with a previous study **Tang et al., (2025) and Son, Lee, & Ko, (2019)** had reported low safety competencies correlated with

identification and reporting of adverse events.

Correlation between nurses' professionalism and safety competencies

The present study showed that there was a positive significant statistical correlation between nurses' professionalism and their safety competencies. This correlation may be supported by the fact that nurses with higher professionalism able to seek additional training, engage in teamwork, and demonstrate the necessary skills to manage risks effectively. This result is congruent with **Ha, Seo, & Lee, (2023) and Chron (2021)** who reported that nursing professionalism is positively associated with safety competencies.

Conclusion & Recommendations

It was concluded that more than sixty percent of nurses had a high level of professionalism and more than fifty of them had a moderate level of safety competencies. There was a positive statistically significant correlation between intensive care nurses' overall professionalism and their safety competencies.

Recommendations:

Based on the results of the current study, it was recommended that
-Provide educational programs, seminars and workshops for nursing staff about professionalism and

safety competencies to increase advancement of nursing profession.

-Ensure safe work environment with adequate staff, equipment to enhance nurses' professionalism and safety competencies.

-Monitoring quality improvement initiatives through feedback, suggestions and committee involvement.

Promote teamwork and effective communication to improve coordination and prevent safety lapses in critical situations.

Allocate nursing staff based on their competencies and patient needs to ensure specialized and effective care.

-Future research is needed to confirm the current study results in different health care sectors.

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Nurses' Perception of Workloads in Relation to the Quality of Patients' care

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Abstract

Background: Nursing workloads are significant occupational stresses for nurses in a number of care settings. Nurses who are under work-related stress may struggle to function efficiently and effectively. Perceived increased nursing effort has long-term effects for the nurse, the patient, and the healthcare system. The nurse workload is obviously connected to patient safety, quality of patients' care, and the cost of healthcare. **Aim:** Assess the relation between nurses' perception of workloads and quality of patients' care. **Methods:** Descriptive correlation research design. **Setting:** all intensive care units at Tanta university Hospitals. **Subjects:** A stratified proportional randomized sampling of intensive care nurse (n=257) who were working in intensive care units at Tanta university Hospitals and stratified proportional randomized sampling of intensive care, patients (n=278). **Tool:** Tool I: Nurses' Perception of Workloads Questionnaire. Tool II: quality of Patients Care Questionnaire. **Results:** (62.3%) of the nurses show high level of overall perception regarding workload, while (36.2%) of the nurses had moderate overall level of perception regarding workload, and minority (1.6%) of them had a low overall level of perception regarding workloads. As majority (85.3%) of patient had low overall level of perception regarding quality of patients' care. While, the minority (9.4%) of them had moderate level perception regarding quality of patients' care. **Conclusion:** There was a positive statically significant correlation between nurses 'over all perception of workloads and patients perception of quality of care. **Recommendations:** Head nurses have to provide psychological support to nurses, Flexible work schedules. Educational training program was required for nurses about time management skills among nurses on perceived workload and quality of patients care.

Keywords: Nursing workload, Patients care, Quality of care

Introduction

Nurses play a pivotal role in helping and tending to patients. As the biggest staff in most health institutions, nurses are essential to both health promotion and the quality of treatment provide (**Kang & Shin, 2024**). Nursing is defined by a variety of job kinds, high levels of intensity, coordination of several work types, erratic work schedules, and complicated operational scenarios. Nurses are essential to maintaining the standard of healthcare (**Vaisi-Raygani , Moradi, Salari, Fattahi, & Hadadian, 2025**). The workload is recognized to affect the actions and efficiency of nurses in their professional environment (**Nemati-Vakilabad, Ebadi,Homaei, Hoseini & Mirzaei, 2025**).

Workload is defined as the quantity of principal duties assigned, might endanger nurses' physical and mental well-being and lower job satisfaction while increasing job burnout (**Poudel,2025**). Nursing workload is characterized as the result of the average daily number of patients attended to, modified by their level of dependence and care type, as well as the average duration of support provided to each patient (**Babaii, Rooholamin,Khoramirad,Moham madbeigi & Abbasinia,2025**).

The nursing workload demanded by patients in intensive care was recognized as a risk factor for adverse events, primarily resulting from pressure ulcers and/or medication errors (**Cassiano, Nogueira, Araújo, Lima,& Hanifi,2025**).

Nurses' perception of nursing workloads dimension; is shaped by the person's ability to process information and the demands of the task. Processing capacity is affected by personal traits (e.g. ability level, energy, individual behaviors and views), performance conditions (e.g. workplace environment and time pressures), task complexity (e.g. regular tasks versus unique or urgent procedures), and indirect factors (e.g. staffing configurations, administrative assistance, non-direct care obligations (**Safdari, Ramezani, Ayubi & Sadeghian, 2025**).

Effect of nursing workloads dimension ;this indicates that workloads negatively affect the physiological abilities of workers, observed in elevated body mass index and increased depression levels among nursing staff (**Masloń,Kamińska& Kvåle,2024**).The physiological stress responses noticed in nursing staff included back pain, fatigue, tiredness, stiff neck, and heartburn.

Additional repercussions involve emotional suffering linked to incidents involving prolonged and irregular working hours, insufficient workforce, and work shifts that led to a rise in workplace accidents and human mistakes, stress, sleep issues, heightened smoking, weakened immune response, digestive disorders, heart disease, and musculoskeletal problems **(Norouzi, Nabavi & Nohi, 2025)**.

Perception about causes of psychological pressure dimension; workloads are a collection of care and administrative tasks that include pressure to conform to societal norms and quick adjustment in the event of issues **(Hao et al., 2022)**. Numerous empirical researches have shown that psychological pressure is prevalent in the medical field. Nursing staff experiences psychological stress on a daily basis. These are the most important loads, and inadequate management and excessive demands are the main causes of them. Likewise, the sources of physiological nurses and the overabundance of tasks for other nursing specialties **(Saifan et al., 2024)**.

Nursing workload can directly affect the quality of the care provided for the patients which in return affects their safety, may affect the quality of the provided

care as nurses would have less time to spend with the relative physicians which increases the risk for developing mistakes and decreasing the quality of care **(Aydogdu, 2024)**. Patient care quality is defined by individuals' ability to access necessary health facilities, the care processes they require, and the effectiveness of the care provided. It refers to the extent to which healthcare services for individuals and communities enhance the chances of achieving desired health results and align with existing professional expertise **(Enahoro, Osunlaja, Maha, Kolawole & Abdul, 2024)**. The quality of patient care is what ensures patients feel satisfied with the services they receive **(Wang, Huang, Zhang, Liu & Chen, 2025)**.

Providing high-quality patient care also lowers nosocomial infections, reduces re-admission rates, enhances cost-effectiveness, and shortens hospital stays. While poor quality of patient care, elevated mortality rates, reduced patient satisfaction, and a rise in adverse events such as medication mistakes, falls, pressure sores, critical incidents, infections, and readmissions **(Al-Balas, Al-Maqableh, Athamneh & Odeibat, 2025)**.

The quality of patient care is categorized into four dimensions: the art of treating patients, the rationing of nursing care quality, health education, and the continuity of nursing care. The art of treating patients dimension refers to how one interacts with patients. The main function of a nurse is to support and tend to patients while communicating with them in clear language **(Tessema, Nuhu, Obeng, & Assefa, 2024)**. Rationing of nursing care quality dimension involves the withholding or neglect of specific care elements due to constrained resources like time, staffing, or skill variety **(Antoszewska& Gutysz-Wojnicka, 2024)**.

The health education dimension provides organized opportunities for learning incorporating communication strategies aimed at enhancing health literacy practices. The continuity of nursing care aspect focuses on the quality of patient care throughout the duration of their treatment. It is a method where the patient and the healthcare provider work together in continuous healthcare management to achieve the common Objective of high quality and cost effective medical care. **(Prior,Rasmussen,Virgilsen,Vedsted&Vestergaard, 2025)**.

Significant of study:

Nurses face constant workloads due to four primary factors: heightened demand for nursing staff, insufficient nurse supply, staff reductions with increased overtime, and shorter patient lengths of stay. These workloads hinder nurses' ability to evaluate patient conditions effectively, preventing them from achieving optimal patient outcomes. This situation contributes to elevated job stress, diminished job satisfaction, a rise in occupational injuries, challenges in decision-making that induce mental strain and job burnout , restrictions in professional relationship, and time constraints that hinder effective training and oversight of new nursing staff, ultimately leading to nurses' dissatisfaction with their work life. **(Almgadawi et al., 2024)** The negative impact of workloads on patients includes: incorrect patient evaluations, faulty patient registrations, and dissatisfaction among patients Imbalanced nursing workloads may result in medication mistakes, falls, and pressure sores.This negatively on the level of quality of patient care. So, the present study aims to assess nurses' perception of workloads and it's relation to quality of patients care. **(Heydarikhat et al.,2024)**

Aim of the Study

Assess the relation between nurses' perception of workloads and quality of patients' care.

Research questions;

1-What are the levels of nurses' perception of workloads?

2-What are the levels of patient perception of quality of patients' care?

3-What is the relation between nurses' perception of workloads and quality of patient care?

Research design:

A descriptive-correlation study design was used in this study.

Setting:

This study was conducted at Tanta University Hospitals affiliated to the Ministry of Higher Education and Scientific Research. The study involved all ICUs at Tanta University Main Hospitals including;

Cardiac ICU, Neurology ICU , pediatric hospital ICU, Medical ICU, Chest ICU .

Subjects:

The study's subjects consisted of:

-A stratified proportional randomized sampling of intensive care patients (n=1000) who were hospitalized in the previously mentioned settings

-A stratified proportional randomized sampling of intensive care nurses (n=767) who were

working in the previously mentioned settings. The sample was proportionally allocated across departments using the formula

$$n_i = \left(\frac{N_i}{N} \right) \times n$$

Tools of data collection

Two tools were utilized for the collection of data.

Tool I: Nurses' Perception of Workloads Questionnaire

This part was used to assess nurses' perception of workloads. This tool was developed by the researcher based on ,Al-Maani, (2006), and Amaar& Aboelrose, (2006), Elsayad, Shazly & Mahmoud, (2017).and related literature Realyvásquez et al.,(2023) .It included two parts:

Part I: Nurses' personal data included age, sex, marital status, level of education, current position, units, year of experience , current units years of experience.

Part II: Nurses' perception of workloads Questionnaire:

It included a total of 59 items divided into the following three domains as follows;

-Perception about nursing workloads included the following sub scales;

-Work environment; included 5 items

-Relationship within the Work; included 5 items

-Personal Factors; included 4 items

-Professional development; included 3 items

-Supervision pattern; included 7 items

-Work conflict ; included 3 items

-Perception about the effect of nursing workloads; included 17 items

-Perception about causes of psychological pressure as a result of the workloads including the following subscale;

- **Internal causes;** included 8 items

- **External causes;** included 7 items

Scoring System: Nurses responses were measured on a 5-points Likert Scale ranging from (1-5) where, strongly disagree (1), disagree (2), uncertain (3), agree (4), and strongly agree (5). The summing scores of all categories were calculated and classified according to statistical cutoff points as follows:

-Low level of workloads <60%

-Moderate level of workloads 60% - <75%

-High level of workloads $\geq 75\%$

Tool II: Quality of Patients Care Questionnaire

This tool was developed by the researcher based on **Sheasha, (2016) and related literature Singh& Meeks, (2023).**

This tool was included two parts;

Part I: Patient personal data ; age, sex, marital status, level of

education, occupation, and the number of hospital admission, units.

Part II: This part intended to assess the level of quality of patients' care

It included a total of 34 items divided into four domains as follows;

-Art- treated patients; included 5 items

- **Rationing of nursing care quality;** included 12 items

-Health education; included 7 items (No18-24)

-Continuity of nursing care; included 10 items

Scoring system:

Patients ' responses were measured on a 5-points Likert Scale ranging from (1-5) where strongly disagree (1), disagree (2), uncertain (3), agree (4), and strongly agree (5).

The summing scores of all categories were calculated and classified according to statistical cutoff points as follows:

-Low level of workloads <60%

-Moderate level of workloads 60% - <75%

-High level of workloads $\geq 75\%$

Method

-An official permission was obtained from the Dean of Faculty of Nursing Tanta University and the authoritative personnel of all intensive care units of Tanta University Hospitals that submitted

to the previously mentioned settings

Ethical consideration

-Approval from the Scientific Research and Ethical Committee at Faculty of Nursing was obtained with code 402-3-2024

-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.

-The right to terminate participation at any time was accepted.

-The nature of the study didn't cause any harm for the entire sample.

-Assuring the nurses and patients about the privacy and confidentiality of the collected data and explain that it was used for the study purpose only.

-Tool I and II was modified, developed and translated into Arabic and presented to a jury of five experts in the area of specialty to check their content validity. The experts were; three professors of Nursing Administration Department and two assistant professors Nursing Administration Department at Faculty of Nursing, Tanta University.

-The jury experts responses were reported in four points scale ranging from (1 – 4) from(1-4); 1= strongly irrelevant, 2 =little relevant, 3

=relevant, 4 =strongly relevant. Essential modification were done including; illustration, avoiding certain items and adding others.

-The content validity value of tool I: Nurses' perception of workloads were 97.4% and tool II: Quality of patients' care were 98.5%

-A pilot study was carried out on 10% of the selected subjects (26 nurses and 28 patients) who were convenient at the time of data collection and included in sample size. A pilot study was carried out after the experts' opinions and before starting the actual data collection. The pilot study was done to test clarity, sequence of items, applicability, and relevance of the questions and to determine the needed time to complete the questionnaire. According to feedback from the pilot study, the tools were included in study sample.

-The researcher used tool's reliability to assess the internal consistency of the tools by administering them to the same participants under identical conditions. Reliability of the tool was ascertained by measuring the internal consistency of its items using Cronbach Coefficient Alpha Test where $r = 0.876$ for tool I and 0.909 for tool II.

Data collection phase:

Data was collected from the nurses by the researcher. The researcher distributed tools on nurses individually at their work setting during the morning and afternoon shifts. The researcher met nurses and head nurses in the waiting area of their department and patients in their units to explain the aim of the study and distribute the questionnaire sheet for them. The subjects recorded the answer in the presence of the researcher to clarify any questions needed.

-The time needed to complete the questionnaires items from the subjects were between 20-30 minutes for two the tools.

-Data was collected over a period of six months started from April 2024 to the end of September, 2024)

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.

The used tests were

Chi-square test: For categorical variables, to compare between different groups. **Monte Carlo correction:** 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.

Results

Table (1): Shows nursing characteristics, showed that, less than two thirds (66.1%) of nurses aged 30 – <40 years with mean $\pm$ SD(32.43 ± 4.45) . More than half (59.5%) of the nurses were female. more than half (57.2%) of them were married. More than one third (38.9%) of them had technical nursing degree .The majority (86.8%) of the nurses working as staff nurse. Less than half (42.8%) of the nurses were working at neurology intensive care units, More than one quarter (29.6%) of nurses working at cardiac intensive care units, About less than nearly one quarter (20.2%) of them working at intensive care units in chest hospital, The minority (3.9%) of nurses working at Intensive care unit in medical hospital, The minority (3.5%) of nurses working at Intensive care unit in pediatric hospital .More than one third

(37.7%) of nurses have >10 years of hospital experience with mean $\pm$ SD(8.68 $\pm$ 4.99) .Less than half (49.4%) of nurses have 5-10years of department experience with mean $\pm$ SD (6.02 $\pm$ 3.72).

Table (2): Shows study patients' characteristic data, It was observed showed that more than half(51.8%) of patients aged >50 years. More than half (52.2%) of the patients were males .More than half (50.4%) of them were unmarried. About less than nearly one quarter (21.9%) and equal percent of them read and write and had technical diploma. (20.1%) of patients had university degree. More than half (54.7%) of them were employed. More than one quarter (28.1%) of them were admitted to hospital more than three times.

Table (3): Shows levels and mean score of nurses' perception of workloads Reveals mean scores and standard deviation of nurses'perception of workloads. It showed that the mean percent of overall nurses'perception of workloads (76.25%).The highest mean percent of nurses'perception of workloads (80.45%) for the perception about the effect of nursing workloads .while, relationship within the work was the lowest mean percent (71.09%).

Table (4): Clarifies Mean scores and standard deviation of the quality of patients'care perceived by patients, Reveals mean scores and standard deviation of the quality of patients'care as perceived by patients was (52.68%). The highest mean percent of quality of patients'care was (53.4%) for rationing of nursing care .While, continuity of nursing care was the lowest mean percent (52.14%).

Table (5): Shows levels of nurses 'perception of workloads dimensions, Illustrates levels of nurses'perception of workloads dimensions. this table display that the majority (86.4%) of nurses had high level of nurses'perception about the effect of nursing workload, less than three quarters(73.9%) of nurses had high level of overall perception about causes of psychological pressure as the result of workloads , While (47.9%) of nurses had moderate level of overall perception about nursing of workloads

Table (6): Shows Levels of Quality of patients'care dimension as perceived by patients, Illustrates Levels of Quality of patients' care dimension as perceived by patients. This table demonstrated that high percent (71.6%) of patients had low level of perception regarding continuity of

nursing care dimension. As well as more than two thirds (69.1%,67.6%, 62.6%) of patients had low level of perception regarding rationing of nursing care quality, health education, and art treated patients dimensions respectively.

Figure (1): Demonstrates Studied Nurses' over all perception of workloads, Show Overall level of nurses' perception regarding workloads. It revealed that less than two third (62.3%) of the nurses had a high level of overall perception regarding workload, while(36.2%) of the nurses had moderate overall level of perception regarding workload, and minority (1.6%) of them had a low overall level of perception regarding workloads.

Figure (2): Illustrates Studied patients perception of quality of care. Show level of quality of patients' care as perceived by patients. It revealed that the majority (85.3%) of patient had low overall level of perception regarding quality of patients'care. While, the minority (9.4%) of them had moderate level perception regarding quality of patients'care.

Figure (3) Shows that there is weak statistical correlation between nurses 'overall perception of workloads and patients perception of quality of care, where $r=0.125$, $p\text{-value}<0.046$

Table (1): Distribution of the studied Nurses according to their personal characteristics and work related data (n = 257)

Personal data	No.	%
Age (years)		
<30	81	31.5
30 – <40	170	66.1
≥40	6	2.3
Min. – Max.	23.0 – 41.0	
Mean ± SD.	32.43 ± 4.45	
Gender		
-Male	104	40.5
-Female	153	59.5
Marital status		
-Married	147	57.2
-Un-married	110	42.8
Level of education		
-Secondary Nursing Diploma Degree	34	13.2
-Technical Nursing Degree	100	38.9
-Bachelor Degree	58	22.6
-Post Graduate Studies	65	25.3
Current position		
-Head Nurse	34	13.2
-Staff Nurse	223	86.8
Department		
-Cardiac intensive care units	76	29.6
-Neurology Intensive care units	110	42.8
-Intensive care units in pediatric hospital	9	3.5
-Intensive care unit in medical hospital	10	3.9
-Intensive care unit in chest hospital	52	20.2
Hospital years of experience		
<5	69	26.8
5 – 10	91	35.4
>10	97	37.7
Min. – Max.	1.0 – 21.0	
Mean ± SD.	8.68 ± 4.99	
Departments years of experience		
<5	102	39.7
5 – 10	127	49.4
>10	28	10.9
Min. – Max.	1.0 – 20.0	
Mean ± SD.	6.02 ± 3.72	

SD: Standard deviation

Table (2): Distribution of the studied patients according to their personal characteristics (n = 278)

Personal data	No.	%
Age (years)		
<30	40	14.4
30 – 50	94	33.8
>50	144	51.8
Min. – Max.	18.0 – 90.0	
Mean ± SD.	52.70 ± 20.22	
Sex		
Male	145	52.2
Female	133	47.8
Marital status		
Married	138	49.6
Unmarried	140	50.4
Level of Education		
Read & Write	61	21.9
Basic Education	50	18.0
Technical Diploma	61	21.9
Associate Degree	50	18.0
University Degree	56	20.1
Occupation		
Employed	152	54.7
Unemployed	126	45.3
Number of Admissions to this Hospital		
Once	64	23.0
Twice	63	22.7
Three times	73	26.3
-More than three times	78	28.1
Department		
Cardiac intensive care units	41	14.7
Neurology Intensive care units	80	28.8
Intensive care units in pediatric hospital	7	2.5
Intensive care unit in medical hospital	87	31.3
Intensive care unit in chest hospital	63	22.7

SD: Standard deviation

Table (3): Mean Score and standard deviation of nurses' perception of workloads (n = 257).

Workloads dimensions	Score Range	Total Score		Average Score (1 – 5)	Percent Score	Rank
		Min. – Max.	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	
Perception about nursing						
Work environment	(5 – 25)	8.0 – 25.0	19.28 $\pm$ 2.91	3.86 $\pm$ 0.58	71.42 $\pm$ 14.56	7
Relationship within the Work	(5 – 25)	10.0 – 25.0	19.22 $\pm$ 2.60	3.84 $\pm$ 0.52	71.09 $\pm$ 12.99	8
Personal Factors	(4 – 20)	7.0 – 20.0	15.68 $\pm$ 2.18	3.92 $\pm$ 0.55	73.03 $\pm$ 13.63	5
Professional development	(3 – 15)	4.0 – 15.0	11.59 $\pm$ 2.12	3.86 $\pm$ 0.71	71.56 $\pm$ 17.68	6
Supervision pattern	(7 – 35)	8.0 – 33.0	27.66 $\pm$ 3.40	3.95 $\pm$ 0.49	73.79 $\pm$ 12.13	4
Work conflict	(3 – 15)	4.0 – 15.0	11.86 $\pm$ 2.08	3.95 $\pm$ 0.69	73.83 $\pm$ 17.31	3
Overall A. Perception	(27 – 135)	75.0 – 121.0	105.30 $\pm$ 7.70	3.90 $\pm$ 0.29	72.50 $\pm$ 7.13	
Perception about the effect	(17 – 85)	38.0 – 85.0	71.70 $\pm$ 9.21	4.22 $\pm$ 0.54	80.45 $\pm$ 13.54	
Perception about causes of psychological						
Internal causes	(8 – 40)	22.0 – 38.0	32.93 $\pm$ 3.23	4.12 $\pm$ 0.40	77.89 $\pm$ 10.09	2
External causes	(7 – 35)	19.0 – 35.0	29.04 $\pm$ 3.42	4.15 $\pm$ 0.49	78.70 $\pm$ 12.23	1
Overall C. Perception	(15 – 75)	22.0 – 38.0	32.93 $\pm$ 3.23	4.12 $\pm$ 0.40	77.89 $\pm$ 10.09	
Overall workloads	(59 – 295)	174.0 – 269.0	239.0 $\pm$ 14.61	4.05 $\pm$ 0.25	76.25 $\pm$ 6.19	

Table (4): Mean scores and standard deviation of the quality of patients' care perceived by patients (n = 278)

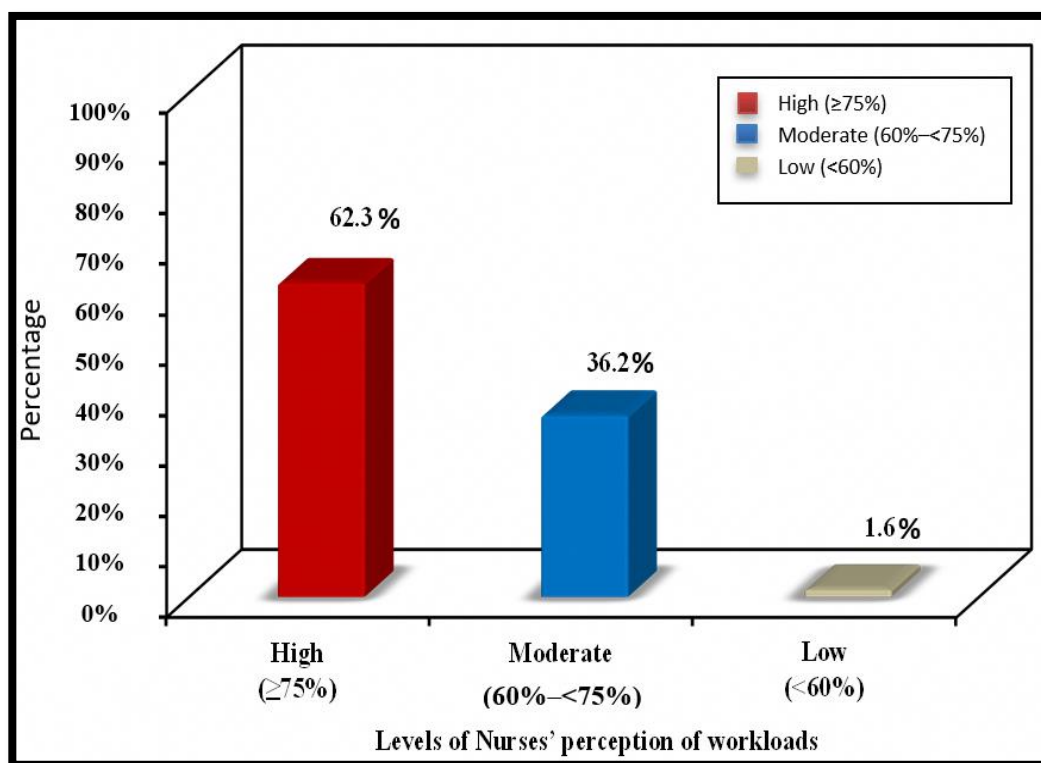
	Score Range	Total Score		Average Score (1 – 5)	Percent Score	Rank
		Min. – Max.	Mean ± SD	Mean ± SD	Mean ± SD	
Art- treated patients	(5 – 25)	6.0 – 25.0	15.53 ± 3.67	3.11 ± 0.73	52.64 ± 18.33	2
Rationing of nursing care quality	(12 – 60)	20.0 – 59.0	37.63 ± 6.03	3.14 ± 0.50	53.40 ± 12.57	1
Health education	(7 – 35)	11.0 – 35.0	21.63 ± 4.31	3.09 ± 0.62	52.25 ± 15.39	3
Continuity of nursing care	(10 – 50)	18.0 – 49.0	30.86 ± 5.33	3.09 ± 0.53	52.14 ± 13.32	4
Overall	(34 – 170)	78.0 – 162.0	105.7 ± 14.19	3.11 ± 0.42	52.68 ± 10.43	

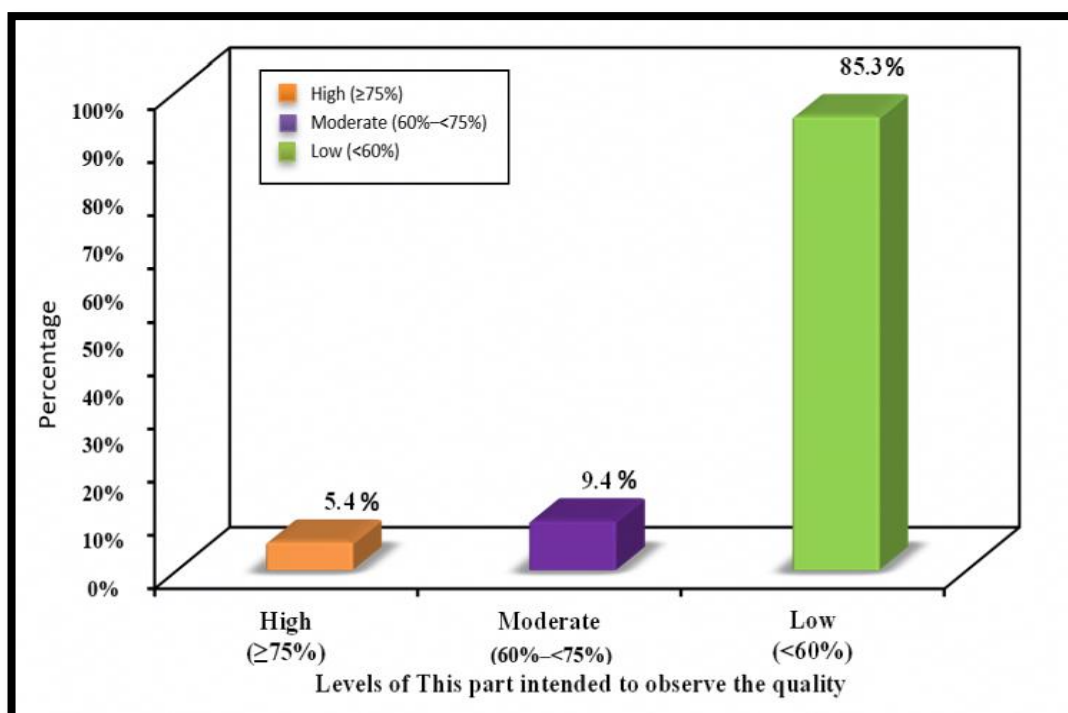
Table (5): Levels of nurses' perception of workloads dimensions (n=257)

Workloads dimensions		Level of nurses' perception of workloads					
		High (≥75%)		Moderate (60 – <75%)		Low (<60%)	
		No.	%	No.	%	No.	%
A	Perception about nursing workloads	121	47.1	123	47.9	13	5.1
B	Perception about the effect of nursing workloads.	222	86.4	32	12.5	3	1.2
C	Perception about the causes of psychological pressure as the result of workloads.	190	73.9	59	23	8	3.1

Table (6): Levels of Quality of patients' care dimension as perceived by patients (n=278).

Dimensions	Levels of This part intended to observe the quality					
	High ($\geq 75\%$)		Moderate (60 – <75%)		Low (<60%)	
	No.	%	No.	%	No.	%
Art- treated patients	43	15.5	61	21.9	174	62.6
Rationing of nursing care quality	17	6.1	69	24.8	192	69.1
Health education	26	9.4	64	23.0	188	67.6
Continuity of nursing care	15	5.4	64	23.0	199	71.6

**Figure (1): Studied Nurses' over all perception of workloads.**



Figure(2): Studied patients perception of quality of care

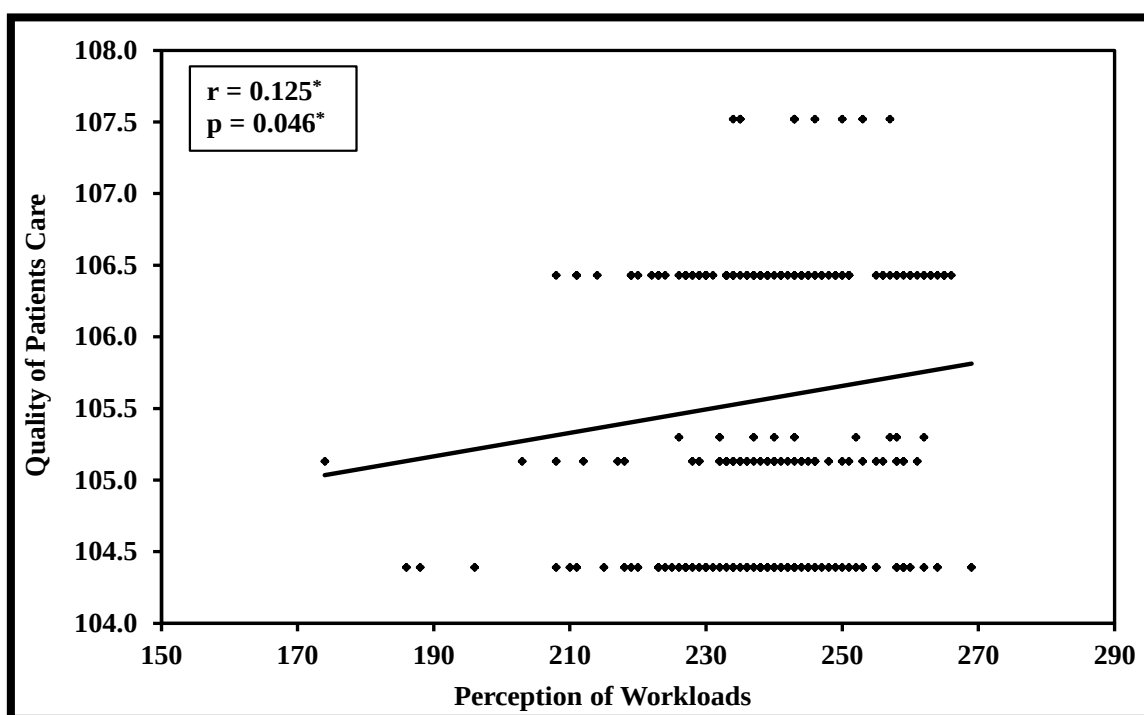


Figure (3): Correlation between nurses' overall perception of workloads and patient's perception of quality of care.

Discussion

Nursing workload is a complex, multidimensional construct that extends beyond patient numbers or shift hours and directly affect the quality of patients' care which in return affects their safety. This may impact the nurses' abilities to work and reduces the efficiency of the provided care owing to the reduced cognitive and physical capabilities, which can affect the quality of the provided care for the patients. (Cerela-Boltunova & Millere, 2025)

A high quality of patient care also reduces nosocomial infection, decrease the rate of re admission, cost effectiveness and decrease length of stay on hospital. While poor quality of patient care, increased mortality, decreased patient satisfaction and increased patient adverse events such as medication errors, falls, pressure ulcers, critical incidents, infections and readmission (Guzmán-Leguel & Rodríguez-Lara, 2025)

Level of nurses workloads

The present study's findings are supported by (De Groot, et al., 2022) demonstrated that nurses had high level of perception regarding workloads. and, Phillips, (2020) confirm that the findings

indicate the higher the nurses' workload perception. Othman, et al., (2022) reported that more than three quarters of participants perceived high level of workload. This may due to bad supervision style inadequate equipment and supplies, absence of staff development opportunities and staff shortage. and, Cerela-Boltunova & Millere, (2026) reported that nurses had high level of perception of workloads during day and night shift due to Staffing levels are not adequately adjusted to actual care demands.

While Contradictory to this results, Zhang, et al., (2021) show that nurses perceived low workload also, Mohammed Soliman & Mahmoud Eldeep, (2020) found that low level of nursing workload associated with strong teamwork among nurses.

The present study results revealed that less than half of nurses had moderate and high level of perception regarding perception about nursing workload dimension, this results due to that there is inadequate staffing, searching for equipment consuming significant time, more than three quarter of nurses agree that there is insufficient number of nursing for

performance of nursing service ,lack of supplies and equipment required to perform good service, more than two third of nurses agree that there absence of spiritual team work affect negatively of work, non nursing tasks, high percent of nurse agree that assigned to performed tasks are not from their specialty and more than two third of nurses agree that work demand exceed abilities and capabilities as the result of long working hours, come early and stay late to complete tasks.

The present study's results are supported by **Trevilato, et al.,(2025)**. who confirmed that nurses had high level of perception regarding nursing workloads. and, **Gustifram, Azwardi, & Fitrianto, (2026)** reported that nurses had high level of perception regarding nursing workloads as result of excessive physical and mental job demands reduce employees' ability to perform optimally and, **Ivziku, et al.,(2022)** showed that Patient acuity, staffing resources, patient transfers, documentation, patient isolation, unscheduled activities and patient specialties were significant in predicting perceived workload and, **Rashed, et al.,(2022)** clarified that majority of nurses perceived

high level of total nursing work overload Also, agreement with **Browne & Braden, (2020)** who mentioned that most of studied nurses reported high workload

This study's results contradict **Galatzan, etal.,(2025)** who showed that nurses had low perception regarding nursing workload, and, **Siregar,et al.,(2026)** reported that nurses had low level of perception of workload due to the ability to manage stress effectively

Level of quality of patients'care as perceived by patients

The present study findings revealed that the majority of patient had low overall level of perception regarding quality of patients'care. The explanation of these results could be that around less than three quarter of patients had low perception regarding to continuity of nursing care dimension. As well as more than two thirds of patients had low level of perception regarding rationing of nursing care quality, health education, and art treated patient's dimensions.

Conclusion: There was a positive statically significant correlation between nurses 'over all perception of workloads and patients perception of quality of care.

Recommendations: Head nurses have to provide psychological support to nurses, Flexible work schedules. Educational training program was required for nurses about time management skills among nurses on perceived workload and quality of patients care.

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Mothers' Knowledge and Practices regarding Toilet Training of their Children with Autism Spectrum Disorders

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Abstract

Background: Autism spectrum disorders (ASD) is a neurodevelopmental condition that characterized by deficits in social and communication abilities . Children with autism face difficulties in mastering toilet training skills. Therefore, mothers play an important role in toilet training of their children with autism.

Aim: Assess mothers' knowledge and practices regarding toilet training of their children with autism spectrum disorders. **Research design:** A descriptive research was utilized. **Subjects:** A purposive sampling of 40 mothers of children with autism was involved. **Setting:** The study was conducted at Pediatric Outpatient Clinic in Psychiatric Center of Tanta Main University Hospital, Egypt.

Tools: Two tools were used to collect data. **Tool (I):** Mothers' knowledge regarding Toilet Training. **Tool (II):** Mothers' reported practices regarding toilet training.

Results: Majority of studied mothers (95%) had low level of total knowledge, while most of them (97.5%) had unsatisfactory level of practice regarding preparation for toilet training and assistance of children during toilet training, while 92.5% of them had unsatisfactory practice in toilet after care.

Conclusion: The majority of mothers had low level of knowledge and unsatisfactory reported practices regarding toilet training of their children with autism spectrum disorders. **Recommendation:** Educational programs should be designed for mothers to improve their knowledge and practice regarding toilet training.

Keywords: Autism Spectrum Disorders, Mothers' Knowledge, Mothers' Practice, Toilet Training.

Introduction

Autism spectrum disorders (ASD) is a neurodevelopmental condition characterized by deficits in social and communication abilities, along with the manifestation of restricted and/or repetitive behaviors, interests, and activities. Autism Spectrum Disorders ranks as the third most common developmental disorder. **(Bertolotto, Pfeifer, & Sposito, 2024)**

Although the exact cause of Autism spectrum disorders is still unknown, a number of theories have been proposed to explain the pathogenesis which include neural migration, neural connectivity, an imbalance between excitatory and inhibitory neural activity, and mitochondrial dysfunction theories. These perspectives demonstrate complexity and multifaceted nature of Autism Spectrum Disorders. **(Nagib,Elrakhawy, & El-Nefiawy, 2023)**

Toilet training (TT) is a critical developmental milestone for learning adaptive skills and achieving independence. Toilet training has many positive effects on autistic children and their parents. It promotes personal hygiene, reduces risk of urinary tract infection, and increases social

interaction. Parents can invest more time and effort into management of core Autism Spectrum Disorders' symptoms. **(Bertolotto et al., 2024)**

The appropriate age to initiate toilet training is between 18 and 24 months. Mothers should wait until their children show clear signs of physical, mental, and psychological readiness before beginning the toilet training. They shouldn't depend on the children's age only to begin toilet training, as every child develops at their own pace. **(Wyndaele, Kaerts, Wyndaele, & Vermandel, 2020)**

Mothers have a vital role in success toilet training. Mothers must be prepared and able to recognize physical, mental, and psychological signs of a child's readiness for toilet training. Mothers of children with autism need to be calm, patient, and have consistent, optimistic attitudes to maintain consistency and success of training. **(Osos et al., 2025)**

Significance of the study:

The incidence and prevalence of autism spectrum disorders among children is increasing globally. It is estimated that 1 in 100 of children globally are thought to have autism. In Egypt, 33.6% of children with developmental impairments have

Autism Spectrum Disorders. (Hasan,& Elhamshary, 2023; Zeidan, 2022)

Children with Autism Spectrum Disorders face several specific challenges in toilet training which result in difficulties and delays in mastering toilet training skills in children with autism. (Ahmad et al., 2024).

The role of pediatric nurse in educating mothers about specific strategies to overcome toilet training challenges that confront children with autism spectrum disorders necessitates assessment of mothers' knowledge and practices and sustainability of toilet training skill. Therefore, This study was carried out to assess mothers' knowledge and practices regarding toilet training of their children with autism spectrum disorders.

Aim of this study

Assess mothers' knowledge and practices regarding toilet training of their children with autism spectrum disorders.

Research questions:

- What are the mothers' knowledge regarding toilet training?
- What are mothers' reported practices regarding toilet training of their children with autism spectrum disorders.

Subjects and Method

Design:

A descriptive research design was used in this study.

Study settings:

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

Study subjects:

A purposive sampling of all mothers (40) who had children with age from 2- 6 years old and don't have toilet control at the time of the study were involved.

Study tools:

Two tools were used in this study:

Tool I: Mothers' knowledge regarding Toilet Training:

This tool was constructed by the researcher and comprised two distinct parts as follows:

Part (1): Mothers' Socio-demographic Data:

A- Mothers' socio-demographic data: it included mothers' age, marital status, educational level, occupation, residence and family income.

B- Family medical history: it included parent's consanguinity, degree of consanguinity, history of

autism and family history of chronic disease.

Part (2): Mothers' Knowledge regarding toilet training: It was developed by researcher after reviewing recent and related literatures (Madkour et al., 2023; Mohammed, & Ali, 2021; Barutçu et al., 2024). It was used to assess mothers' general knowledge about toilet training and children's readiness for toilet training.

Mothers' knowledge was scored as following:

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

Total score was calculated into:

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

Tool II: Mothers' reported practice regarding toilet training:

It was developed by the researcher after reviewing recent and related literatures (Abd El-momiem et al., 2020, Bertolotto, Pfeifer, & Sposito, 2024, Ito, & Inoue, 2022) to assess mothers' reported practices regarding toilet training for their

children with autism. It included three distinct parts as following:

-Part (1): Preparation for toilet training.

-Part (2): Practices during toilet training

-Part (3): Post toilet care.

Mothers' Reported Practice was scored as follow:

- Done skill was scored (1).
- Not done skill was scored (0).

The total score of Mothers' reported practice was classified into:

- Satisfactory level was considered from $\geq 70\%$.
- Unsatisfactory level was considered from $< 70\%$.

Method:

The study was accomplished through the following steps:

Administrative process:

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

Ethical considerations:

- Ethical approval for conducting the study was obtained from the Scientific Research Ethics Committee of the Faculty of Nursing, (Code No. 589-2-2025).
- The nature of the study did not cause any harm or pain to any participant in the sample.

-Confidentiality and privacy of all collected data was strictly maintained throughout the study.

-Informed consent was obtained from mothers prior to participation.

-Two tools were used for data collection.

-The questionnaire validity was 94% with level of significance more than 90%.

-A pilot study was conducted on 10% of the total sample (4 mothers) to assess the clarity, applicability, and feasibility of data collection tools. No significant modification was done. A pilot study was involved in the current sample.

-Test of reliability using Cronbach's Alpha Coefficient test was utilized by the pilot subjects. It was 0.874 for mothers' knowledge regarding toilet training tool and 0.846 for mothers' reported practice regarding toilet training.

-During the initial interview, researcher explained the purpose of the study to the mothers and assessed their knowledge and their reported practices regarding toilet training for their children with ASD using tool I & tool II.

Statistical analysis:

The statistical analysis of the data was performed using IBM SPSS software version 27.0 (IBM Corp, 2020) Categorical data were

summarized as numbers and percentages. For continuous data, normality was assessed using the Shapiro-Wilk test. Quantitative data were described using range (minimum and maximum).

Results

Table (1): Shows percentage distribution of the studied mothers according to their socio-demographic characteristic. It was found that nearly half of mothers (47.5%) their age was $20 < 30$ years old with mean $\pm$ SD 30.83 ± 7.20 years .It was found that most of the mothers (97.5%) were married. Regarding educational level, 55% of mothers had secondary Education / Diploma and majority of them (85%) were unemployed. It was found that nearly two thirds of the mothers (62.5%) were living in rural areas most of the them (80%) had Sufficient family income.

Table (2): Shows distribution of the studied mothers according to their family medical history. It was found that the majority of mothers (87.5%) had no consanguinity, and less than two-thirds (60.0%) had a second-degree consanguinity. It was also found that all of the mothers (100.0%) had no a family history of autism.

Regarding family history of chronic diseases, it was clear that more than

half of the mothers (57.5%) had no family history of chronic diseases. Among family members with chronic diseases, it was found that nearly half of them (47.1% & 58.8%) were grandmothers and suffered from hypertension respectively.

Table (3): Shows distribution of mothers' knowledge regarding toilet training. It was found that none of mothers had correct and complete answers regarding toilet training definition, and motor skills of two years & four years old child. Also, It was found that only one-quarter of mothers (25%) had correct and complete answer regarding appropriate age to start toilet training.

Table (4): Reveals percentage distribution of studied mothers according to their knowledge about toilet training for a child with autism spectrum disorders. It was found that the majority of mothers (95%) had correct and complete answer regarding child with autism need a longer period for toilet training.

Nearly one- third of mothers (30%&32.5) had incorrect answers regarding comfortable toilet sitting experience, resistance of toilet training respectively. Also, it was found that half of studied mothers

had incorrect answer regarding wash child hands after toilet and importance of diaper checking every 15 minutes.

Table (5): Reveals mothers' total knowledge regarding toilet training. Regarding general information about toilet training, it was clear that all of mothers (100%) had low level of knowledge. Concerning data related to toilet training for a child with autism spectrum disorders, It was found that (75% & 70%) of the mothers had low level of knowledge regarding toilet training for a child and children's readiness for toilet training respectively.

Figure (1): Shows mothers' overall knowledge regarding toilet training. It was noticed that majority of mothers (95%) had low level knowledge, while minority of mothers (5%) had moderate level of total knowledge regarding toilet training of their children.

Table (6): Shows percentage distribution of studied mothers regarding their reported practice of toilet training preparation. It was found that all mothers (100%) reported that they did not provide a simple explanation about toilet training and increase period between toilet attendances gradually. Also, it was noticed that majority of mothers

(90%) did not encourage the child's choices and did not prepare rewards for using after toilet.

Table (7): Demonstrates mothers' total reported practice regarding toilet training. It was noticed that the majority of studied mothers (97.5%) had unsatisfactory reported practice about preparation for toilet training and practices during toilet training. Concerning practices of care after toilet use, it was found that the majority of mothers (92.5%) had unsatisfactory practice about care after toilet.

Table (1): Percentage Distribution of Studied Mothers according to their Socio-Demographic Data (n = 40)

Socio-demographic data	No.	%
Age (years)		
20 < 30 years	19	47.5
30 < 40 years	17	42.5
40 – 50 years	4	10.0
Mean ± SD.	30.83 ± 7.20	
Marital Status		
Married	39	97.5
Widow	1	2.5
Educational Level		
Basic Education	2	5.0
Secondary Education / Diploma	22	55.0
University Education	16	40.0
Occupation		
Employed	6	15.0
Unemployed	34	85.0
Place of Residence		
Rural	25	62.5
Urban	15	37.5
Family Income		
Sufficient	32	80.0
Insufficient	8	20.0

Table (2): Percentage Distribution of Studied Mothers according to the Family Medical History (n = 40)

Family Medical History	No.	%
Parents' consanguinity		
Yes	5	12.5
No	35	87.5
Degree of consanguinity (n=5)		
Second degree	3	60.0
Third degree	2	40.0
History of autism		
No	40	100.0
Family history of chronic diseases		
Yes	17	42.5
No	23	57.5
Family member with chronic diseases[#] (n=19)		
Mother	7	41.2
Grandmother	8	47.1
Grandfather	4	23.5
Type of chronic disease[#] (n=24)		
Diabetes	8	47.1
Hypertension	10	58.8
Heart diseases	6	35.3

#: More than one answer

Table (3): Percentage Distribution of Studied Mothers according to their Knowledge about Toilet Training (n = 40)

General information about toilet training	Incorrect		Correct & incomplete		Correct & complete	
	No.	%	No.	%	No.	%
Definition of toilet training	18	45.0	22	55.0	0	0.0
Appropriate age to start toilet training	28	70.0	2	5.0	10	25.0
Motor skills of a two years child	13	32.5	27	67.5	0	0.0
Language development of a two years child	10	25.0	30	75.0	0	0.0
Motor skills of a three years child	16	40.0	23	57.5	1	2.5
Language development of a three years child	19	47.5	21	52.5	0	0.0
Motor skills of a four years child	15	37.5	25	62.5	0	0.0
Language development of a four years child	13	32.5	26	65.0	1	2.5
Motor skills of a five years child	12	30.0	28	70.0	0	0.0
Language development of a five years child	22	55.0	17	42.5	1	2.5
Motor skills of a six years child	7	17.5	32	80.0	1	2.5
Language development of a six years child	18	45.0	22	55.0	0	0.0

Table (4): Percentage Distribution of Studied Mothers according to their Knowledge about Toilet Training for a Child with Autism Spectrum Disorders (n = 40)

General information about toilet training for a child with autism spectrum disorders	Incorrect		Correct & incomplete		Correct & complete	
	No.	%	No.	%	No.	%
Child with autism need a longer period for toilet training	1	2.5	1	2.5	38	95.0
Causes of delay in toilet training	8	20.0	27	67.5	5	12.5
Importance of toilet training	10	25.0	27	67.5	3	7.5
Criteria of potty chair	23	57.5	16	40.0	1	2.5
Cleaning of potty chair after use	6	15.0	32	80.0	2	5.0
A mother know child needs for toilet training	13	32.5	18	45.0	9	22.5
Comfortable toilet sitting experience	12	30.0	25	62.5	3	7.5
Dealing with accidental urination /defecation outside the toilet	8	20.0	26	65.0	6	15.0
Resistance of toilet training	13	32.5	21	52.5	6	15.0
Fear of entering to the toilet	8	20.0	31	77.5	1	2.5
Fear of sitting on the toilet	9	22.5	29	72.5	2	5.0
Fear of running water sound	15	37.5	20	50.0	5	12.5
Fear of the flushing sound	11	27.5	27	67.5	2	5.0
Wash child hands after toilet	20	50.0	20	50.0	0	0.0
Needs for a longer period for toilet training	12	30.0	26	65.0	2	5.0
Effective methods of toilet training	18	45.0	20	50.0	2	5.0
Methods of successful toilet training	16	40.0	20	50.0	4	10.0
Importance of diaper checking every 15 minutes	20	50.0	17	42.5	3	7.5
The importance of using visual illustrations during toilet training	17	42.5	21	52.5	2	5.0
The goal of immediate rewards	12	30.0	26	65.0	2	5.0

Table (5): Percentage Distribution of Mothers' Total knowledge regarding Toilet Training (n = 40)

Mothers' Knowledge regarding toilet training	No.	%
General information about toilet training		
Low	40	100.0
Moderate	0	0.0
High	0	0.0
Data related to toilet training for a child with autism spectrum disorders		
Low	30	75.0
Moderate	10	25.0
High	0	0.0
Knowledge related to children's readiness for toilet training		
Low	28	70.0
Moderate	12	30.0
High	0	0.0

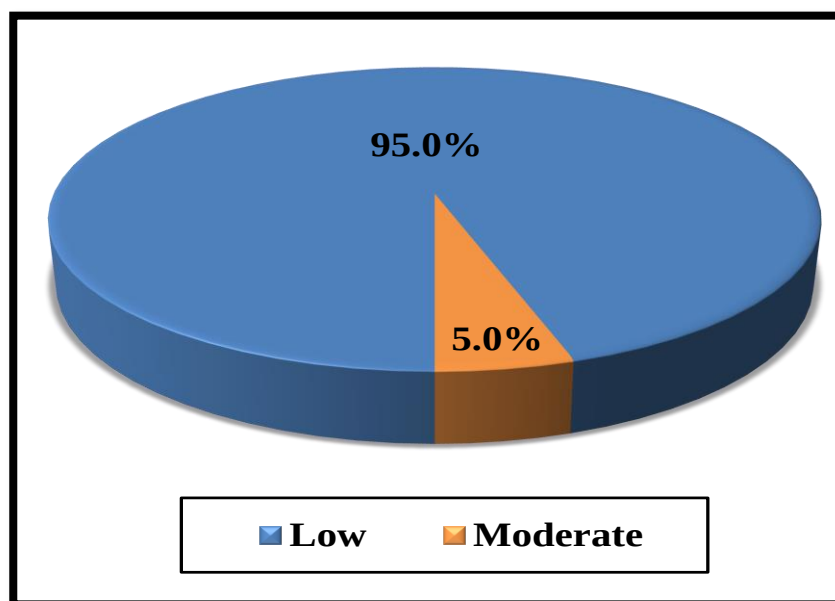
**Figure (1): Mothers' Overall Knowledge regarding Toilet Training**

Table (6): Percentage Distribution of Studied Mothers according to their Reported Practice of Toilet Training Preparation Items (n = 40)

Mothers' reported practice regarding preparation for toilet training	Not done		Done	
	No.	%	No.	%
Create a comfortable environment	7	17.5	33	82.5
Use a comfortable potty/toilet	24	60.0	16	40.0
Encourage the child's choices	36	90.0	4	10.0
Encourage the child to express the need to use the toilet	32	80.0	8	20.0
Provide simple explanation about toilet training	40	100.0	0	0.0
Prepare the child sit on the potty with a diaper	34	85.0	6	15.0
Remove diaper after urination or defecation	34	85.0	6	15.0
Throw the waste into the toilet in front of the child	34	85.0	6	15.0
Child wear easily removed clothes	18	45.0	22	55.0
Organize the amount of fluids and dietary fibers	29	72.5	11	27.5
Create a schedule for the child's toilet use	30	75.0	10	25.0
Prepare rewards for using after toilet	36	90.0	4	10.0
Set specific times for using the toilet	34	85.0	6	15.0
Increase period between toilet attendance gradually	40	100.0	0	0.0
Notice signs of the child needs to use the toilet	18	45.0	22	55.0

Table (7): Total mothers' reported practice regarding toilet training (n = 40).

Mothers' reported practice regarding toilet training	No.	%
Preparation for toilet training		
Unsatisfactory	39	97.5
Satisfactory	1	2.5
Assistance during toilet training		
Unsatisfactory	39	97.5
Satisfactory	1	2.5
Care after toilet use		
Unsatisfactory	37	92.5
Satisfactory	3	7.5
Overall practice		
Unsatisfactory	40	100.0
Satisfactory	0	0.0

Discussion

Autism Spectrum Disorders (ASD) defines a group of neurodevelopmental disorders characterized by deficits in social communication and interaction, and restricted and repetitive patterns of behavior. Children with ASD face several specific challenges in toilet training, which result in difficulties and delays in mastering toilet training skills in children with autism. (Ahmad et al., 2024)

Pediatric nurses have vital role in educating mothers about cognitive, psychological, and physical signs of toilet training readiness. The current study aims to assess the mothers' knowledge and practices regarding toilet training of their children with autism spectrum disorders.

Concerning mothers' knowledge regarding toilet training, it was clear that all of mothers had low level of knowledge regarding general information about toilet training. Concerning data related to toilet training for a child with autism spectrum disorders, It was found that three-quarters of the mothers had low level of knowledge. Nearly three-quarters of mothers had low level of knowledge regarding children's readiness for toilet training. Concerning mothers' overall

knowledge, it was noticed that the majority of mothers had low level knowledge, while none of the mothers had high level of knowledge. From the researcher perspective, this may be related to two-thirds of mothers lived in rural areas with limited access to professional medical advice.

This finding was congruent with **Mohamed et al., (2025)** who conducted a study entitled “Designed Nursing Program on Mothers' Knowledge, Practices and its effect on their Children with Nocturnal Enuresis” and concluded that more than two-thirds of the studied mothers had unsatisfactory level of knowledge.

This finding was in agreement with **Baker et al., (2023)**, who studied “Effect of Nursing Intervention Program for Parents Caring of Children with Autism Regarding to their Daily Activities”, and reported that nearly three quarters of them had unsatisfied level of knowledge. Similarly, **Elhayge et al., (2022)**, who conducted a study entitled “Effect of training program on improving mothers' care provided to their autistic children” and found that the majority of mothers had unsatisfied level of knowledge.

Also, a study conducted by **Saad, (2024)** about “An Educational Program for Mothers of Autistic Children” who reported that half of mothers’ study had poor level of knowledge.

These results were in contrast to a study conducted by **Sutrisni et al., (2022)** entitled “The Effect of Health Education on the Level of Knowledge about Toilet Training in Mothers with Toddler Age Children (1-3 Years)”, who revealed that nearly two-thirds of mothers had enough knowledge regarding toilet training.

Concerning mothers' practice regarding toilet training, It was noticed that the majority of studied mothers had unsatisfactory practice as regards preparation for toilet training and practices during toilet training. Concerning practices of care after toilet use, it was found that the majority of mothers were unsatisfactory. This may be explained by inadequate mothers’ knowledge about toilet training that had a reflection on their practice, they did not know how to overcome challenges during toilet training of their autistic children

These findings were in the same direction with **Ghallab et al., (2024)**, who conducted a study under

the title “Autism Spectrum Disorder Care Education: Improving Parents' Knowledge and Caregiving Practices for their Children” that illustrated that all mothers had an unsatisfactory level of caregiving practice.

The present study shares similar results with **Elhayge et al., (2022)**, who found that more than two-thirds of mothers had an unsatisfactory level of reported practice. Similarly, a study by **Baker et al., (2023)** revealed that majority of mothers had unsatisfactory level of practice.

Conclusion

According to the findings of the current study, it can be concluded that the majority of mothers had low level of knowledge and unsatisfactory reported practices as regards toilet training of their children with autism.

Recommendations

Based up on the previous findings, the following recommendations are suggested:

- Develop continuous educational programs for mothers to improve their knowledge and practice regarding toilet training of children with autism.
- Workshops and mothers’ classes should be conducted to empower mothers’ toilet training practice.

-Educational booklet must be available at pediatric outpatient clinic.

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Correlation between Symptom Distress and Functional Status Among Cancer Patients Undergoing Chemotherapy

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Abstract

Background: Chemotherapy is one of the most widely used treatment modalities in cancer care and has contributed to improved survival outcomes.

Aim: This study aimed to identify the correlation between symptom distress and functional status among cancer patients undergoing chemotherapy.

Design: Descriptive correlational research design was utilized.

Setting: The study was conducted at the Oncology Center at Fayoum and EL Fayoum General Hospital.

Sample: Convenient sample of 200 cancer patient's undergoing chemotherapy.

Tool of data collection: Patient's demographic characteristics, and medical data, Edmonton Symptom Assessment System (ESAS-r), and Inventory of Functional Status–Cancer (IFS-CA).

Results: There was a significant difference between level of painful symptoms of patients pre and after 3 months of chemotherapy where the patients with severe symptoms decreased from 52.5% to 1.5%, while the patients with mild symptoms increased from 7% to 50.5%.

The functional status revealed a significant decline in personal and household activities after three months of chemotherapy ($p < 0.05$).

Additionally, a significant correlation was found between symptom distress and function status. Higher symptom distress was associated with lower functional status.

Conclusion: Symptom distress has a significant negative impact on the functional status of cancer patients receiving chemotherapy.

Effective symptom management is essential to improve patients' functional abilities and overall quality of life.

Recommendation: Continuous patient support and education should be maintained throughout all stages of treatment.

Keywords: Cancer, Chemotherapy, Functional Status, Symptom Distress.

Introduction:

Cancer is a major global health problem that places a significant burden on patients' physical, psychological, and functional well-being. Chemotherapy is one of the most widely used treatment modalities in cancer care and has contributed to improved survival outcomes. However, patients undergoing chemotherapy often experience multiple concurrent symptoms such as fatigue, pain, nausea, sleep disturbances, and psychological distress, which may persist throughout the treatment period and negatively affect patients' daily functioning (**Bray et al., 2021; Miaskowski et al., 2020**)

Symptom distress refers to the degree of discomfort and suffering experienced by patients as a result of disease- or treatment-related symptoms. It reflects not only the presence of symptoms but also their severity and the extent to which they interfere with patients' daily lives. Evidence suggests that higher levels of symptom distress are associated with poor treatment tolerance, increased psychological burden, and decreased quality of life among cancer patients receiving chemotherapy (**Cleeland et al., 2020**).

Functional status is a key indicator of health outcomes in oncology care

and refers to an individual's ability to perform activities of daily living, maintain independence, and fulfill usual roles. Chemotherapy-related symptoms can significantly impair functional status, leading to limitations in physical activity, self-care, and social participation (**Given et al., 2021**). Preserving functional status is therefore considered a central goal of nursing and supportive cancer care.

Nursing plays a critical role in the management of cancer with patients undergoing chemotherapy. Oncology nurses are responsible for the safe administration of antineoplastic agents, continuous patients' assessment, and early detection of treatment-related complications. They apply evidence-based interventions to manage side effects, provide patient education regarding self-care and symptom reporting, and offer essential psychosocial support. Through coordinated and holistic care, oncology nurses enhance treatment adherence, promote patient safety, and improve quality of life among patients receiving chemotherapy (**World Health Organization, 2023; Oncology Nursing Society, 2024**).

Significance of the study:

This study is important because it examines the relationship between symptom distress and functional

status among patients undergoing chemotherapy. Patients receiving chemotherapy often experience various physical and psychological symptoms that may negatively affect their daily activities and overall well-being.

The findings of this study may help nurses and healthcare providers improve symptom assessment and management, enhance patient care, and promote better health outcomes. In addition, this study may provide useful information for hospital administrators and policymakers to develop effective healthcare strategies and improve the quality of oncology services (Erdemsoy Karahan & Izgu, 2023; Othman et al., 2023) .

Furthermore, the results of this study may contribute to nursing knowledge and support future research in the field of oncology nursing and symptom management (Wang et al., 2024).

Aim of the study:

The study aimed to identify the correlation between symptom distress and functional status among cancer patients undergoing chemotherapy.

Research questions:

The following research questions were formulated to achieve the aim of the current study

1-What is the distressing symptom among cancer patients undergoing

chemotherapy?

2-What are the functional status profiles among cancer patients undergoing chemotherapy?

3-What is the correlation between distressing symptoms and functional status among cancer patients undergoing chemotherapy?

Operational definition:

Functional status: The patient's overall ability to perform physical, psychological, social, and role-related activities necessary for daily living and self-care. It includes the level of independence in performing basic activities of daily living (ADLs)

Subjects and Methods:

Research design:

Descriptive correctional research design will be utilized to achieve the aim of this study.

Setting:

The study was being carried out at the Oncology Center in Fayoum and El Fayoum General Hospital.

Subject:

A convenient sample consists of 200 adult cancer patients undergoing chemotherapy.

Tools of data collection:

Tool I: Structured Interview Questionnaire Sheets:

Part 1: Demographic Data: it covering questions as age, gender, marital status, education of level, occupation status, residence, monthly income, and living with.

Part 2: Medical Data Sheets: It includes patient's diagnosis, period of disease occurrence, location of tumor, dose of chemotherapy, type of treatment, chemotherapy of cycle and Biochemical assessment such as hemoglobin and platelets.

Tools II: Edmonton Symptom Assessment system (ESAS-r)

Each patient respond range from zero = no symptoms and ten = worst possible symptoms. The total of (ESAS-r) score can be calculated by summing nine core symptoms, range from zero to 90 common interpretation.

As follows: Mild: 0 - 3, Moderate: 4 - 6, Severe: 7- 10

High score medicate was symptom severity.

The Edmonton Symptom Assessment system (ESAS-r) is widely used, numerical scale and self-report symptom intensity tool for assessing ten common symptoms in chemotherapy, with ratings ranging from 0 (none, best) to 10 (worst) (Watanabe, et al., 2011).

Tool III: Inventory of Functional Status Cancer (IFS-CA):

IFS-CA adopted from (Tulman et al, 1991) and adapted by the researcher. It consists of 39 items, designed to measure functional status according to its four subscale items that tap functional status relevant to cancer patients such as:

(a)Personal care activities (10 items): Such as bathing, dressing, eating, exercising, relaxing, resting & sleeping

(b)Household and family activities (15 items): Such as cleaning, cooking, doing dishes, shopping and caring for spouse and children.

(c)Occupation activities (8 items): Such as amount of work accomplished at one has job, amount of job responsibility, and hours worked

(d)Social and community activities (6 items): Such as participation in community and religious organization, socializing with friends and relatives and time spent on hobbies.

Scoring system:

IFS-CA is using 4 Likert scale, range from 0 (never) to 4 (all the time). The possible score ranges from 39 to 156 (Tulman et al., 1991; Tulman & Fawcett, 1996). The higher score indicated the greater functional status.

Content Validity and Reliability:

The content validity of the tools will be ascertained by a panel of Experts (3) in the field of medical surgical nursing to review tools for clarity, relevance nursing, comprehensiveness and applicability, modification of tools were done.

Reliability of the tools was done by using Alpha Cronbach test. The reliability of the tools to determine the questionnaire items were related to each other as the following: the symptoms distress was 0.89 and functional status questionnaire was 0.93

Pilot study:

A pilot study was being carried out on 10% of cancer patients on chemotherapy under the study to ensure clarity, applicability of the tools and time needed to complete the tools, and patients in pilot study were included in the study.

Field work:

-An official permission will be obtained from director of Fayoum General Hospital and Fayoum Oncology Center.

-Informed patients' consent was obtained before data collection, after explained the purpose and nature of study.

-At the beginning of the study demographic and medical data were collected by interviewing subjects individually.

-Evaluate the symptoms distress and functional status will be filled before chemotherapy & after 3 months of chemotherapy.

-The research collected the data during the morning and afternoon shifts in oncology center and general hospital in Fayoum.

Ethical considerations:

Prior study conduction, ethical approval was obtained from the Scientific Research Ethical Committee of the Faculty of Nursing Fayoum University. The researcher was assured maintaining anonymity confidentiality of the subject data.

Patients who had cancer and undergoing chemotherapy was informed that they were allowed choosing to participate or not in the study and they have the right to withdraw from the study at any time without giving any reasons.

Statistical design:

Descriptive statistics in the form of means, standard deviation and numbers and percentages were calculated. Paired t test was used for mean comparison pre and post while Chi square test was used for qualitative variables. Pearson correlation was used for correlation. All tests considered significant if value less than 0.05. SPSS version 29.0 for statistical analysis.

Results:

Table (1): Shows Frequency and percentage distribution of the studied patients according to demographic data. This table shows that the mean age was 52.3 ± 10.7 , more than two 69% of studied patients were females and 91% live in rural area. As regards marital status, 84% of the studied

patients were married and 70% live with family. Referring to family income, the majority studied patients 98.5% were insufficient income.

Table (2): Represents Frequency and Percentage distribution of the studied patients according to medical data. Shows that 22 % of the studied cancer patients had breast tumor and 57.5% had the cancer from 1 to 5 months ago, while 40.5% started chemotherapy 1 week ago. Also 55% have 4 cycle per month.

Figure (1): Revealed that there was a significant difference between level of painful symptoms of patients pre and after 3 months of chemotherapy where the patients with severe symptoms decreased from 52.5% to 1.5%, while the patients with mild symptoms increased from 7% to 50.5%.

Table (3): Clarifies Measurement of central tendency and distribution of functional status among patients Pre and After 3 months of treatment. Revealed that there was a significant difference between functional status of cancer patients pre and after 3 months of chemotherapy. As regard personal activities, the mean value decreased from 32.3 to 29.9 and the mean value of family and household activities significantly decreased from 48.9 to 44.6. While, there was no significant change regarding

Occupation activities or social activities $p > 0.05$

Table (4): Shows Correlation between common symptoms and some variables characteristics of cancer patients undergoing chemotherapy. Revealed that there was a significant direct positive correlation between common symptoms and both income and start of chemotherapy of cancer patients. While, there was a significant inverse negative correlation between painful symptoms and both age and education of cancer patients.

Figure (2): Illustrates Correlation between symptom distress and functional status post treatment. The figure shows that there is a direct correlation between symptom distress and functional status post treatment.

Table (1): Frequency and Percentage distribution of the studied patients according to demographic data (n=200).

Research variable	No.	%
Age:		
Mean $\pm$ SD =52.3 $\pm$ 10.7		
Gender:		
Male	62	31.0
Female	138	69.0
Marital status:		
Single	5	2.5
Divorced	6	3.0
Married	168	84.0
Widow	21	10.5
Education level:		
Illiterate	135	67.5
Primary	10	5.0
Secondary	49	24.5
University/ Post graduate	6	3.0
Occupation status:		
Worker	28	14.0
Farmer	29	14.5
House wife	129	64.5
Other	15	7
Residence:		
Urban	18	9.0
Rural	182	91.0
Monthly income:		
Enough	3	1.5
Not enough	197	98.5
Lives With who		
Alone	56	28.0
Family	140	70.0
Relative	4	2.0

Table (2): Frequency and Percentage distribution of the studied patients according to medical data (n=200).

Research variable	No.	%
Place of tumor:		
Laryngeal	8	4.0
Left breast	44	22.0
Left lung	14	7.0
Neck	9	4.5
Ovarian	7	3.5
Pancreas	9	4.5
Stomach	13	6.5
Uterine	11	5.5
Other*	85	42.5
Onset of cancer:		
1 - 5 months	115	57.5
6 - 12 months	40	20
> 12 months	45	22.5
Start of chemotherapy:		
1 week ago	81	40.5
2 weeks ago	63	31.5
3 weeks ago	56	28.0
Treatment cycle per monthly:		
1 cycle	83	41.5
2 cycle	7	3.5
4 cycle	110	55.0

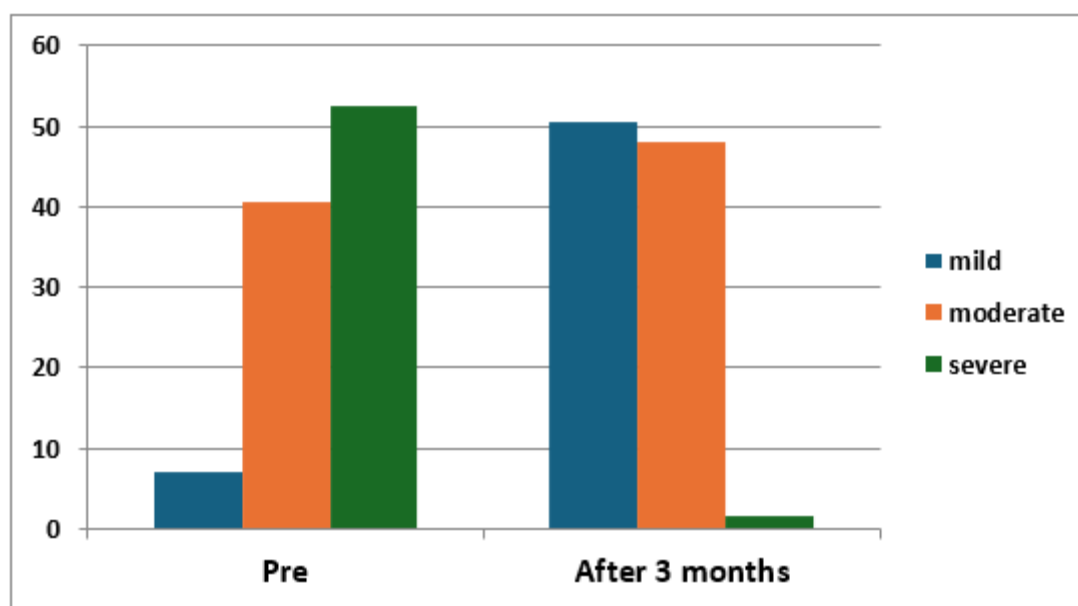


Figure (1): Distribution of common symptoms among studied patients pre and post chemotherapy.

Table (3): Measurement of central tendency and distribution of functional status among patients Pre and after 3 months of treatment (n=200).

Functional status	Pre	After 3 months	t	P
	Mean $\pm$ SD	Mean $\pm$ SD		
Personal activities	32.35 $\pm$ 4.59	29.93 $\pm$ 3.53	2.289	0.026*
Family and household activities	48.9 $\pm$ 8.23	44.6 $\pm$ 9.61	2.223	0.049*
Occupation activities	29.63 $\pm$ 2.18	29.05 $\pm$ 2.97	0.862	0.392
Social activities	16.9 $\pm$ 3.35	16.41 $\pm$ 3.44	0.559	0.578
TIFSCA	120.10 $\pm$ 29.9	127.70 $\pm$ 31.12	2.21	0.04*

*Significant at p-value<0.05

Table (4): Correlation between common symptoms and some variables characteristics of cancer patients undergoing chemotherapy(n=200).

Research variables	Painful symptoms	
	R	p
Age	-0.14	0.04*
Gender	T=1.8	0.07
Income	0.32	0.00*
Education	-0.26	0.00*
Start of chemotherapy	0.29	0.00*
Number of monthly doses	-0.04	0.5

*Significant at p-value<0.05

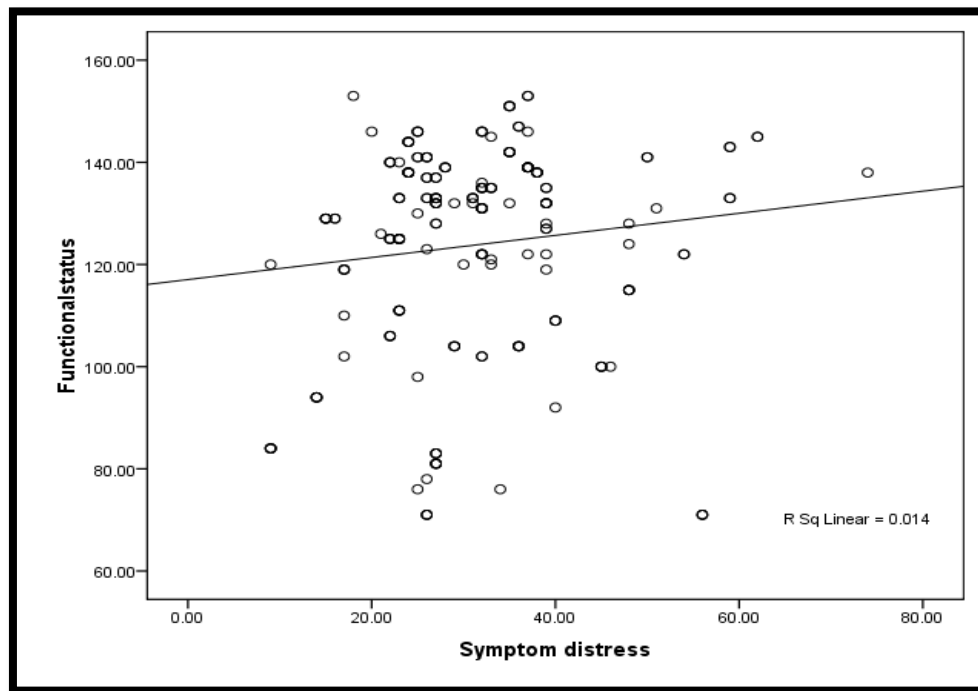


Figure (2): Correlation between symptom distress and functional status post treatment.

Discussion:

Cancer patients undergoing chemotherapy frequently experience a wide range of distressing symptoms that negatively influence their functional status and overall quality of life (**Kuo et al., 2025**). So, this study aimed to identify the correlation between symptom distress and functional status among cancer patients undergoing chemotherapy.

Regarding the sociodemographic characteristics, the current study revealed that the majority of patients were middle-aged females, most of whom were married, living in rural areas, and had insufficient income. These findings are in agreement with

Ahmed et al. (2022) and **Al-Azzam et al. (2023)**, who reported that cancer patients receiving chemotherapy in developing countries are more likely to be females with limited socioeconomic resources. Socioeconomic status has been shown to play a crucial role in patients' access to healthcare services, symptom management, and overall health outcomes (**Ojelabi et al., 2022**).

In relation to clinical characteristics, the study found that a considerable proportion of patients were diagnosed with breast cancer and had recently initiated chemotherapy. This aligns with **Hassan et al. (2022)**, who reported that breast cancer is one of the most prevalent

malignancies among females in Egypt, and many patients begin chemotherapy shortly after diagnosis. Additionally, **Singh et al. (2023)** highlighted that chemotherapy treatment is often initiated within a short period following diagnosis and is administered in repeated cycles based on standardized protocols.

Concerning symptom experience, the present study revealed a significant improvement in symptom severity after three months of chemotherapy. This reduction in symptom burden may be attributed to the therapeutic effects of chemotherapy, along with improved symptom management and supportive care. These findings are supported by **Wang et al. (2022)**, who reported a gradual decline in symptom severity over time during chemotherapy due to treatment response and patient adaptation.

Despite the improvement in symptom severity, the study findings indicated a significant decline in functional status, particularly in personal and household activities. This result suggests that even when symptoms become less severe, their cumulative effects may continue to impair patients' ability to perform daily activities. Similar findings were reported by **Zhang et al. (2022)**, who found that cancer

patients undergoing treatment often experience persistent limitations in physical functioning due to treatment-related fatigue and comorbid conditions. Moreover, **Karabulutlu and Yildirim (2021)** emphasized that physical and psychological distress during chemotherapy can negatively affect patients' ability to maintain daily responsibilities and social roles.

Regarding the correlation between symptom distress and patient characteristics, the present study demonstrated a significant association between symptom severity and factors such as age, education, income, and timing of chemotherapy initiation. These findings are consistent with **Mulugeta et al. (2023)**, who reported that demographic and socioeconomic factors significantly influence patients' functional status and quality of life. Patients with lower education levels and limited resources may have reduced access to health information and supportive care, which can exacerbate symptom burden and negatively affect functional outcomes.

Overall, the findings of the current study highlight the complex and multidimensional relationship between symptom distress and functional status among cancer patients undergoing chemotherapy.

While symptom severity may improve over time, functional impairment may persist, particularly in physically demanding activities. This emphasizes the importance of comprehensive oncology nursing care that focuses not only on symptom control but also on maintaining and improving patients' functional abilities. Effective nursing interventions, patient education, and continuous assessment are essential to enhance patients' quality of life and promote better treatment outcomes (World Health Organization, 2023; Oncology Nursing Society, 2024).

The present study demonstrated a significant direct correlation between symptom distress and functional status among cancer patients after chemotherapy. This finding indicates that patients who experienced higher levels of symptom distress following treatment also showed greater impairment in their functional abilities. This result is consistent with previous evidence suggesting that chemotherapy-related symptoms such as fatigue, pain, nausea, and psychological distress continue to negatively influence patients' ability to perform daily activities even after treatment.

This finding is supported by **Karahan and Izgu (2023)** and **Kuo et al. (2025)**, who reported that

increased symptom burden is significantly associated with poorer functional outcomes and reduced performance status among patients undergoing chemotherapy. The persistence of this relationship post-treatment may be attributed to the cumulative effects of chemotherapy toxicity, which can prolong physical and psychological symptoms, thereby limiting patients' mobility, self-care capacity, and social functioning. Moreover, this result highlights the importance of continuous symptom monitoring and effective supportive care interventions even after chemotherapy. Managing symptom distress through appropriate nursing care, psychological support, and individualized treatment plans is essential to improve functional status and enhance overall quality of life among cancer patients.

Conclusion:

-Patients receiving chemotherapy suffer from a multitude of side effects that alter their functional status, which may manifest not only at a physical or physiological level but also can be associated with psychosocial sequelae resulting in emotional and social issues.

-That patients exhibit a marked decline in functional status at the study of chemotherapy, followed by gradual improvement through out of the treatment, with further

improvement observed by the end of therapy and during the three- month follow-up period.

-Age negatively correlates with symptoms distress among patients undergoing chemotherapy ($p=0.04$).

-There was a direct correlation between symptom distress and functional status post treatment.

Recommendation:

-Replication of this study is highly recommended on a large representative probability sample to achieve generalizable results.

-Implementation of structured in-service training programs for chemotherapy nursing staff to enhance the quality and continuity of patient care.

-Continuous patient support and education should be maintained throughout all stages of treatment

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Implementing Nursing Instructions for Mothers about Expression and Storage of Breast Milk and its Effect on Relactation of their Premature Neonates

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Abstract

Background: Breast milk provides critical immunological protection for premature neonates against sepsis and necrotizing enterocolitis. However, neonatal intensive care unit separation and physiological immaturity often necessitate milk expression and relactation strategies. **Aim:** To assess implementing nursing instructions for mothers about expression and storage of breast milk on relactation of their premature neonates. **Setting:** Neonatal Intensive Care Units at Al-Menshawey General and Kafr El-Sheikh University Hospitals. **Subjects:** A purposive sampling of 80 mothers and their premature neonates. **Tools:** Four tools were used. Tool I: Mothers' knowledge about breast milk expression, storage and relactation questionnaire sheet, Tool II: Mothers' reported practices checklist about expression and storage of breast milk, Tool III: Mothers' reported practices checklist about relactation and Tool IV: Breastfeeding Evaluation and Education Tool **Results:** More than three quarter of studied mothers and their premature neonates demonstrated excellent breastfeeding performance and education. While slightly less than a quarter showed good performance after one-month post discharge. **Conclusion:** Mothers' knowledge and practice levels regarding breastmilk expression, storage, and relactation improved significantly after nursing instructions, maintaining high performance and proficiency one month after discharge. **Recommendations:** Integrate the "breast milk expression and storage" instructions as a standardized nursing protocol in all Neonatal Intensive Care Units

Keywords: Breast Milk Expression, Milk Storage, Nursing instructions, Relactation.

Introduction

World Health Organization defines premature neonates as those born before 37 weeks of gestation. Premature birth affects approximately 9.9% of births worldwide and it is the most common cause of neonatal morbidity and mortality **(Lee et al., 2025)**. Premature birth in Egypt is estimated to be less than 10% in the general population **(Mohamed et al., 2022)**. Prolonged NICU hospitalization of premature neonates imposes adverse effects on infants, families, medical staff, and healthcare systems alike **(Fu et al., 2023)**. Evidence suggests that mother-infant separation serves as a primary clinical complication that compromises the development of early maternal bonding and the successful initiation of breastfeeding **(Alibhai et al., 2022)**.

Breastmilk stands as a critical factor for the healthy growth and development of premature neonates. It helps in supplying essential nutrients that foster optimal development, particularly through mother's own milk provided in the NICU for short- and long-term health benefits. Sufficient breast milk intake correlates with enhanced immunity, cognitive development, security, and attachment **(Scott et al., 2020)**, while

discontinuation or reduced milk production during hospitalization can be restored via expression, storage of breast milk and relactation techniques **(Giraldo Montoya et al., 2020)**.

Expressing and storing breastmilk is a strategy to ensure that premature neonates have continuous milk intake even when temporarily separated from their mothers. Breast milk expression is defined as removing milk from the breasts and can be achieved using the hands or the pump method employing manual or electric machines. **(Edemba et al., 2022)**. To maximize milk production, it is vital to express milk regularly during the first few weeks. This consistent schedule triggers the hormonal responses needed to build and maintain a strong supply **(Amin, 2022)**.

Proper storage and handling of expressed breast milk are essential to preserve nutritional and immunological properties. Mothers must be educated on using sterile containers, labeling with date and time, and adhering to recommended temperature guidelines. In NICU settings, coordination with staff ensures timely delivery and safe thawing procedures. This guidelines of breastmilk storage protect the infant from contamination and

reinforces maternal confidence in contributing to their baby's care (Aprilina et al., 2025 & Cazorla-Ortiz et al., 2020)

Relactation refers to the process by which a mother resumes breast milk production after partial or complete cessation. It involves consistent breast stimulation, emotional bonding, and occasionally pharmacological support, making it highly relevant for premature neonates separated from their mothers in neonatal care (WHO, 2023). Relactation outcomes may be complete, partial, or failed. Complete relactation supports only exclusive breastfeeding for growth. Partial relactation was defined when infants were still required artificial feed for adequate growth. While relactation failure was defined as total absence of milk flow or secretion of only a few drops of milk following regular suckling for a period of at least 7 days (Giraldo et al., 2022).

Alternative feeding methods can be recommended for neonates who have had latching problems and nipple confusion behavior (Yang et al., 2025). It includes cup feeding, spoon feeding, syringe feeding, supplemental nursing system (SNS), and finger feeding (FF). The ideal method should be suitable for the

baby's physical characteristics and maturity level, contain equipment that parents can easily apply, provide, and clean, and help the baby learn to breastfeed (Inal et al., 2023).

Proper positioning forms the cornerstone of successful breastfeeding for premature neonates (Huang et al., 2020). With the cross-cradle hold recommended early on to enhance maternal control of the infant's head and ensure chest-to-chest contact (Osman et al., 2025), often paired with the Dancer Hand or U-hold techniques that support the breast while stabilizing the jaw and preventing duct compression ((Kaya et al., 2024).

Achieving an effective latch is particularly challenging in premature neonates due to their immature oral musculature and reduced muscle tone. Research has demonstrated that premature birth and low birth weight are significantly associated with poor attachment (latch-on) and poor effective suckling. Poor attachment was also linked to adverse maternal outcomes, including cracked nipples and mastitis (Altay et al., 2022). An effective latch builds on optimal positioning but remains challenging due to premature neonates' weak oral musculature, often necessitating silicone nipple shields temporarily

despite risks to exclusivity (**Rapheal et al., 2023; Silva et al., 2023**).

The coordination of sucking skills develops progressively as the infant approaches term gestational age (**Azhar et al., 2025**), a transition characterized by sustained suckling patterns, audible swallowing, and a clinical readiness to transition from enteral tube feeding to oral intake (**Meiliana et al., 2024**). Adequate milk intake is essential for the growth and nutritional sufficiency of the premature neonate. Feeding with breast milk reduces the risk of necrotizing enterocolitis, late-onset sepsis, bronchopulmonary dysplasia, and retinopathy of prematurity. It is associated with improved neurodevelopmental outcomes and cardiac function in premature neonates (**Nor, 2024**). After each feeding, the premature neonate should appear satisfied and ideally achieve 8 to 10 feedings and at least 6 to 8 wet diapers per day (**Wang et al., 2025**).

Monitoring weight gain is a key measure of nutritional adequacy and developmental progress. Although initial weight loss is expected, most premature neonates should begin gaining weight shortly after birth (**Fenton et al., 2022**). Expected growth rates vary by gestational age,

ranging from 5g/day at 24 weeks to 30g/day for those near term (**Kinoshita et al., 2024**). Post-discharge, maintaining a gain of 20–30g/day remains a priority, often requiring enriched formulas or fortifiers to optimize growth (**Perumal et al., 2022**).

Significance of the study Human milk contains all basic requirements for all infants, including those who are premature or ill, because of its unique nutritional and bioactive components. For premature neonates, human milk is the golden standard that provides significant protection against necrotizing enterocolitis sepsis, and other common morbidities associated with the Neonatal Intensive Care Unit (**Asool, 2025**). Early nutritional support not only influences immediate growth parameters such as weight, length, and head circumference but also contributes significantly to long-term cognitive, motor, and social-emotional development (**American Academy of Pediatrics, 2022**).

Premature neonates, especially those with low birth weight, frequently require NICU admission, leading to prolonged maternal-infant separation. This physical distance, compounded by the physiological immaturity of sucking reflexes, renders direct

breastfeeding clinically challenging and may affect the maternal milk supply. To diminish these challenges, structured milk expression and storage protocols serve as a vital clinical bridge, ensuring the delivery of essential nutrition. Consequently, nursing-led education is imperative to equip mothers with the necessary skills for systematic expression. This instructions not only sustains lactation during hospitalization but also serves as a fundamental motivator for successful relactation and the transition to direct breastfeeding upon discharge (Stefana et al., 2017& Dukuzumuremyi et al., 2022).

Aim of the Study

The current study aimed to Assess implementing nursing instructions for mothers about expression and storage of breast milk on relactation of their premature neonates.

Research hypothesis:

Implementing nursing instructions for mothers about expression, and storage of breast milk are expected to improve relactation of their premature neonates.

Subjects and Method

Subjects

Research design: A quasi-experimental research design was used in the study.

Setting: The study was conducted at: **1-Neonatal Intensive Care Unit at Al-Menshawy General Hospital**, which is affiliated to the Ministry of Health &Population. It consists of 3 rooms, 17 beds and one servo.

2-Neonatal Intensive Care Unit at Kafr El-Sheikh Main University Hospital, which is affiliated to the Ministry of Higher Education and Scientific Research. It consists of 3 rooms, 14 beds and one servo.

Subject:

A purposive sample consisted of 80 mothers and their premature neonates was collected from the previously mentioned setting (40 premature neonate for each hospital). The sample size was calculated using (Epi-Info) software statistical program according to the total number of the mothers and their premature neonate was about 282 attended to Intensive Care Unit per year, based on the level of significance (95%) and study power (80%) by and type I error 0.05 with confidence level 95% using the sample size equation for estimation of single proportion.

Data Collection Tools:

Four tools were used for data collection. These tools include the following:

Tool (I): Mothers' knowledge about breast milk expression, storage and relactation questionnaire sheet it was conducted through individualized interview. It was developed by the researcher after reviewing recent literature (Aboelmagd & Tawfic, 2020, Eglash et al., 2017 & Mehta et al., 2018)

It was composed of two parts as follow:

Part (1): Socio-demographic characteristics which includes:

Data related to mothers' such as age, educational level, residence, number of siblings, number of family members, delivery time, mode of delivery and obstetric history.

Data related to premature neonate such as gestational age, sex, birth order, diagnosis, and feeding method.

Part (2): Mothers' knowledge about milk expression, storage and relactation. It included the following:

a-Mothers' knowledge about milk expression and storage that includes meaning of breast milk colostrum, breast milk expression and storage, indications, importance of breastmilk, different methods of milk expression, methods of breast milk storage, and valid duration of breast milk storage (14 questions).

b-Mothers' knowledge about relactation that includes meaning of relactation, advantages of breast feeding and disadvantages of artificial feeding, proper position of premature neonate, and criteria of adequate feeding (9 questions).

Scoring system of mothers' knowledge was as the following:

-Score (2) for Correct and complete answer.

-Score (1) for correct and in complete answer.

-Score (0) for wrong answer.

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

-Score more than 70% represents high level of knowledge.

-Score from 50 to 70% represents Moderate level of knowledge.

-Score less than 50% represent Low level of knowledge.

Tool (II): Mothers' reported practices checklist about expression, storage of breast milk and relactation.

Part (I): Mothers' reported practices checklist about expression and storage of breast milk it was developed by the researcher after reviewing recent literature (Aboelmagd & Tawfic 2020 & Eglash et al., 2017) to assess

mothers reported practice about expression and storage of breast milk.

a-Mothers' practice before breast milk expression and storage such as: wash the hands with soap and water, clean the breast, use a sterilized container to collect the milk and mother in a comfortable and quiet place and stimulating milk ejection (5 steps).

b-Mothers' practice during breast milk expression and according to each mother's individual choice:

-Hand expression for breast milk such as: use sterile containers, support the breast, position thumb and finger opposite the areola, press inward toward breast center, roll fingers and thumb rhythmically, rotate positions around the areola and switch breasts after flow stops (7 steps).

-Manual pump expressing for breastmilk such as: ensure correct shield size, center the nipple in the breast shield, pump rhythmically, massage the breast to increase flow and switch breasts until milk flow stops (5 steps).

-Electric pump expressing breastmilk such as: ensure correct shield size, center the nipple in the breast shield, start with low suction, pump until the milk flow stops and I.

switch breasts until milk flow stops (5 steps).

a-Mothers' practice after breast milk expression and storage such as: clean storage containers, label containers with date and time and sterilize and clean the pump and the used container (3 steps).

The scoring system of mothers reported practice about expression and storage of breast milk was classified as:

Total score of mother practice and skills was classified as following:

-Done correctly was scored (1)

-Not done correctly or not done was scored (0)

Total score of mother practice was classifying as following:

-Less than 70% was considered unsatisfactory

-From 70% - 100 % was considered satisfactory

Part (II): Mothers' reported practices checklist about

relactation it was developed by the researcher after reviewing recent literature (**Buldur et al., 2020 & Cole & Lanham, 2011**) to assess mother reported practice about relactation.

-Mothers' practice before breastfeeding:

Preparation related to mother as mother hands and breast is washed

and dried, mother set in comfortable position, mother clothes should be clean and not be tight (3 steps).

-Preparation related to neonate as the premature neonate is hungry and dry (1 step).

b-Mothers' practice during breastfeeding such as practice related to:

-Feeding readiness consist of signs of feeding readiness and skin-to-skin contact (✓steps).

-Positioning consists of the mother set in an upright or semi-reclined position, the infant on a cushion for positioning, mother supports the infant head and mouth in front of the nipple, gently touching the infant lips with the nipple or finger to elicit rooting and mother support the breast with a C-hold or a V-hold position (✓ steps).

- **Latching and feeding** consist of the neonate's nose is aligned with the nipple, the head tilted slightly back, the neonate's mouth is wide open, the nipple is guided towards the roof of the infant mouth the premature chin is to the breast, the lips is flanged and take a large portion of the areola for deep latch (5 steps).

-Feeding Techniques consist of using breast compressions to increase milk flow and listen for swallowing sounds (2 steps).

-Using syringe as alternative feeding method if the premature refuse nursery breastfeeding consists of avoiding bottles to prevent nipple confusion, position the premature neonate semi-upright in the mother's arms and the milk is dropped with the syringe into the inner side of the neonate's cheek (4 steps).

b-Mothers' practice after breast feeding such as hold premature neonate upright to rub the back after spontaneous release and place in a right-side or prone position to aid stomach emptying.

The scoring system of mothers about breast feeding was classified as:

-Done correctly was scored (1)
-Not done correctly or not done was scored (0)

Total score of mother practice was classified as following:

-Total score of mother performance $\geq 70\%$ satisfactory
-Total score of mother performance $< 70\%$ unsatisfactory

Tool (III): Breast feeding Evaluation and Education Tool (BEET):

It adapted from (Tobin, 1996) after reviewing of related literature. It consists of eight sub-scales that

assess different aspects of breastfeeding.

-Feedings: assesses the frequency and duration.

-Positioning: assesses the mother's and premature neonate's positioning during breastfeeding.

-Latch on assesses premature neonate's latch on the breast.

-Sucking: assesses the premature neonate's sucking patterns.

-Milk flow assesses the flow of milk from the breast.

-Intake: assesses the amount of milk the premature neonate is getting.

-Output: assesses the premature neonate's wet and dirty diapers.

-Weight gain: assesses the premature neonate's weight gain.

The scoring system of the breastfeeding evaluation and education tool:

-Excellent breastfeeding practices was scored (3)

-Fair breastfeeding practices was scored (2)

-Needs Improvement was scored (1)

Total Score Interpretation:

-20-24 points: Excellent breastfeeding technique.

-15-19 points: Good breastfeeding technique, some areas for improvement.

-10-14 points: Challenges present, need for lactation consultant or healthcare professional guidance.

-Below 10 points: Significant difficulties require immediate intervention from a healthcare professional.

Method

The study was accomplished through the following steps:

Administrative process: An official permission to conduct the study was obtained from the Dean of Faculty of Nursing, Al-Menshawey General Hospital, and from Kafer El-Sheik Main University Hospital to obtain their approval and cooperation for carrying out the present study.

Ethical consideration:

-Ethical approval was taken from the Scientific Research Ethics Committee of the Faculty of Nursing, Tanta University before conducting the study. Code number 401-3-2024.

-Informed consent to participate in the study was obtained from mothers.

-Confidentiality and privacy were taken into consideration regarding the data collection and was maintained by coding numbers.

-The nature of the study wouldn't cause any harm or pain to the entire sample.

Tools Development: Four tools were used in the current study. Tool (I):

Mothers' knowledge about breast milk expression, storage and relactation questionnaire sheet, Tool (II): consist of two parts, part (I) mothers' reported practices checklist about expression, storage of breast milk, part (II) mothers' reported practices checklist about relactation and Tool (III): Breastfeeding Evaluation and Education (BEET). Study tools were developed by the researcher after reviewing of recent literatures under the supervision of the supervisors.

Content validity:

The tools of the study were presented to a jury of five experts in the field of Pediatric Nursing to check content validity and clarity of the questionnaire. Content validity index = 97.5%.

Reliability of tools: Testing reliability of proposed tools was done by Cronbach's alpha test through SPSS computer package. It was 0.782 for "Mothers' knowledge about breast milk expression, storage, and re-lactation questionnaire sheet", 0.758 for tool "Mothers' reported practices checklist". And 0.877 for tool "Breastfeeding evaluation and educational tool" Which indicate that the three tools were reliable to detect the objectives of the study.

Pilot study:

A pilot study was carried out on 10% of the studied mothers (8 mothers). The pilot study done to test the tool for its clarity, applicability, feasibility, consistency to determine any obstacles that may encountered the reasercher during the period of data collection. The necessary modifications were done from excluded pilot study sample, these included adding new items and simplifying the phrasing of existing questions to ensure clarity and comprehension for the mothers.

Phases of the study: The study was conducted through four phases:

Phase (I) Assessment phase: The researcher was available all days of the week in the morning shift (8am to 2 pm) in the previous settings to collect the baseline data of studied mother and their premature neonates and assess actual mothers practice regarding breastmilk expression, storage and relactation of premature neonates during morning shift. Knowledge and practice were assessed pre, immediate and one month after nursing instructions using Tool (I, II). Tool (III) was used one-time to evaluate the long-term effectiveness of the nursing instructions on the actual

breastfeeding practices of the mothers.

Phase (II) Planning phase: This phase includes the assessment phase (pre-test) findings and identification of the actual needs of the studied mothers.

-Educational intervention was planned according to mothers' educational needs assessment and based on literature review which includes the following: setting objectives, preparation of the content which covered the reason behind the implementation of the sessions, the educational intervention was translated into Arabic and different methods and materials of educational intervention was used including booklets, ,lectures, group discussion, demonstration, redemonstration and video-based learning.

-A copy of the instructional booklet was provided to each mother to facilitate the recall of knowledge and reinforce the practical steps discussed throughout the theoretical component of the nursing instructions.

-Data was collected at a rate of one studied mother per day, six days per week.

-The data was collected over a period of six months from the beginning of September 2024 to the end of February 2025.

The implementation phase included the following sessions:

The First session: This session focused on theoretical knowledge, and it includes overview about breastfeeding, relactation, expression and storage of breastmilk, nipple confusion and alternative feeding.

The Second session: It was an educational session about the meaning of relactation, advantages of breastfeeding and disadvantages of artificial feeding, proper position and attachment of premature neonate, criteria of adequate feeding, meaning of breast milk expression and storage, indications, different methods of milk expression, methods of breast milk storage, and valid duration of breast milk storage.

The Third session: This session focused on mother practice. It includes a practical educational session about steps of breast milk expression, preparation for breast milk storage, the storage temperature of breast milk, and methods for frozen breast milk, steps before, during and after breastfeeding and how to use alternative Feeding method.

The Fourth session: It was implemented after the child discharged and includes: assess mother and premature neonate

breastfeeding and assess neonate feeding frequency and duration, positioning, latch on, sucking, milk flow, intake, output, and neonate weight gain. Each session was end with a summary of its content and the mothers gaved their feedback.

Evaluation phase: Evaluation of the studied mothers' knowledge and practice was carried out using the study tools. Each mother was evaluated individually immediately after implementation of the nursing instructions and one month later, and these two evaluations were compared to the pretest results to evaluate the impact of the intervention on mothers' knowledge and practice. Each premature neonate underwent a single evaluation at one-month after discharge to assess different aspects of breastfeeding.

Statistical analysis: Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 27. Graphics were done using Excel program. Quantitative data were presented by mean (X) and standard deviation (SD). Qualitative data were presented in the form of frequency distribution tables, number and percentage. It was analyzed by chi-square (χ^2) test, Anova test (F) and correlation (R). Level of significance

was set as P value <0.05 for all significant tests (White, 2019).

Results

Table (1): Reveals percentage distribution of the studied mothers according to their sociodemographic characteristics.

It was observed that 38.8% of the studied mothers were in the age category $20 < 30$ years with the mean age of (26.95 ± 6.85) , It was observed that 61.3% of the studied mothers lived in rural areas, and 82.5% of them were married. It was cleared that 46.3% of the studied mothers had university education and 60% of them were not working. Moreover, 55% of the studied mothers had three members in their family.

Table (2): Illustrates percentage distribution of the studied mothers according to their obstetrical history.

It was revealed that equivalent proportion of the studied mothers (31.3%) were primigravida and multigravida with precisely two prior pregnancies. It was cleared that nearly half of the studied mothers (45.0%) delivered within the preceding week. The mode of delivery was cesarean section and represent by 73.7% of them. The majority of the studied mothers (81.2%) reported antenatal complications as gestational diabetes

mellitus which present in 30.0% of mothers.

Table (3): Illustrates percentage distribution of the studied premature neonates according to their sociodemographic characteristics.

It was found that more than half (53.8%) of the studied premature neonates were male, and 52.4% of them were born at a gestational age of ≥ 34 weeks. Regarding birth weight, 53.8% were born within the range of 1.5 kg to < 2.5 kg. Regarding birth order, it was observed that 38.8% of the studied premature neonates were first-born infants, and 58.8% of them suffered from neonatal health complications. All infants were born at lower gestational ages. Among affected premature neonates, neonatal jaundice constituted the most prevalent health complications affecting 60.0% of the studied premature neonates. The findings indicate that 63.8% of the studied premature neonates receive bottle-feeding and 51.2% of them receive artificial milk formula.

Table (4): shows percentage distribution of studied mothers' overall knowledge regarding expression, storage and relactation of breast milk before, immediately and after one month of nursing

instructions. It was found that there was a highly statistically significant improvement in the studied mothers' overall knowledge regarding expression, storage and relactation immediately and after one month compared to before nursing instructions implementation with (p -value <0.001) as 3.8% of the studied mothers had high level of knowledge before nursing instructions compared to 100% and 91.2% of the studied mothers immediately and after one month respectively.

Table (5): shows percentage distribution of studied mothers' overall reported practice regarding expression, storage of breastmilk and relactation before, immediately and after one month of nursing instructions.

It was observed that 2.5% of studied mothers had a satisfactory level regarding total reported practice about expression, storage and relactation before nursing instructions compared to 100% and 81.3% immediately and after one month respectively. It was observed that the total mean score of studied mothers' total practice was (0.03 ± 0.16) before nursing instructions compared to (1.00 ± 0.00) and (0.81 ± 0.39) at immediate and after one month respectively.

Figure (1): Shows distribution of studied mothers and their premature neonates regarding total score of breastfeeding evaluation and education after one month of discharge. It was revealed that 76.3% of studied mothers and their premature neonates had excellent performance regarding breastfeeding evaluation and education after one month of discharge. On the other hand, 23.7% of them had good performance. While none of the studied mothers and their premature neonates had challenges or significant difficulties after one month of discharge.

Table (6): Illustrate correlation between total mothers' reported practices and their total knowledge score pre, and one month after nursing instructions. It was found a high positive significant correlation between studied mothers' total knowledge and total reported practices pre and one month after nursing instructions as (p-value < 0.001), ($r_1=0.394$, $r_2=0.475$) respectively.

Table (7): Illustrate correlation between total studied mothers' reported practices and their score of relactation evaluation and education one month after discharge. It was found to have a

high positive significant correlation between studied mothers' total reported practices and total relactation evaluation and education one month after discharge as (p-value < 0.001) and ($r=0.861$) respectively.

Table (1): Percentage Distribution of the Studied Mothers According Sociodemographic Characteristics.

Sociodemographic characteristics of the studied mothers	No.	%
(n=80)		
Age in years		
<20 yrs.	23	28.7
20<30 yrs.	31	38.8
30<40 yrs.	17	21.2
≥40 yrs.	9	11.3
Mean ±SD 26.95±6.85		
Residence		
Rural	49	61.3
Urban	31	38.8
Marital status		
Married	66	82.5
Divorced	14	17.5
Educational level		
Secondary education/diploma	30	37.4
University education	37	46.3
Postgraduate studies	13	16.3
Occupation		
Working	32	40.0
Not working	48	60.0
Number of family members		
Three	44	55.0
Four	18	22.5
Five or more	18	22.5

Table (2). Percentage Distribution of the Studied Mothers According to their Obstetric History.

Obstetric history of the studied mothers	No.	%
(n=80)		
Number of pregnancies		
First	25	31.3
Second	25	31.3
Third	24	30.0
Fourth	6	7.5
Delivery time		
One day	7	8.8
Less than a week	36	45.0
week < 10 days	13	16.3
10 days < 15 days	6	7.5
15 days to month	18	22.5
Type of delivery		
Vaginal delivery	21	26.3
Caesarian section	59	73.7
Pregnancy complications		
Yes	65	81.2
No	15	18.8
Pregnancy complications		
Preeclampsia	19	23.8
Gestational diabetes	24	30.0
Anemia	12	15
Precipitate labor	19	23.8
Placenta problems	18	22.5
Urinary tract infection	12	15

Table (3): Percentage Distribution of the studied premature neonates according to their sociodemographic characteristics.

Sociodemographic characteristics of studied infants.	No.	%
(n=80)		
Gender		
Male	43	53.8
Female	37	46.3
Gestational age		
28-31 weeks	19	23.8
32-33 weeks	19	23.8
>33 weeks	42	52.4
Birth weight		
1<1.5 kg	13	16.3
1.5<2.5 kg	43	53.8
2.5 kg or more	24	30.0
Birth order		
First	31	38.8
Second	25	31.3
Third	18	22.5
Fourth	6	7.5
Health problems		
Low gestational age	80	100
Septicemia	2	2.5
Neonatal jaundice	48	60
Respiratory distress syndrome	44	55
Patent ductus arteriosus	19	23.8
The method of feeding used in the incubator		
Bottle feeding	51	63.8
Ryle feeding	29	36.2
Type of formula used for bottle or Ryle feeding		
Artificial milk	41	51.2
Mixed (breast and artificial milk)	39	48.8

Table (4): Percentage Distribution of Studied Mothers' Overall Knowledge Regarding Expression, Storage and Relactation of Breastmilk.

Overall knowledge	(n=80)											
	Before		Immediate		After one month		Test of sig.			Sig. between periods		
	No.	%	No.	%	No.	%	X ² ₁	X ² ₂	X ² ₃	P ¹	P ²	P ³
Low	32	40	0	0	4	5	147.4	7.3	122.1	<0.001**	0.026*	<0.001**
Moderate	45	56.2	0	0	3	3.8						
High	3	3.8	80	100	73	91.2						
Mean total score (Mean±sd)	0.64±0.56		2.00±0.00		1.86±0.47		F= 254.15			<0.001**	0.032*	0.000**
Mean rank	1.09		2.53		2.39		————			————	————	————

SD: Standard deviation**P-value**>0.05=no significant; **p-value**<0.05= significant; **p-value**<0.001= high significant**X²:** Chi-square test.**F:** Anova test**P¹:** p-value between pre and immediate**P²:** p-value between immediate and after one month**P³:** p-value between pre and after one month

Table: (5): Percentage Distribution of Studied Mothers' Overall Reported Practice Regarding Expression, Storage of Breast milk and Relactation.

Total practice	Before		Immediate		After one month		Test of sig.			Sig. between periods		
Expression, storage of breastmilk and relactation	No.	%	No.	%	No.	%	X ² ₁	X ² ₂	X ² ₃	P ¹	P ²	P ³
Satisfactory	2	2.5	80	100	65	81.3	152.19	16.55	101.9	<0.001 ^{**}	<0.001 ^{**}	<0.001 ^{**}
Unsatisfactory	78	97.5	0	0	15	18.7				<0.001 ^{**}	<0.001 ^{**}	<0.001 ^{**}
Mean total score (Mean ± sd)	0.03±0.16		1.00±0.00		0.81±0.39		F=358.96			<0.001 ^{**}	<0.001 ^{**}	<0.001 ^{**}
Mean rank	1.12		2.58		2.30		————			————	————	————

SD: Standard deviation

X2: Chi-square test

F: Anova test

P1: p-value between pre and immediate

P2: p-value between immediate and after one month

P3: p-value between pre and after one month

(p-value >0.05 NS; *p-value <0.05 S; **p-value <0.001 HS)

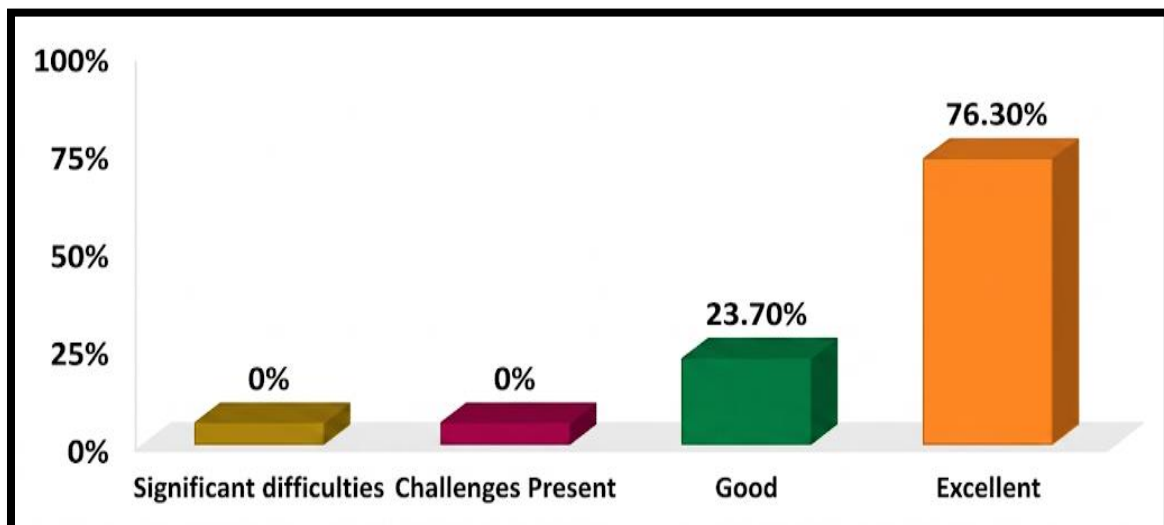
**Figure (1): Mothers and Their premature neonates regarding Total Score of Breastfeeding.**

Table (6): Correlation between Total Mothers' Reported Practices and their Total Knowledge Score Pre, and One Month after Nursing Instructions.

Total Mothers' Reported Practices and their Total Knowledge Score	Total reported practices score			
	Pre nursing instructions implementation phase		After one month phase	
	<i>r</i> 1	p- value1	<i>r</i> 2	p- value2
Pre nursing instructions phase	0.394	<0.001**		
After one month phase			0.475	<0.001**

Pearson's R (p-value >0.05 NS; *p-value <0.05 S; **p-value <0.01 HS)

Table (7): Correlation between Total Mothers' Reported Practices and their Score of Breastfeeding Evaluation and Education one Month after Discharge.

	Total reported practices score	
	<i>r</i>	p- value
Total breastfeeding evaluation and education score	0.861	<0.001**

Pearson's R (p-value >0.05 NS; *p-value <0.05 S; **p-value <0.01 H)

Discussion

The World Health Organization recommends that breastfeeding should begin within the first hour of birth, all premature neonates should be given only breast milk for the first six months of their lives **(WHO.,2023)**.

This recommendation is particularly important for sick premature neonates, as exclusive breastfeeding reduces the short-term risks of common illnesses, food intolerances, necrotising enterocolitis, and chronic lung disease. It also improves long-term outcomes, including cognitive performance, neurological development and enhances the premature neonate immunity **(Santiveri-Camacho et al., 2026)**. In addition, premature neonates exhibit reduced oromotor tone and immature neural control of sucking and swallowing, which adversely affects the coordination between these processes. In these situations, neonates must get expressed breast milk, which may be enhanced by enteral feeding, or a syringe drop of milk **(Li et al.,2022)**.

Consequently, the present study aimed to Assess implementing nursing instructions for mothers about expression and storage of breast milk on relactation of their premature neonates.

In accordance to the overall knowledge regarding expression,

storage and relactation of breastmilk. This study found that there was a highly significant improvement in the studied mothers' overall knowledge regarding expression, storage and relactation, immediately and after one month compared to before nursing instructions with (p-value<0.001) as all and the majority of mothers' high level of knowledge improved immediately and after one month respectively compared to less than tenth of them before nursing instructions.

The findings were in same line with a study conducted by **(Shoman et al. 2018)**, which entitled “evaluation of lactation management education program among nursing mothers attending a primary health care unit in Suez governorate, Egypt” and revealed that there was a significant improvement in mothers' knowledge about breastfeeding after the educational program. Also, the findings in contrast to a study **(Zhang et al.2024)** entitled “the effectiveness of online breastfeeding education and support program on mothers of premature neonates: A quasi-experimental study” and stated that the positive and significant change in breastfeeding knowledge only occurred after a 3-month intervention, but its early effect was not obvious.

In the context of the studied mothers' overall reported practice

regarding expression, storage of breastmilk and relactation. The studied mother's satisfactory level improved from less than tenth before nursing instructions to all of them and the majority immediately and after one month respectively. The total mean score of studied mothers' total practice was (0.03 ± 0.16) pre-nursing instructions phase compared to (1.00 ± 0.00) at immediate and (0.81 ± 0.39) after one month of nursing instructions.

The current study is similar to **(Warrior & Baishya 2023)**, who "Assessed the Effectiveness of Structured Teaching Program on Knowledge and Practices of Storage and Use of Expressed Breastmilk Among Working Women in Selected Schools and Offices of Kamrup, Metro", and stated that the practices mean score of mothers was ± 8.9 with a standard deviation of 2.874, while after the administration of the teaching, there was an improvement in the practice mean score 17.17 with a standard deviation of 1.586. Also, the findings in the same line with **(Sabry et al. 2023)** who stated that after intervention, the majority of mothers had satisfactory practices of lactation and kangaroo mother care. When compared to before the intervention, there was a statistically significant increase in overall mean score of practice level after

intervention as compared to before intervention.

Concerning the studied mothers and their premature neonates regarding total score of breastfeeding evaluation and education one month after discharge. Concerning the studied mothers regarding total score of breastfeeding evaluation and education one month after discharge. This study revealed that more than three quarter of the studied mothers had excellent performance regarding breastfeeding storage, expression, and relactation after implementing the nursing instructions. While none of the mothers and their premature neonates had challenges or significant difficulties regarding breastfeeding storage, expression, and re-lactation after implementing the nursing instructions. From the researchers' point of view, barriers to feeding cut across the high awareness received by mothers after nursing instruction.

These findings congruent with **Jang & Ju. (2020)** who found after one month discharge 73.2% of mothers had good breastfeeding practice that indicated the care education program for mothers of premature neonates can be a useful nursing intervention in clinical practice. Also, the findings in the same line with the findings were matched with **(Tran et al., 2023)** who found that after one month of discharge, all mothers and

their premature neonates had good exclusive breastfeeding.

While the findings were incongruent with **Dong et al. (2022)** who conducted a study with title " A prospective cohort study on lactation status and breastfeeding challenges in mothers giving birth to premature neonates. And stated that at 2 weeks post-discharge, feeding complications in infants and poor mothers' breastfeeding techniques and low human milk volume became the predominant challenges and highlighted the need of mothers' counselling after discharge. Also, contrary to Shoman et al. (2018) who stated that the majority (>80%) of the mothers faced barriers to exclusive breastfeeding that include reported pain as a major barrier and insufficient milk production.

As regard the total mothers' reported practices and their total knowledge score. It was found a high positive significant correlation between studied mothers' total knowledge and total reported practices pre and one month after nursing instructions as (p-value < 0.001). This attributed to the concept that efficient mothers' practice and infant care is based on their improved knowledge that contributed to the effectiveness of nursing instructions.

This result is consistent with **El-Talawy et al. (2022)** who assessed the mothers' knowledge, practice and

attitude regarding prevention of exclusive breastfeeding discontinuation and revealed that a highly statistically significant difference between total knowledge of the studied mothers and their total practice (P-value=<0.001**).

Likewise, (**Krishnasamy et al., 2024**) who demonstrated a stronger positive correlation, with a mean posttest knowledge score of 32 and a corresponding practice score of 13.96, showing an r-value of +0.715. These results underline the effectiveness of the intervention in improving both knowledge and practices among the participants.

Concerning the total studied mothers' reported practices and their score of breastfeeding evaluation and education month after discharge. This study found a high positive significant correlation between studied mothers' total reported practices and total breastfeeding evaluation and education one month after discharge (p-value < 0.001). This may be attributed to the integrated effect of nursing education on both cognitive knowledge and behavioral practice domains.

This finding on the same line with (**Magnano San Lio et al., 2021**) who studied and stated that there was a high significant association between mothers' breastfeeding practice and education level with p-

value < 0.007 . Also similarly with **Gallegos-Martínez et al. (2020)** who stated that in the experimental group, consisting of mothers who received education through the Teach-Back method, a significant and positive correlation was found between the breastfeeding self-efficacy scale scores and the LATCH breastfeeding evaluation scores in the measurements taken before education and at 1-month post-education, that indicated that as breastfeeding self-efficacy levels increase in educated mothers, breastfeeding success also increases.

Conclusion

Maternal knowledge and practice levels were significantly low regarding breastmilk expression, storage, and relactation before nursing instructions. However, a highly statistically significant improvement was observed post-intervention, with the vast majority of mothers achieving high knowledge and satisfactory practice levels, maintaining high performance and proficiency even one month after discharge.

Recommendations

Based on the present study findings, the following recommendations were suggested:

-Longitudinal studies should be conducted to evaluate the long-term impact of successful relactation on the growth, immunity, and

neurodevelopmental milestones of premature neonates during the first two years of life.

-Integrate the "Breast Milk Expression and Storage" instructions as a standardized nursing protocol in all Neonatal Intensive Care Units (NICUs).

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Relation between Teamwork and Professional Communication Skills among Nurses

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Abstract

Background: Awareness of teamwork in nursing is pivotal, as it can influence nurses' productivity and satisfaction, alongside professional communication skills.

Aim: Assess the relation between teamwork and professional communication skills among nurses. **Design:** A descriptive -correlational design was used. **Setting:** The study was conducted at Al-menshawy General Hospital affiliated to the Ministry of Health and Population. **Subject:** all nurses (N=600) who provided direct patient care. **Tools:** Two tools were used: Teamwork Nurse's Perception Questionnaire and Professional Communication Skills Questionnaire. **Results:** 88.7 % of nurses had high level of total perceptions of teamwork and, 7.3% of them had a low level. 77.8% of nurses had high level of total professional communication skills and, 17.7% of them had a fair level. **Conclusion:** There was a statistically significant positive correlation between teamwork and professional communication skills among nurses. **Recommendations:** Conduct continuous in-service training for nurses that boost the knowledge and skills of teamwork and professional communication. Ensure adequate resources are available to nursing staff and take time to meet nurses regularly to develop and re-evaluate patient care plans.

Keywords: Nurses, Professional Communication Skills, Teamwork.

Introduction

The healthcare system is a complex network designed to deliver medical services, promote health, and manage diseases within a population **Aminabee, 2024** At the heart of this system lies nursing, a vital profession that encompasses not only the provision of direct patient care but also advocacy, education, and support for individuals and families **((Nickitas et al., 2024).**

Nurses play a crucial role in coordinating care, ensuring patient safety, and enhancing the overall quality of healthcare delivery **(Gaing et al., 2024).** They serve as the primary point of contact for patients, bridging the gap between patients and other healthcare professionals **(Shaban et al., 2024).** Collaboration and work in multidisciplinary teams can meet the challenges faced by nurses such as aging of population, increasing of chronic conditions and advanced in technology **((Mlambo et al., 2021).**

Teamwork in nursing is a process where team members interact and utilize available resources to complete their tasks. Effective teamwork is crucial for delivering safe and high-quality patient care, as it not only leads to improved patient satisfaction but also creates a healthier and more positive work environment for nurses, increasing their job satisfaction **(Nobahar et al.,**

2023) . Key dimensions of teamwork in nursing include team structure, leadership, situation monitoring, mutual support among colleagues, and information and communication **(Meneses-La-Riva et al., 2025)).**

Team structure identifies multiteam system components that must work together to ensure safety **((Barendsen et al., 2021).** Leadership is the ability to maximize the activities of team members by ensuring that team actions are understood, changes in information are shared, and team members have the necessary resources **(Khalilov et al., (2025).**

Situation monitoring is a process of actively scanning and assessing situational elements to gain information to support team functioning **(Zajac et al., 2021)** Mutual support is the ability to anticipate and support team members' needs through accurate knowledge about their responsibilities and workload. Information and communication is a structured process by which information is clearly and accurately exchanged among team members **(Rosengarten, 2019) .**

Effective teams are characterized by trust, respect, and collaboration. Successful teamwork relies on effective collaboration, knowledge sharing, procedural integration and communication **(Alkhaqani, 2023) .**

Communication skills play a central role in effective teamwork, encompassing both verbal communication and non-verbal communication ((Mata Á et al., 2021) Professional communication involves dynamic interactions among healthcare teams, patients, and other caregivers, covering treatment plans, decision-making, and clinical evaluations to support patients and caregivers, encourage self-management, and help in relieving anxiety and depression (Tavakoly Sany et al., Wu & Street Jr, 2020)

Professional communication encompasses five aspects, informative communication, empathy, respect, authenticity, and social skills. Informative communication refers to how nurses obtain and convey information during interactions with patients and other colleagues((Kwame & Petrucka, 2021) .Empathy refers to nurses' ability to understand and recognize the emotions of patients as well as other colleagues expressing their empathy within the relationship(van Diggele et al., 2022).

Respect and authenticity focus on the alignment between nurses' actions and their genuine intentions in the clinical relationship they form with patients as well as colleagues (Leal-Costa et al., 2016).

Social skills refer to the entire range of skills (behavioral capacities) that promote effective functioning in interpersonal situations (Koprowska, 2024).

Significance of study:

Teamwork involves fostering a work environment where healthcare groups maintain quality patient care. International studies have highlighted the relationship between communication skills and nurses' caregiving behaviors. It has been emphasized the importance of dialog and communication skills in the nursing process to ensure quality of patient care (Kwame & Petrucka, 2020; Pérez-Martín et al., 2022) .

Professional communication in healthcare is essential for ensuring teamwork that is continuous, effective, and efficient. Effective communication ensures that patients' needs, concerns, and progress are accurately shared among team members, promoting continuity of care (Meneses-La-Riva et al., 2025).

When nurses possess strong communication skills, they can articulate their thoughts clearly, listen actively, and engage in meaningful dialogue, which enhances mutual understanding and trust among team members (Addimando, 2024).

Aim of the study

The aim of the study was to assess the relation between teamwork and professional communication skills among nurses.

Research questions

- What are the levels of teamwork among nurses?
- What are the levels of professional communication skills among nurses?
- What is the relation between teamwork and professional communication skills among nurses?

Study Design

A descriptive-correlational design was used to carry out this study.

Setting

The study was conducted at Al-menshawey General Hospital affiliated to the Ministry of Health and Population. The hospital beds' capacity is 250 beds. The hospital includes six intensive care units (ICUs) namely neurology, cardiology, medical, pediatric, intermediate and neonatal.

In addition, the hospital includes Hemodialysis and Emergency Rooms. The inpatient units include; General Surgery, Obstetrics & Gynecology and Orthopedic units.

Subject

The study subjects included all nurses (N=600) who were working in the previously mentioned settings, and provided direct patient care and distributed as the following; General Surgery (53), Orthopedic (51),

Emergency (84), Hemodialysis (44), Obstetric (45). In addition to Medical ICU (80), Pediatric ICU (28), Neurologic ICU (38), Neonatal ICU (76), Cardiac ICU (72) and Intermediate ICU (29) nurses.

Tools of data collection

Two tools were used for data collection as follow:

Tool I: Teamwork Nurses' Perception Questionnaire: (Appendix I):

It consisted of two parts as follows:

Part I: Nurses' personal data: It included age, sex, marital status, educational level, years of experience and department.

Part II: Teamwork Nurses' Perception Questionnaire: This part was developed by the researcher guided by **Castner (2012); Ceravolo and Foltz-Ramos (2013); Kawaguchi and Kao (2021); Baek et al. (2023); Bakht et al. (2024)** to assess levels of nurses' perception teamwork. This tool consisted of 32 items divided into five subscales as follows:

Team structure included 11 items, leadership included 6 items, situation monitoring included 5 items, mutual support to fellow staff included 4 items and information and communication included 6 items.

Scoring system

Nurses' responses were measured on a three points Likert Scale ranged from 1= disagree, 2= uncertain, and

3= agree. The total scores represented varying levels according to cut off points as follow:

-High teamwork > 75%, equal to > 72 from total score.

-Moderate teamwork 60- 75%, equal to > 57.6 - 72 from total score.

-Low teamwork < 60 % equal to < 57.6 from total score.

Tool II: Professional Communication Skills

Questionnaire: :(Appendix II)

This tool was developed by the researcher guided by **Leal-Costa et al. (2016); Juliá-Sanchis et al. (2020); Mendi et al. (2020); Jankelová and Joniaková (2021); Ammentorp et al. (2022)**. It was used to assess the levels of nurses' professional communication skills and contained 58 items, it was classified into two scales patient and colleagues communication skills and each scale was classified into four dimensions as follow: Informative communication for patient included 10 items, empathy for patient included 14 items, respect and authenticity for patient included 5 items, social skills for patient included 10 items, informative communication for colleagues included 1 item, empathy for colleagues included 8 items, respect and authenticity for colleagues included 4 items, and social skills for colleagues included 6 items.

Scoring system

Nurses' responses were measured on a five points Likert Scale ranged from 1= almost never, 2= once in a while, 3= normally, 4= very often, 5= many times.

The total score was calculated, summing scores and classified into categories according to cut off points. The total scores represented in a varying levels as follows:

-Good professional communication skills > 75%, equal to > 217.5 from total score.

-Fair professional communication skills 60- 75%, equal to 174 -217.5 from total score.

-Poor professional communication skills < 60%, equal to < 174 from total score.

Methods

Official permission to conduct the study was obtained from Dean of faculty of Nursing Tanta University to the administrator of Al-menshawy General hospital and was submitted to the responsible authorities of the selected units.

Ethical considerations:

-Approval of the Scientific Research Ethical Committee of the Faculty of Nursing Tanta University was obtained with code no (351-12-2023).) **(Appendix III)**

-Nature of the study was not cause any harm or pain to the nurses.

-Nurses consent to participate in the study was obtained after informed

them about the privacy of information obtained from them, nature of the study, their right to withdraw.

-Confidentiality and privacy were taken into consideration regarding data collection. A code number were used instead of names

Tools I and II were developed by the researcher and translated to Arabic by researcher.

The study tools I and II were presented to a jury of five experts in the area of specialty to check their content validity. The experts were two professors, two assistant professors, one lecturer of Nursing Administration and two professors of psychiatric and mental health nursing from the Faculty of Nursing Tanta University. **(Appendix IV).**

-The expert's responses were reported on a four points Likert Scale ranged from (4-1); 4= strongly relevant, 3= relevant, 2= little relevant, and 1= not relevant.

Face validity for tool (I) teamwork perception questionnaire of nurses was 93.9 % and 95.6 % for tool (II) professional communication skills questionnaire. **(Appendix V).**

A pilot study was carried out on 10% of the subject (60) nurses to test the clarity, reliability of tools, identify obstacles and problems that may be encountered during data collection and modifications were

done. This group was excluded from the total study sample, as they didn't provide direct care for patient.

Reliability of tools was tested using Cronbach's Alpha coefficient factor, its value for tool I teamwork perception of nurses was 0.855 and for tool II professional communication skills was 0.945.

Data collection phase: The data was collected from nurses by the researcher. The researcher met the nurses in small groups of about five nurses at their work settings and distributed the questionnaire on nurses during their work shifts morning and afternoon and according their workload. The estimated time needed to complete the questionnaire was 15-20 minutes. The nurses recorded the responses in the presence of researcher to clarify and ascertain all questions were answered.

Data was collected within six months from July to December 2024.

Statistical analysis of the 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.

The used tests were

1-Chi-square test for categorical variables, to compare between different groups F-test (ANOVA)

2-Pearson coefficient to correlate between two normally distributed quantitative variables.

Results:

Table (1): Shows nurses' characteristic data. As evident in the table more than one third (38.5%) of nurses fall in the age group less than 30 years with mean age of 34.99 ± 9.87 . While, around three-quarters (75.3%) of nurses were female and nearly three fifths (58.8%) of them were married. Regarding educational level; around one third (31.3%) of nurses had Associate Degrees in Nursing.

According to years of experience in nursing profession, more than two fifths (43.8%) of nurses had more than 10 years of experience with mean 13.30 ± 11.22 years of experience. Regarding the nurses' work department, the highest percentage (14%) of nurses were working in emergency unit followed by (13.5%) of nurses were working in medical intensive care unit.

Figure (1): Illustrates nurses' levels of overall perceptions of teamwork. The figure shows that the majority (88.7%) of nurses had a high level of overall perceptions of teamwork. While around one tenth (7.3%) of nurses had a moderate level of overall perceptions of teamwork.

Table (2): Demonstrates nurse's levels of perception regarding

teamwork dimensions. The table shows that the majority (91.3%) of nurses had a high level of perception regarding team structure dimension of teamwork. Around one fifth (17.7% and 17.3%) of nurses had a moderate level regarding leadership and mutual support dimensions of teamwork respectively. While around one tenth (10.2%) of nurses had low level regarding leadership dimension of teamwork.

Figure (2): Illustrates nurses' levels of overall professional communication skills. The figure shows that more than three quarters (77.8%) of nurses perceived good level of overall professional communication skills. Around one-fifth (17.7%) of nurses perceived fair level of overall professional communication skills.

Figure (3): Shows nurses' levels of overall professional Communication with patients and colleagues.

The figure illustrates more than two-thirds (71.5%) of nurses perceived good level of overall professional communication skills with patient. Around one-quarter (22.7%) of nurses perceived fair level of overall professional communication skills with patient. Majority (81.5%) of nurses perceived good level of overall professional communication skills with colleagues. Around one-fifth (14.5%) of nurses perceived fair

level of overall professional communication skills with colleagues.

Figure (4): Represents correlation between nurses' perception of teamwork and professional communication skills. The figure illustrates that there was a statistically significant positive correlation between nurses' perception of teamwork and professional communication skills at $p\text{-value} < 0.05$.

Table (1): Nurses' characteristic data (N= 600).

Characteristic data	Nurses	
	No.	%
Age (years)		
< 30	231	38.5
30 – 40	210	35.0
> 40	159	26.5
Min – Max.	21.0 – 60.0	
Mean ± SD.	34.99 ± 9.87	
Sex		
Male	148	24.7
Female	452	75.3
Marital status		
Married	353	58.8
Not married	247	41.2
Nursing educational level		
Diplom	158	26.3
Associate Degree	188	31.3
Baccalaureate Degree	158	26.3
Post graduate studies	96	16.1
Years of experience		
< 5	167	27.8
5 – 10	170	28.4
> 10	263	43.8
Min – Max.	1.0 – 41.0	
Mean ± SD.	13.30 ± 11.22	
Department		
General surgery	53	8.8
Hemodialysis	44	7.4
Pediatric intensive care unit	29	4.8
Neonatal intensive care unit	73	12.2
Intermediate care	29	4.8
Orthopedic department	51	8.5
Medical intensive care unit	81	13.5
Neurological intensive care unit	38	6.3
Cardiac intensive care unit	73	12.2
Obstetric and gynecology	45	7.5
Emergency	84	14.0

SD: Standard deviation

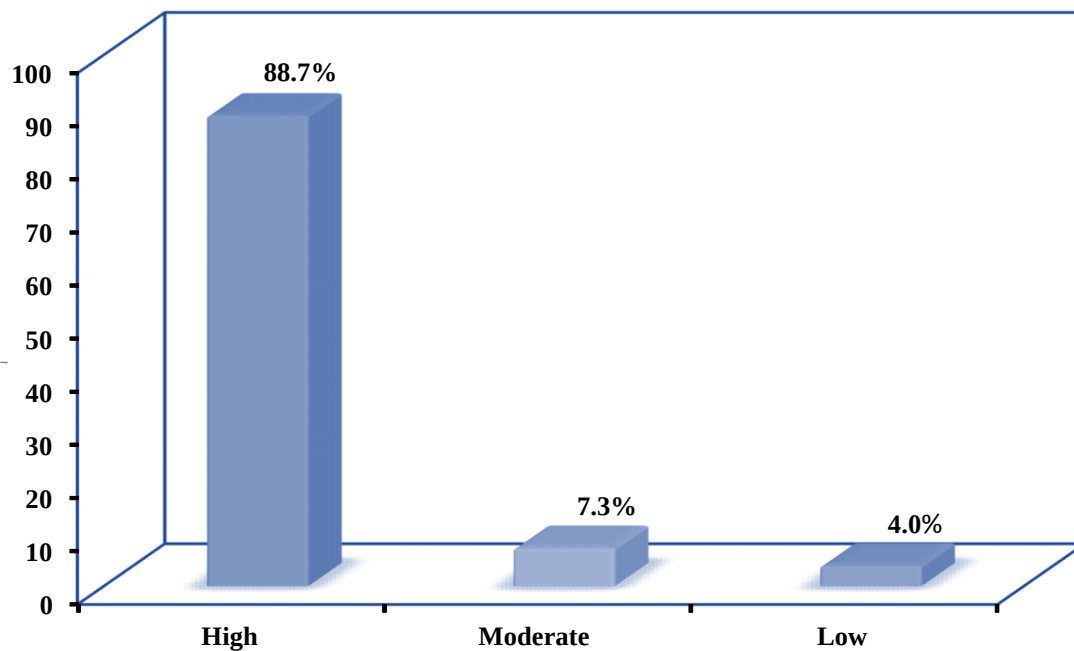


Figure (1): Nurses' levels of overall perceptions of teamwork. (n=600).

Table (2): Nurses' levels of perception regarding teamwork dimensions (n=600).

Nurse's Perception of teamwork dimensions	Levels of teamwork Perception					
	High (>75%)		Moderate (60 – 75%)		Low (<60%)	
	No.	%	No.	%	No.	%
Team Structure	548	91.3	28	4.7	24	4.0
Leadership	433	72.2	106	17.7	61	10.2
Situation Monitoring	512	85.3	56	9.3	32	5.3
Mutual Support	466	77.7	104	17.3	30	5.0
Information and Communication	510	85.0	64	10.7	26	4.3

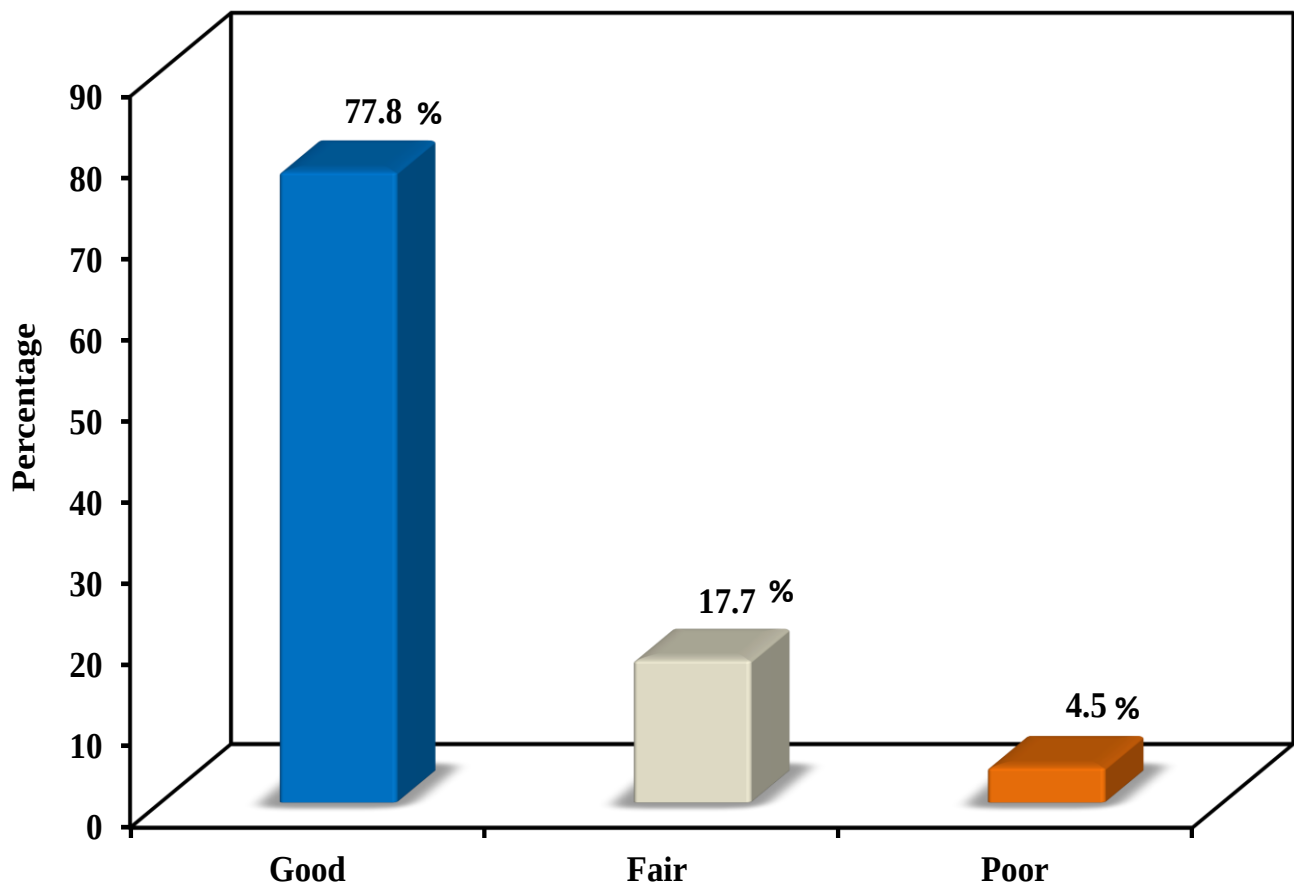


Figure (2): Nurses' levels of overall professional communication skills (n=600)

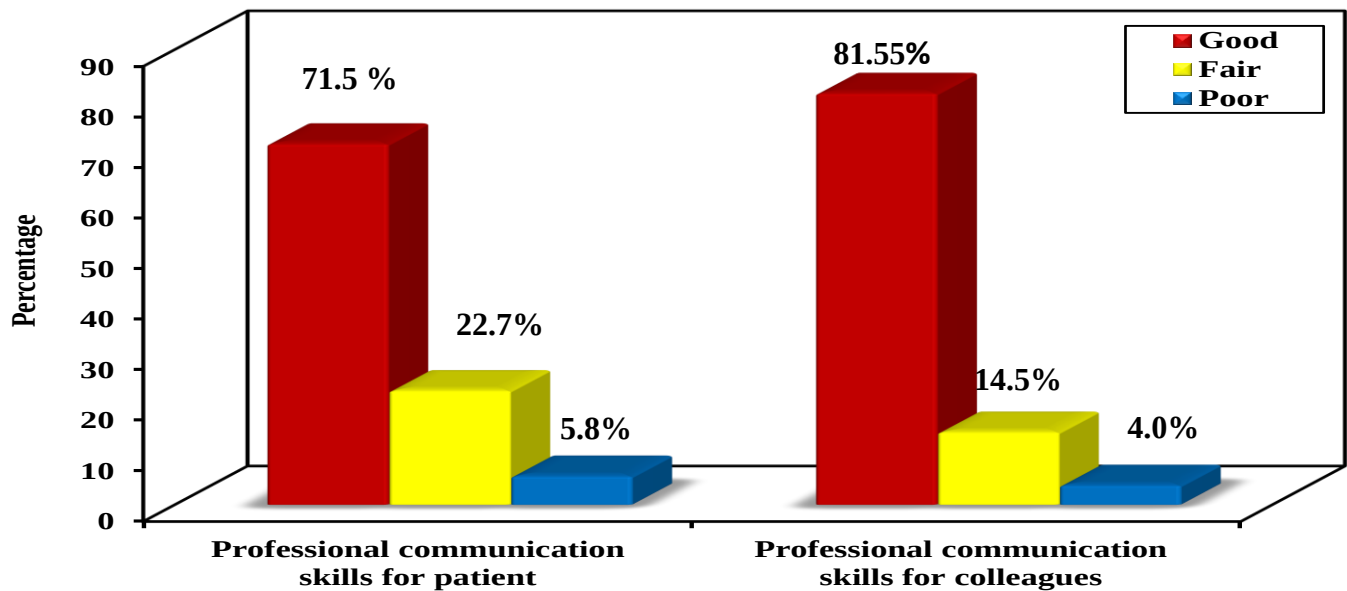


Figure (3): Nurses' levels of overall Professional communication skills with patient and colleagues (n=600).

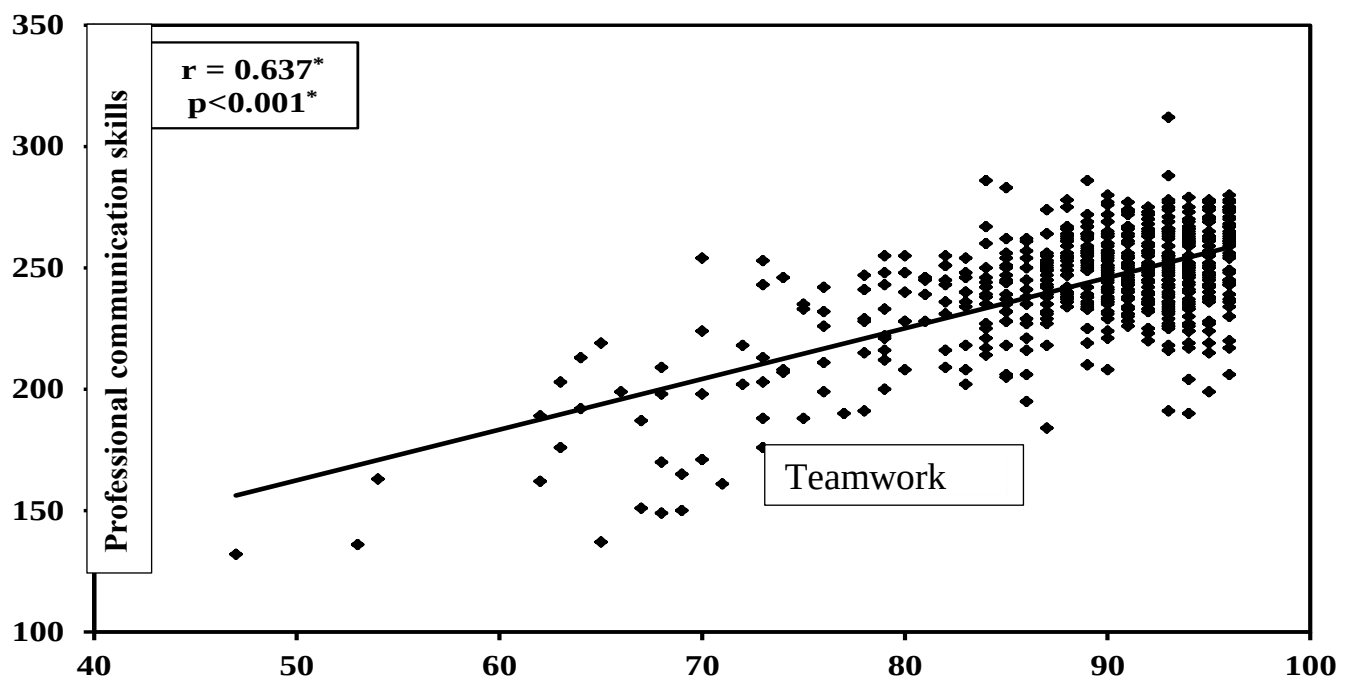


Figure (4): Correlation between nurses' perception of teamwork and professional communication skills.

Discussion

In modern healthcare settings, teamwork supports safe and efficient care by clarifying roles, enhancing leadership, improving monitoring, and promoting mutual support and communication (Marques et al., (2020)). These teamwork components strengthen coordination, reduce stress and improve patient satisfaction (Marques-Quinteiro et al., (2020)). Professional communication enables nurses to engage in accurate information exchange, patient education, and therapeutic interaction characterized by empathy, respect, authenticity, and social skills (Meneses-La-Riva et al., (2025)).

This study examined the relationship between teamwork and professional communication skills among nursing professionals at Al-Menshawey General Hospital. Proficient communication ensures accurate information exchange and quality of patient care.

Nurses' Perceptions of Teamwork.

The present study revealed that the majority of nurses demonstrated high perception levels of overall teamwork. This can be attributed to the high levels of effective team structures and the ability of team to monitor different situations and

share information as well as use open channels of communication.

However, the present study revealed that around one-tenth of nurses had a moderate level of overall perception of teamwork. This result may be due to around a quarter of nurses had less than five years of experience and around one fifth had moderate level of perception regarding leadership support of work in teams.

In agreement with the present study, (Gad et al., (2021)) found that the vast majority of staff nurses perceived their teamwork at a high level. Similarly, (Moussa et al., 2022), revealed predominantly positive attitudes towards teamwork, with participants demonstrating moderate to high scores across teamwork domains. In contrast, (Kohanová et al., (2023)), found that registered nurses perceived only moderate levels of teamwork during their shifts.

The findings of the present study illustrated that among the five teamwork dimensions, team structure received the highest percentage, with the majority of nurses perceiving high levels. This result may be due to high structural clarity showed in priorities and orders of actions were informed to team members. In agreement with these findings, (Gad et al., (2021)),

identified Team Structure as the highest dimension of teamwork. Similarly, **Moussa et al., (2022)**, found high mean scores for the team structure subscale.

The present study results showed that leadership among the teamwork dimensions has received the lowest percentage of high ratings among all subscales. Around one fifth of nurses had a moderate level regarding leadership, while around one-tenth had low level. The relatively lower scores regarding leadership perception compared to other teamwork dimensions may be due to some supervisors' lack of awareness of potential conflicts and insufficient involvement of staff in care planning.

Nurses' Response for Professional Communication Skills

The present study revealed that more than three-quarters of participants demonstrated good overall professional communication skills, while around one-fifth showed fair levels. The present study showed that the majority of nurses demonstrated good colleague communication, while more than two-thirds showed good patient communication. These results may be due to greater comfort with peers who share common professional language, clinical contexts, and mutual understanding.

In contrast, patient communication demands additional competencies including health literacy adaptation, emotional labor, and cultural sensitivity when building therapeutic relationships with unfamiliar individuals across diverse backgrounds. This requires nurses to have more experience and advancement in educational level, and this was clear as around one third of them had less than five years of experience and around half held a diplom or associate degree.

These findings go in the same link with **Leal-Costa et al., (2020)**, found that nurses generally perceived their communication competence as high, particularly in dimensions of empathy and informative communication. Similarly, **Ghrayeb et al., (2025)**, reported a high mean score for communication skills. In contrast, **Coolen et al., (2025)**, reported that while nurses felt confident in their friendly communication style with colleagues. However, they struggled with assertiveness and structured communication when interacting with physicians.

Correlation between nurses' perception of Teamwork and Professional Communication Skills.

The present study reveals a statistically significant positive

correlation between nurses' perception of teamwork and professional communication skills. This can be attributed to the relation between bidirectional dynamics where effective communication enables coordinated teamwork while strong teamwork structures provide platforms for communication skill expression.

The current study findings confirmed by **Meneses-La-Riva et al., (2025)**, reported a very strong positive correlation between effective communication and teamwork. Similarly, **Dlamini and Park, (2024)**, found that both teamwork and communication skills were significant positive predictors of patient-centered care. In contrast, **Demir and Dinç, (2024)** found only a weak positive correlation between communication skills and psychosocial care skills.

Conclusion

Based on the findings of the present study, it was concluded that The majority of nurses had high perception level of teamwork. More than three-quarters of nurses demonstrated good overall professional communication skills. There was a statistically significant positive correlation between nurses' perception of teamwork and professional communication skills

at Almenshawy General Hospital

Recommendations

In the light of the findings obtained from the present study, the following recommendations were suggested:

For the hospital administration:

- Conduct continuous in-service training for nurses that boost the knowledge and skills of teamwork and professional communication.

- Develop structured mentoring programs pairing experienced nurses with novice nurses to facilitate communication skill development.

- Establish structured reward and recognition systems that value effective teamwork and communication contributions.

For head nurses:

- Provide support to nurses through honest interaction, open communication, and shared decision-making to strengthen leadership perception.

- Foster a psychologically safe environment that encourages nurses to monitor each other's performance, speak up about concerns, and report safety issues without fear.

- Ensure adequate resources are available to nursing staff and take time to meet nurses regularly to develop and re-evaluate patient care plans.

For nurses:

-Attend educational programs about teamwork and professional communication.

-Concentrate on improving personal understanding of social skills, empathy and respect skills.

For further research:

-Investigate the relation between teamwork and patient safety outcomes.

-Impact of teamwork quality on patient safety.

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Effect of Structured Educational Guidelines on Nurses' Performance and Attitudes Regarding High-Alert Medications at Mansoura University hospitals

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Abstract

Background: High-alert medications are drugs that bear a heightened risk of causing significant patient harm when used in error. Nurses play a pivotal role in the safe administration of these medications, acting as the final safeguard against potential errors. **Aim of the study:** to evaluate the effect of structured educational guidelines on nurses' performance and attitudes regarding high-alert medications at Mansoura University Hospitals. **Design and Setting:** A quasi-experimental research design was utilized. The study was conducted at the cardiology, medical and surgical departments of Mansoura University Hospitals. **Sample:** All available registered nurses (80) who are directly involved in administering high-alert medications to patients in the per mentioned settings. **Tools:** three tools were used; **Tool I: Structured Nurses' Interview Questionnaire (II) Nurses' Practice observational Checklist, (III) Nurse Attitude Assessment tool. Results:** The findings of the present study revealed that there was a statistically significant improvement in nurses' knowledge, practice, and attitudes throughout the study; increasing from 15.0%, 32.2%, and 10.0% pre-the educational guidelines to 92.5% and 80.0%, 97.7% and 90.4%, 90.0% and 77.5% immediately post-implementation and at 2 month follow-up, respectively. **Conclusion:** The implementation of structured educational guidelines is a highly effective strategy for enhancing nursing knowledge and competency. **Recommendations:** Regular workshops and seminars on high-alert medications should be mandatory for nursing staff.

Keywords: High-Alert Medications, Nursing performance, Attitudes, Educational Guidelines.

Introduction

High-alert medications (HAMs) are a class of drugs that, while therapeutically essential, carry a significantly elevated risk of causing severe patient harm or death when administered incorrectly **(ISMP, 2024)**. Globally, medication errors are a leading cause of preventable harm in healthcare, with an estimated cost of \$42 billion USD annually, representing almost 1% of total health expenditures worldwide **(WHO, 2025; WSNA, 2024)**. Medication errors involving high-alert medications (HAMs), although not necessarily the most common, are strongly associated with serious adverse consequences such as prolonged hospitalization, permanent disability, and increased healthcare costs **(Almutairi, 2025; Menezes, 2025)**. The Institute for Safe Medication Practices (ISMP) continually updates its list of HAMs, reflecting the ongoing global challenge of ensuring their safe use and the importance of implementing rigorous management and safety protocols **(ISMP, 2024)**. Nurses are at the forefront of medication administration, serving as a critical safeguard against errors and playing a key role in safe high-alert medication (HAM) use **(Abd Elaziz et al., 2023)**. Their knowledge, vigilance, and professional attitudes are essential

for reducing risks and improving patient safety, while studies show that inadequate knowledge or weak practices among nurses can significantly increase medication errors, especially with high-risk drugs **(Farag, 2024; Bibi, 2025)**.

Medication errors involving high-alert medications (HAMs) are a serious concern in Egyptian healthcare, with studies from Mansoura University Hospitals and other national centers showing errors in HAM administration reaching about 25.3%, often due to incorrect dosing **(Abdelhamed, 2020; Aly N, 2023; ClinicalTrials.gov, 2025; Shehata, 2016)**. These findings highlight the need for targeted educational interventions to strengthen nurses' knowledge, attitudes, and practices, thereby improving their competence and confidence in managing HAMs and enhancing patient safety.

Structured educational guidelines are widely recognized as an effective pedagogical approach to enhance healthcare professionals' performance and cultivate favorable attitudes toward patient safety **(Ali, 2024)**. Such guidelines provide a standardized framework for knowledge acquisition, reinforce best practices, and facilitate practical skill development, ultimately reducing variations in

care delivery and minimizing error potential.

Significance of the Study

Medication errors involving high-alert medications are a critical global challenge, threatening patient safety, causing substantial morbidity and mortality, and imposing a heavy financial burden estimated at \$42 billion annually (WHO, 2025; WSNA, 2024; Naserallallah, 2023). In Egypt, such errors remain a pressing concern within healthcare settings. So, the current study, focusing on Mansoura University, aims to evaluate the effect of structured educational guidelines on nurses' performance and attitudes regarding High Alert medication.

Aim of the Study; to evaluate the effect of structured educational guidelines on nurses' performance and attitudes regarding high-alert medications at Mansoura University Hospitals.

Research Hypotheses

H1: Nurses' mean score of knowledge regarding high-alert medications is expected to be improved after implementation of the structured educational guidelines.

H2: Nurses' mean score of practice regarding high-alert medication administration is expected to be improved after implementation of

the structured educational guidelines.

H3: Nurses' attitudes toward high-alert medication safety are expected to be significantly more positive after implementation of the structured educational guidelines.

Research Design: A quasi-experimental research design (pretest\posttest) was used.

Setting

The study was conducted at the cardiology, medical and surgical units at Mansoura University Hospitals affiliated to the ministry of higher education and scientific research.

Subjects

All available registered nurses (80) who are directly involved in administering high-alert medications to patients in the previously mentioned settings were involved in the study.

Tools of Data Collection

Tool I: Structured Nurses' Interview Questionnaire regarding High Alert Medication.

This tool was developed by the researcher and consisted of two parts:

Part (1): Socio-Demographic characteristics of studied Nurses

This part collected background information about the nurses that included: Code number, Age, Sex, Education level, Marital status, Years of experience, Place of

residence, and Previous specific training on HAM administration.

Part (2): Nurses' Knowledge Assessment Questionnaire regarding High Alert Medications.

It was developed by the researcher after reviewing relevant recent literature (Ahmad, Khan, Bibi, Khan, and Khan, S. 2024 ; Aziz, T., Khan, A., Sial, Jaseem, and Khan, S. 2024), to assess nurses' knowledge about high-alert medication (HAM). This tool was a structured multiple-choice questionnaire (MCQ) and consisted of (73) questions covering the following categories:

a- Nurses' knowledge regarding Insulin administration (23 questions): It included questions about sources, benefits, normal blood sugar values, types of insulin (rapid, short, intermediate, and long-acting), administration timing, storage, precautions, and management of hypoglycemia and hyperglycemia.

b- Nurses' knowledge regarding Opioid administration (8 questions): It included questions about indications (e.g., chronic pain, cancer), signs of toxicity or overdose (respiratory depression, sedation), side effects, contraindications, and critical vital signs monitoring.

c- Nurses' knowledge regarding Sedative administration (14 questions):

It included questions about nursing actions in the absence of orders, administration rates, risks in patients with respiratory conditions (asthma, sleep apnea), side effects, withdrawal symptoms,

d- Nurses' knowledge regarding Anticoagulant administration (28 questions):

It included questions about indications, required baseline blood studies, contraindications, drug-food interactions, administration routes, transition protocols, and emergency antidotes.

Scoring System for Knowledge:

Each question was scored as follows: Correct and complete answer: 2 points. Correct but incomplete answer: 1 point. Incorrect or "don't know" answer: 0 point.

The total knowledge score was calculated as a percentage and classified into three levels: Good knowledge level: $\geq 80\%$ of the total score. Fair knowledge level: $60\% - < 80\%$ of the total score. Poor knowledge level: $< 60\%$ of the total score.

Tool (II): Nurses' Practice observational Checklist regarding High Alert Medication. This tool was developed by the researcher after reviewing relevant recent literature (Aziz, Khan, Sial,

Jaseem, M., and Khan, S. 2024 ; Farag, Eweda, Elsayed, N., & Yousef, G. 2024) , it was used to assess the actual clinical practices of nurses during the administration of high-alert medications. It was divided into four specific sub-checklists:

A-Insulin Administration (25 items): Assessed practices such as storage, admission assessment (type, time, sites, habits), glucose monitoring, double-checking, documentation, and patient education on self-injection and glucometer use.

B-Opioid Administration (15 items): Focused on independent double-checks, respiratory risk assessment, vital signs monitoring , allergy assessment, and the use of pain and sedation scales.

C-Sedative Administration (7 items): Included allergy checks, respiratory risk assessment, reassessment of pain at peak effect (30-60 mins), and documentation of complete medication orders.

D-Anticoagulant Administration (16 items): Assessed baseline coagulation profile documentation, storage and labeling, availability of antidotes (Protamine Sulfate, Vitamin K), patient education, and monitoring for signs of bleeding .

Scoring System for Practice: Each item was scored as the following;

Done: (1) point., - Not done: (0) points. The total practice score was calculated as a percentage and classified into two levels; **Satisfactory** practice ($\geq 70\%$) of the total score, - **Unsatisfactory** practice ($< 70\%$) of the total score.

Tool (III): Nurses' Attitude toward High Alert Medication Assessment tool. This tool was developed by the researcher after review of relevant literature (Rahman, Bilal, Ahmad, Khan, and Khan, S. 2025) , to evaluate the nurses' attitudes toward HAM administration through two sections that covered the general attitudes and Attitudes Toward Safety Practices as following;

General Attitudes Toward HAM Administration (5 items): this part assessed confidence levels, perceived importance of HAMs, comfort in consulting colleagues, and concerns about making errors.

Attitudes Toward Safety Practices (5 items): this part evaluated beliefs regarding error reporting, comfort in reporting mistakes, fear of blame, and perceptions of decision support tools versus time constraints.

Scoring System for Attitude:

The tool evaluated nurses' attitude through a 5-point Likert scale (ranging from 1 = **Strongly Disagree**, 2 = **Disagree**, 3 = **Neutral**, 4 = **Agree**, 5 = **Strongly Agree**). The total attitude score was

calculated as a percentage and classified into:

Positive attitude: $\geq 60\%$ of the total score.

Negative attitude: $< 60\%$ of the total score.

Methods

Ethical and legal consideration:

Official letters were secured from the Faculty of Nursing, Mansoura University, and submitted to the appropriate authorities in the selected study locations. The directors of the Medical, Surgical, and Cardiology departments at Mansoura University Hospital granted permission to conduct the study, while ethical approval was obtained from the Faculty of Nursing's Ethics Committee (code no: 0845). All participating nurses provided informed consent after the study's purpose and their right to withdraw at any time were explained. Confidentiality was ensured by using code numbers instead of names during data collection.

Methods of data collection:

-All study instruments were assessed for content validity and clarity by a panel of five experts, including specialists in Medical-Surgical Nursing and clinical pharmacologists. Based on their feedback, necessary modifications were made. The Content Validity

Index (CVI) was subsequently calculated and found to be 97%.

-A pilot study was then conducted on 10% of the nurses to evaluate the feasibility, applicability, clarity, relevance, and organization of the tools, as well as to identify any potential obstacles during data collection. Required adjustments were made accordingly, and the pilot group was excluded from the main study sample.

-The reliability for the study tools was calculated by Cronbach's alpha test; it was 0.89 for Tool (I) Part (ii), 0.94 for Tool (II), and 0.88 for Tool (III). The suitable statistical tests were used for testing questionnaire reliability.

-Data collection for the current study took place over an eight-month period, from January 2025 through August 2025.

-The study was carried out in four sequential phases: assessment, planning, implementation, and evaluation. Each nurse participated individually during their regular clinical shifts throughout the study.

Assessment phase:

Assessment of the baseline data for the participating nurses was carried out by using Tool (I), Tool (II), and Tool (III) to assess nurses' socio-demographic data, theoretical knowledge, clinical practices, and attitudes regarding high-alert medication administration before

implementation of the structured educational guidelines. Each interview and observation session took approximately 45–60 minutes.

Planning phase:

The study's objectives were developed according to the assessed needs of the nurses. The specific objectives of this structured educational program were to:

Enhance nurses' **knowledge** regarding the safe administration, monitoring, and management of high-alert medications, including Insulin, Opioids, Sedatives, and Anticoagulants., Improve nurses' **practical skills** in handling high-alert medications, administration, patient assessment, documentation, and complication management., Positively influence nurses' **attitudes** towards the adherence to safety protocols and guidelines for high-alert medications.

The structured educational guidelines were constructed by the researcher based on participant assessments and an extensive literature review. (ISMP, 2024; Jayachandra, & Al Rasheedi, 2025). A structured, illustrated colored booklet, written in simple Arabic and enhanced with clear pictures, was developed as a guide for the study participants.

In addition, multiple teaching methods were used, including instructional videos, group

discussions, PowerPoint presentations, and demonstration followed by re-demonstration by the studied nurses for the practical performance component.

Implementation phase:

The program was carried out by the researcher, ensuring a consistent and standardized approach. The studied nurses were divided into subgroups, each contained a manageable number of participants (six nurses per group) which facilitated interactive learning and individualized attention. The educational program was delivered through a series of **(4) sessions** for the nurses. Each session was approximately **(2) hours** in duration, with a frequency of **(2) days per week**. The specific timing for each session was about 30-45 minutes per topic, allowing for focused learning and practical application.

Part I: Theoretical Sessions (2 Sessions) Session 1: Introduction to High-Alert Medications (HAMs) and Insulin Administration (Approx. 2 hours). This session provided foundational knowledge regarding high-alert medications and the specifics of insulin administration. It covered; **Definition and Categories of HAMs:** Understanding what constitutes a high-alert medication and common categories, **General**

Safety Protocols: Overview of essential safety measures for HAMs, including independent double-check procedures, **Insulin Knowledge:** Sources, benefits, normal blood sugar values, types of insulin (rapid, short, intermediate, and long-acting), administration timing, storage, precautions, and management of hypoglycemia and hyperglycemia.

Session 2: Opioid, Sedative, and Anticoagulant Knowledge (Approx. 2 hours). This session focused on the theoretical aspects of opioid, sedative, and anticoagulant administration, that emphasized on safety and monitoring which included; **Opioid medication:** Indications (e.g., chronic pain, cancer), signs of toxicity or overdose (respiratory depression, sedation), side effects, contraindications, and critical vital signs monitoring, **Sedative medication:** Nursing actions in the absence of orders, administration rates, risks in patients with respiratory conditions (asthma, sleep apnea), side effects, and withdrawal symptoms., **Anticoagulant medication:** Indications, required baseline blood studies, contraindications, drug-food interactions (Vitamin K), administration routes, transition protocols, and emergency antidotes.

Part II: Practical Sessions (2 Sessions)

Session 3: Practical Skills for Insulin and Anticoagulant Administration (Approx. 2 hours). This session focused on the practical application of practice related to insulin and anticoagulant administration, incorporating demonstration and re-demonstration:

Insulin Administration Practice: included practices such as storage, admission assessment (type, time, sites, habits), glucose monitoring, independent double-checking, documentation, and patient education on self-injection and glucometer use., **Anticoagulant Administration Practice:** included baseline coagulation profile documentation, storage and labeling, availability of antidotes (Protamine Sulfate, Vitamin K), patient education, and monitoring for signs of bleeding (e.g., melena, hematuria).

Session 4: Practical Skills for Opioid and Sedative Administration, Documentation, and Safety Culture (Approx. 2 hours). This session covered the practical aspects of opioid and sedative administration, alongside crucial elements of documentation and fostering a safety culture:

Opioid Administration Practice: Focused on independent double-

checks, respiratory risk assessment, vital signs monitoring (every 4 hours), allergy assessment, and the use of pain and sedation scales., **Sedative Administration Practice:** Included allergy checks, respiratory risk assessment, reassessment of pain at peak effect (30-60 mins), and documentation of complete medication orders., **Documentation and Safety Culture:** Emphasizing accurate documentation of administration, reporting of medication errors without fear of blame, and patient education before discharge.

Evaluation phase; Every nurse was evaluated 3 times: - First time: pre application of structured educational guidelines using Tool I part 2 and Tool II,III. Second time: immediately post structured educational guidelines using Tool I part 2 and Tool II,III., and the Third time: 2 months post structured educational guidelines using Tool I part 2 Tool II and III.

Methods of data analysis:

The entire dataset was compiled, coded, tabulated, and subjected to statistical evaluation using SPSS version 20, with Microsoft Excel employed for data handling and visual presentations. Variables were reported as counts and percentages. Significance for numerical data was determined using the F-test,

adopting a threshold of $p \leq 0.01$ as highly significant.

Results

Table (1): Illustrates the percent distribution of socio-demographic characteristics and training/exposure to high-alert medications of the studied nurses.

The table revealed that more than one third (40%) of the nurses aged from 35–44 years, the majority (85%) were females, more than half (60%) were married, the majority (70%) were from urban areas, half of them (50%) had diploma in nursing, and regarding years of nursing experience, 40% had 6–10 years of experience. Concerning training and exposure to high-alert medications, three quarters (75%) of the nurses had not received specific training on high-alert medication administration, and 40% administered high-alert medications weekly.

Table (2): Illustrates distribution of the studied nurses regarding domains of knowledge about HAM throughout periods of the study

The table showed that, regarding knowledge related to insulin, there was a statistically significant improvement in nurses' knowledge throughout the periods of the educational guidelines program. The mean $\pm$ SD was 49.21 ± 9.70 before the study, while it improved

to 83.21 ± 7.69 and 80.18 ± 10.98 immediately post-the study and at 2-month follow-up, respectively. Concerning knowledge related to opioids, a statistically significant improvement was observed in nurses' knowledge across the educational guidelines program phases. The mean $\pm$ SD was 48.93 ± 10.98 prior to the program, improving to 84.37 ± 7.47 and 81.30 ± 10.38 immediately post-program and at 2-month follow-up, respectively. For knowledge related to sedatives, there was a statistically significant improvement in nurses' knowledge throughout the periods of the educational guidelines program. The mean $\pm$ SD was 48.94 ± 10.97 before the program, while it improved to 84.50 ± 6.99 and 80.41 ± 10.84 immediately post-program and at 2-month follow-up, respectively.

Regarding knowledge related to anticoagulants, a statistically significant improvement was evident in nurses' knowledge across the educational guidelines program phases. The mean $\pm$ SD was 47.28 ± 11.06 prior to the intervention, improving to 84.41 ± 8.11 and 79.77 ± 9.81 immediately post-intervention and at 2-month follow-up, respectively.

Overall, for total knowledge scores, there was a statistically significant improvement in nurses' knowledge

throughout the periods of the educational guidelines program. The mean $\pm$ SD was 48.52 ± 11.05 before the intervention, while it improved to 83.89 ± 7.87 and 80.91 ± 8.75 immediately post-intervention and at 2-month follow-up, respectively with p value <0.0001 pre vs. post and pre vs. follow up period

Figure (1): Shows distribution of the studied nurses regarding their total levels of knowledge about high-alert medications

throughout the pre, immediate post, and follow-up periods of study. The figure showed that there was a highly significant improvement in the nurses' total levels of knowledge about high-alert medications where the majority (85%) of the nurses had poor level of knowledge pre implementation of the structured educational guidelines, whereas the majority (92.5%) and 80% of the nurses had scored good level of knowledge immediately post implementation, and at the 2-month follow-up respectively with p value < 0.001 .

Table (3): Clarifies distribution of the studied nurses' practice regarding domains of practice throughout periods of the study

The table showed that; **Regarding practice related to insulin administration,** there was a

statistically significant improvement in nurses' practice throughout the periods of the educational guidelines program. The mean $\pm$ SD was 69.14 ± 17.35 before the intervention, while it improved to 88.72 ± 7.37 and 85.23 ± 10.58 immediately post-intervention and at 2-month follow-up, respectively. Concerning practice related to opioid administration, a statistically significant improvement was observed in nurses' practice across the educational guidelines program phases. The mean $\pm$ SD was 69.45 ± 15.66 prior to the intervention, improving to 88.78 ± 8.05 and 85.19 ± 12.01 immediately post-intervention and at follow-up, respectively. **For practice related to sedative administration**, there was a statistically significant improvement in nurses' practice throughout the periods of the educational guidelines program. The mean $\pm$ SD was 69.56 ± 15.35 before the intervention, while it improved to 88.44 ± 6.99 and 85.96 ± 9.72 immediately post-intervention and at follow-up, respectively. Regarding practice related to anticoagulant administration, a statistically significant improvement was evident in nurses' practice across the educational guidelines program phases. The mean $\pm$ SD was 68.73 ± 16.33 prior to the intervention,

improving to 88.88 ± 5.95 and 87.47 ± 9.64 immediately post-intervention and at follow-up, respectively.

Overall, for total practice scores, there was a statistically significant improvement in nurses' practice throughout the periods of the educational guidelines program. The mean $\pm$ SD was 69.77 ± 16.47 before the intervention, while it improved to 89.02 ± 7.93 and 85.65 ± 10.10 immediately post-intervention and at 2-month follow-up, respectively with p value <0.001 pre vs. post and pre vs. follow up period

Figure (2): Shows Percent distribution of the studied nurses regarding their total practice levels in high-alert medication administration throughout the pre, immediate post, and follow-up periods of study. A highly significant enhancement in the nurses' overall practice levels is evident in the figure throughout the periods of the educational guidelines program ; where 67.8% of nurses had achieved unsatisfactory level of practice pre-implementation of the structured educational guidelines, whereas 97.7% and 90.4% of nurses had achieved satisfactory level of practice immediately post-implementation, and at the 2-month

follow-up respectively with $P < 0.001$.

Table (4): Represents the distribution of the studied nurses' attitudes regarding domains of attitude throughout the periods of the study.

The table showed that; regarding general attitudes toward HAM administration, there was a statistically significant improvement in nurses' attitudes throughout the periods of the educational program. The mean $\% \pm SD$ was 49.26 ± 14.25 before the intervention, while it significantly improved to 74.39 ± 13.09 and 71.01 ± 16.33 immediately post-intervention and at 2- month follow-up, respectively. Concerning attitudes toward safety practices, a statistically significant improvement was observed in nurses' attitudes throughout the educational guidelines program phases. The mean $\% \pm SD$ was 47.86 ± 14.82 prior to the intervention, improving to 73.62 ± 15.69 and 71.10 ± 16.70 immediately post-intervention and at 2-month follow-up, respectively. Overall, for total attitude scores, there was a statistically significant improvement in nurses' attitudes throughout the periods of the educational guidelines program. The mean $\% \pm SD$ was 48.46 ± 13.35 before the study, while it improved to 76.72 ± 11.34 and

70.39 ± 15.64 immediately post-intervention and at follow-up, respectively with p value <0.001 pre vs. post and pre vs. follow up period **Figure (3): Represents Percent distribution of the studied nurses regarding their total attitude levels toward high-alert medication administration throughout the pre, immediate post, and follow-up periods of study.** The figure showed that there was a highly significant improvement in the nurses' total attitude levels towards HAMs throughout the periods of the educational guidelines program; where 90.0% of nurses had a negative attitude level pre-implementation of the structured educational guidelines, whereas 90.0% and 77.5% of nurses had achieved a positive attitude level immediately post-implementation and at the 2-month follow-up, respectively with $P < 0.001^*$.

Table (5): Illustrates the correlation between socio-demographic characteristics of the studied nurses and their total knowledge, practice, and attitude levels throughout the study periods. The table reveals highly significant positive correlations between higher education levels, more years of nursing experience, previous training on HAM, and higher frequency of administering

HAM with improved knowledge, performance, and attitudes with ($p < 0.01$). Additionally, age and marital status showed significant positive correlations in certain domains ($p < 0.05$). Conversely, no statistically significant correlations were observed between nurses' gender or place of residence and their total knowledge, performance, or attitudes ($p > 0.05$).

Table (1) Percent distribution of socio-demographic characteristics and training/exposure to high-alert medications of the studied nurses (n=80)

Characteristic	Frequency	Percentage (%)
Age		
25–34 years	28	35.0
35–44 years	32	40.0
45–54 years	16	20.0
55 or older	4	5.0
Mean ± SD 39.0 ± 8.7		
Gender		
Female	68	85.0
Male	12	15.0
Marital Status		
Single	24	30.0
Married	48	60.0
Divorced/Separated/Widowed	8	10.0
Place of Residence		
Urban	56	70.0
Rural	24	30.0
Level of Education		
Diploma in Nursing	40	50.0
Bachelor's Degree in Nursing	36	45.0
Master's Degree in Nursing	4	5.0
Years of Nursing Experience		
1–5 years	24	30.0
6–10 years	32	40.0
11–20 years	16	20.0
More than 20 years	8	10.0
Part 2: Training and Exposure to High-Alert Medications		
Have you received specific training on high-alert medication (HAM) administration?		
Yes	20	25.0
No	60	75.0
How often do you administer high-alert medications in your current role?		
Daily	24	30.0
Weekly	32	40.0
Monthly	16	20.0
Rarely/Never	8	10.0

Table (2): distribution of the studied nurses regarding domains of knowledge related to HAM throughout periods of the study

Knowledge domains of (Number of Questions)	Pre-Program	Immediate Post-program	Follow-up (2 months)	(Pre vs Post)	(Post vs Follow-up)	(Pre vs Follow-up)
	Mean % $\pm$ SD	Mean % $\pm$ SD	Mean % $\pm$ SD	P-value	P-value	P-value
Knowledge related to insulin (23)	49.21 $\pm$ 9.70	83.21 $\pm$ 7.69	80.18 $\pm$ 10.98	<0.001**	0.0449	< 0.001**
Knowledge related to opioids (8)	48.93 $\pm$ 10.98	84.37 $\pm$ 7.47	81.30 $\pm$ 10.38	<0.001**	0.0333	< 0.001**
Knowledge related to sedatives (14)	48.94 $\pm$ 10.97	84.50 $\pm$ 6.99	80.41 $\pm$ 10.84	<0.001**	0.0052	< 0.001**
Knowledge related to anticoagulants (28)	47.28 $\pm$ 11.06	84.41 $\pm$ 8.11	79.77 $\pm$ 9.81	<0.001**	0.0014	< 0.001**
Total knowledge scores (73)	48.52 $\pm$ 11.05	83.89 $\pm$ 7.87	80.91 $\pm$ 8.75	<0.001**	0.0249	< 0.001**

Significant at level $P < 0.05$. ** High significant at level $p < 0.001$

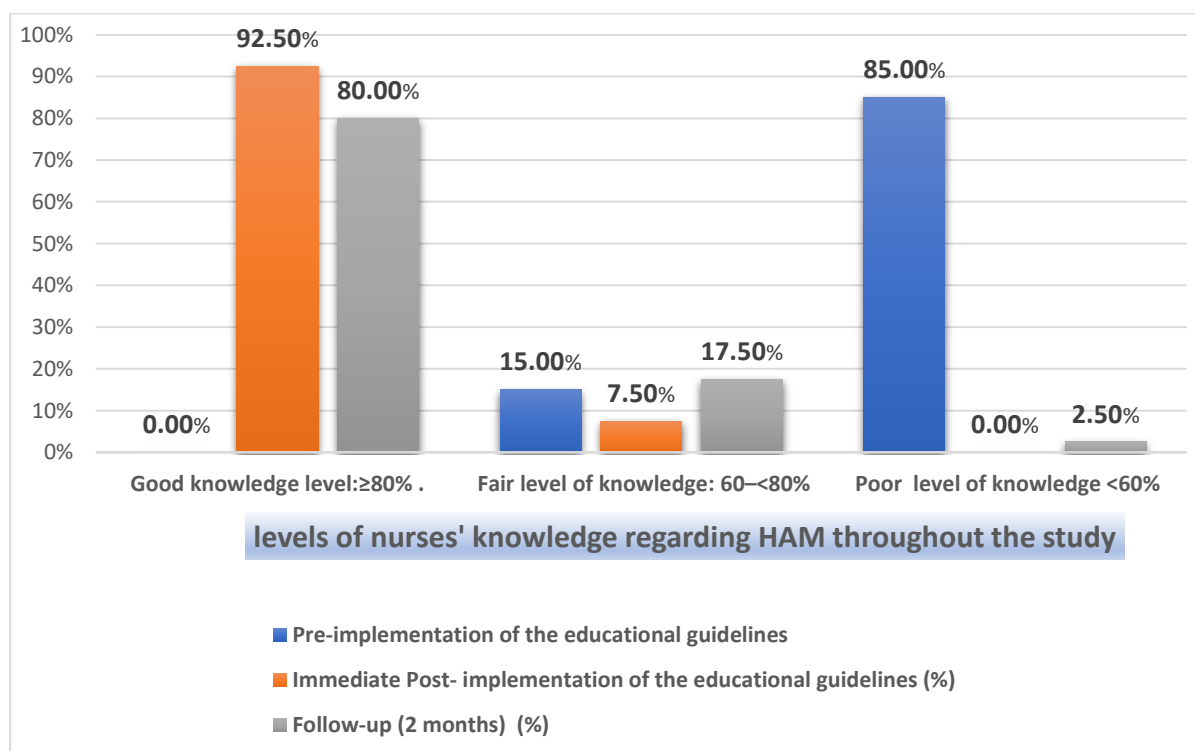


Figure (1) Percent distribution of the studied nurses regarding their total levels of knowledge about high-alert medications throughout the pre, immediate post, and at 2-month follow-up periods of study.

Table (3): distribution of the studied nurses regarding domains of practice regarding HAM throughout periods of the study

Practice Items (Number of Items)	Pre-Program	Immediate Post- program	Follow-up (2 months)	(Pre vs Post)	(Post vs Follow- up)	(Pre vs Follow- up)
	Mean % $\pm$ SD	Mean % $\pm$ SD	Mean % $\pm$ SD	P-value	P-value	P-value
Insulin Administration (25 items)	69.14 $\pm$ 17.35	88.72 $\pm$ 7.37	85.23 $\pm$ 10.58	<0.001**	0.0166	< 0.001**
Opioid Administration (15 items)	69.45 $\pm$ 15.66	88.78 $\pm$ 8.05	85.19 $\pm$ 12.01	<0.001**	0.0278	< 0.001**
Sedative Administration (7 items)	69.56 $\pm$ 15.35	88.44 $\pm$ 6.99	85.96 $\pm$ 9.72	<0.001**	0.0658	< 0.001**
Anticoagulant Administration (16 items)	68.73 $\pm$ 16.33	88.88 $\pm$ 5.95	87.47 $\pm$ 9.64	<0.001**	0.2673	< 0.001**
Total Practice scores (63)	69.77 $\pm$ 16.47	89.02 $\pm$ 7.93	85.65 $\pm$ 10.10	<0.001**	0.0201	< 0.001**

Significant at level $P < 0.05$. ** High significant at level $p < 0.001$

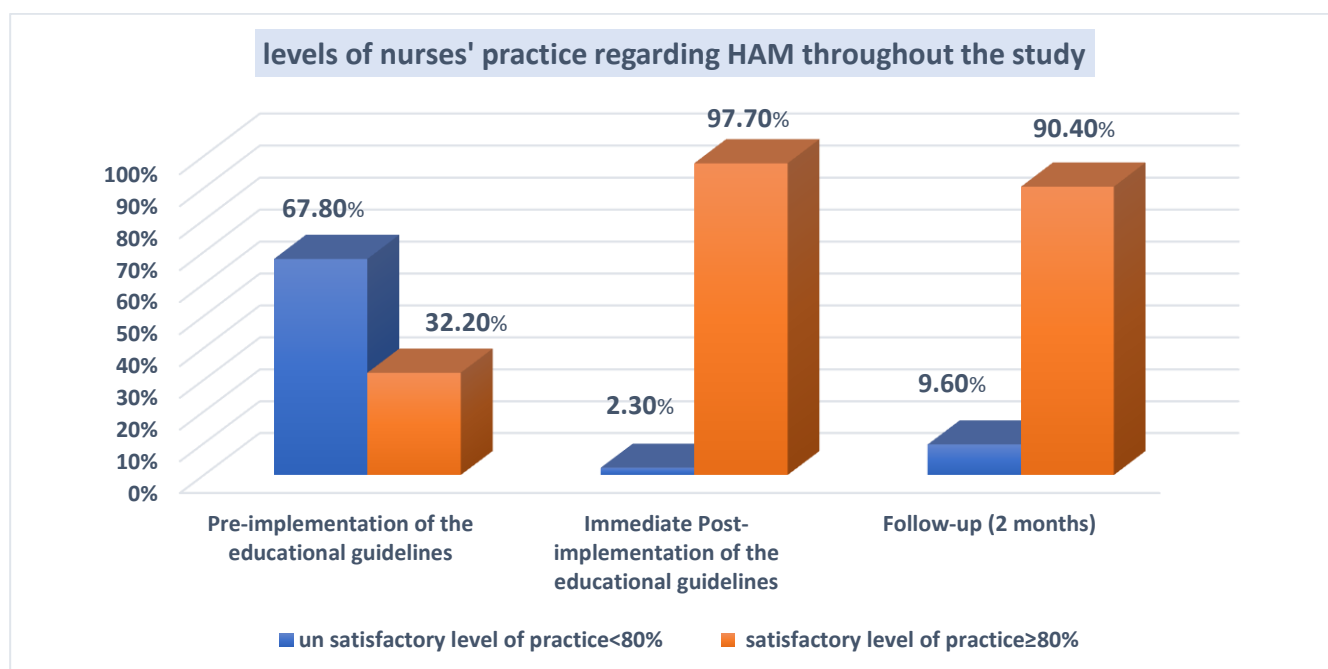
**Figure (2): Percent distribution of the studied nurses regarding their total levels of practice in high-alert medication administration throughout the pre, immediate post, and follow-up periods of study.**

Table 4): distribution of the studied nurses regarding domains of attitudes toward HAM throughout periods of the study

Attitude Domains (Number of Items)	Pre-program	Immediate Post-program	Follow-up (2 months)	(Pre vs Post)	(Post vs Follow- up)	(Pre vs Follow- up)
	Mean % $\pm$ SD	Mean % $\pm$ SD	Mean % $\pm$ SD	P-value	P-value	P-value
General Attitudes Toward HAM Administration (5)	49.26 $\pm$ 14.25	74.39 $\pm$ 13.09	71.01 $\pm$ 16.33	< 0.001**	0.1506	< 0.001**
Attitudes Toward Safety Practices (5)	47.86 $\pm$ 14.82	73.62 $\pm$ 15.69	71.10 $\pm$ 16.70	< 0.001**	0.3268	< 0.001**
Total Attitude scores (10)	48.46 $\pm$ 13.35	76.72 $\pm$ 11.34	70.39 $\pm$ 15.64	< 0.001**	0.0039	< 0.001**

Significant at level $P < 0.05$. ** High significant at level $p < 0.001$

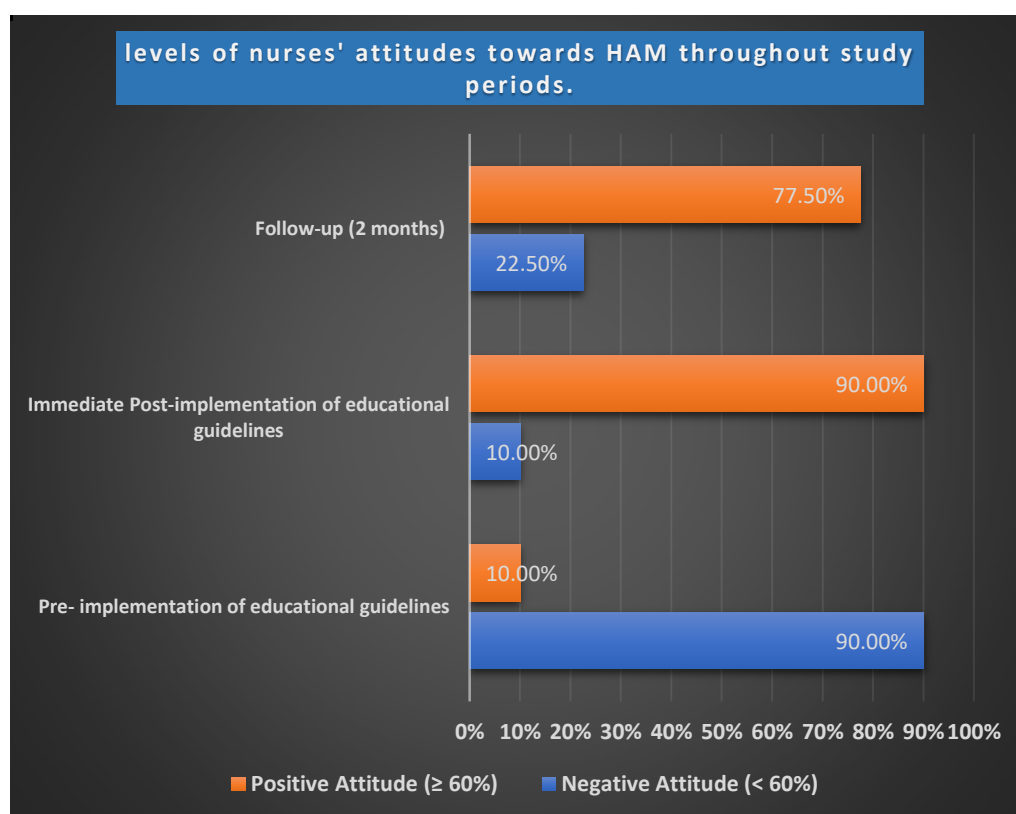
**Figure (3): Percent distribution of the studied nurses regarding their total attitudes towards high-alert medications throughout the pre, immediate post, and follow-up periods of study.**

Table (5): Correlation between socio-demographic characteristics of the studied nurses (n=80) and their total knowledge, practice, and attitudes levels towards high alert medications throughout the periods of study.

Socio-demographic Variable	Total Knowledge (r)	P-value	Total practice (r)	P-value	Total Attitudes (r)	P-value
Age (continuous)	0.28	0.012*	0.32	0.004**	0.25	0.026*
Gender (Female vs. Male)	0.15	0.184	0.18	0.112	0.12	0.289
Marital Status (Married vs. Others)	0.22	0.049*	0.24	0.032*	0.20	0.076
Place of Residence (Urban vs. Rural)	0.19	0.094	0.21	0.062	0.16	0.155
Level of Education (Bachelor/Master vs. Diploma)	0.35	0.002**	0.38	<0.001**	0.30	0.007**
Years of Experience (continuous)	0.30	0.007**	0.34	0.003**	0.27	0.002**
Previous Training on HAM (Yes vs. No)	0.42	<0.001**	0.45	<0.001**	0.40	<0.001**
Frequency of Administering HAM (Higher)	0.36	0.001**	0.39	<0.001**	0.33	0.003**

Significant at level $P < 0.05$. ** High significant at level $p < 0.001$

Discussion

High-alert medications (HAMs) refer to drugs, like insulin, anticoagulants, and opioids, that pose a substantial risk of severe patient harm when administered incorrectly (Yousef, Hasanein, & Mohamed, 2018).

Structured educational guidelines are designed to boost nurses' expertise in managing HAMs through sustained training, while promoting favorable attitudes toward medication safety.

Concerning to the Socio-demographic Characteristics and Training/Exposure to High-Alert Medications;

The results of the current study revealed that **more than one-third** of the participating nurses were in the age group of 35-44 years. This suggests that a significant portion of the nursing workforce consists of individuals in their mid-career phase, who likely possess a balanced combination of physical capability and clinical experience. This finding is consistent with Abd Elaziz, El Said, & Mohammed, E. (2023), whose study indicated a similar proportion of nurses in critical care units within a middle-age group. However, this result contradicts Mohamed and Abdalla (2022), whose study reported a younger mean age for nurses, approximately 27 years.

Regarding gender, the vast **majority** of the nurses participating in the study were females. This demographic distribution is a reflection of the common trend in the nursing profession, particularly in the Middle East. This finding strongly aligning with Shittaya, , Al-Rafay, Tantawi & Ali, E (2019) and Abd-Elrahman, Mostafa, & Hasanin, A. (2022), who both reported a predominance of female nurses in their nursing study samples.

Concerning marital status, residence, and education, the present study findings showed that **more than half** of the nurses were married, and the **majority** resided in urban areas. The finding is likely due to age-related family responsibilities and hospital locations in city centers. Also, it was found that **half** of the studied nurses held a diploma in nursing aligning with Abd El Hafez, El-Deen & Mohamed, A. (2023) who found most studied nurses had similar technical-level education.

Regarding nursing experience, the study showed that **nearly half** of nurses had 6-10 years of experience. This level of experience is associated with the development of clinical competence and the ability to handle specialized tasks. This result is consistent with Mohamed

and Abdalla (2022), who highlighted that **most** nurses in their care units had moderate levels of experience.

Additionally, **three-quarters** of the nurses had not received specific training on high-alert medication administration, despite **nearly half** of them administering these medications weekly. This gap between exposure to HAMs and formal training is alarming, as these medications carry a high risk of causing significant patient harm if used incorrectly. This result is strongly supported by **Abd-Elrahman, Mostafa, & Hasanin, (2022)** and **Farag, Eweda, & Elsayed, N. (2017)**, who reported a lack of specialized training among nurses dealing with HAMs, and emphasized that the **majority** of nurses required continuous educational programs to improve their competence in managing these medications.

Concerning the distribution of the studied nurses regarding domains of knowledge throughout periods of the study, the study findings revealed that there was a statistically significant improvement in nurses' knowledge across all domains and in overall knowledge scores following the study, which was sustained at follow-up. **Regarding to Knowledge Related**

to Insulin, Opioids, sedatives and anticoagulants, nurses demonstrated **nearly half** of their potential knowledge before implementation of the educational guidelines which was improved to **the majority** immediately post-the program and follow-up. This substantial improvement suggests the educational program was highly effective in enhancing nurses' understanding of insulin. This finding is consistent with **Farag, Eweda & Elsayed, N et al. (2017)** who observed that baseline knowledge scores for insulin, opioids, sedatives and anticoagulants were low, indicating that **a minority** of nurses possessed adequate knowledge, but showed significant improvement post-intervention, reinforcing the need and effectiveness of their educational programs.

Concerning to Nurses' Total Knowledge Level regarding High-Alert Medications (HAMs) throughout periods of the study. The current study results revealed a highly statistically significant improvement in the nurses' total level of knowledge about high-alert medications (HAMs) throughout the program periods. As the majority of the studied nurses had a poor level of knowledge pre-the program, while a vast majority and **the most**

of the studied nurses achieved a good level of knowledge immediately post-the program and at the follow up period respectively. This enhancement can be attributed to the effectiveness of the structured educational guidelines, which utilized simplified and illustrated materials tailored to the nurses' needs. This finding was in the same line with **Farag, A., Eweda, S., Elsayed, N., & Yousef, G. (2024)** who reported that total knowledge scores improved from **more than half** (pre-program) to **the majority** (immediate post) and 3 months follow-up).

The initial poor knowledge level may be attributed to the lack of specialized training for the nurses and heavy clinical workloads. This finding is in harmony with **Shittaya, Al-Rafay Tantawi & Ali, E. (2019)** who reported that **more than half** of studied nurses initially had inadequate knowledge regarding HAMs. Also, **Abd-Elrahman, Mostafa, & Hasanin, A et al. (2022)** found that **nearly all** nurses required structured programs to improve their competence.

The marked improvement post-the program aligns with **Abd Elaziz, S., El Said, R., & Mohammed, E.(2023)** and **Farag, Eweda, Elsayed, & Yousef, G. (2024)**, where the **majority** nurses

demonstrated higher knowledge levels following educational guidelines, with sustained elevated scores observed three months post-intervention.

The sustainability of knowledge at the follow-up period is supported by **Abd El Hafez, M., El-Deen, G., & Mohamed, A. (2023)** , where **the vast majority** of nurses maintained improved competence. Additionally, **Farag, A., Eweda, S., & Elsayed, N et al. (2017)** found that while **all** patients initially had unsatisfactory knowledge pre the study, **more than half** retained a satisfactory level after three months. The current study showed that post the completion of the educational program; the percentage of total knowledge was slightly reduced. This result might be explained by the fact that, knowledge retention and storming of information are usually affected by time, which is aligned with **Ali and Hamed (2019)**, who observed a slight reduction in retention scores among **nearly one-third** of their sample **Concerning Nurses' Total practice Levels regarding High-Alert Medications (HAMs) throughout the periods of the study.** The current study results revealed a highly statistically significant improvement in the nurses' total practice level in

administering high-alert medications (HAMs) throughout the program periods. As more than two-thirds of the studied nurses had an unsatisfactory practice level pre-the program, while a vast majority and the most of them achieved a satisfactory level immediately post-the program and at the follow-up period respectively.

This enhancement can be attributed to the effectiveness of the structured educational guidelines, which provided clear, simplified, and practical instructions that directly improved both knowledge and clinical skills and was effective in refining the practical skills and safety practices required for HAM administration. This finding was in the same line with **Shittaya, A., Al-Rafay, S., Tantawi, H., & Ali, E. (2019)** who reported that more than half of studied nurses initially demonstrated inadequate practice levels regarding high-alert medications.

The initial unsatisfactory practice level observed in more than **two-thirds** of the sample may be attributed to the absence of standardized protocols, lack of regular supervision, or performance feedback and heavy workloads. This finding is in harmony with **Abd Elaziz, S., El Said, R., & Mohammed, E. (2023)** and **Abd-**

Elrahman, E., Mostafa, G., & Hasanin, A. (2022) who demonstrated that educational guidelines significantly enhanced practical performance, with the **majority** of nurses achieving high levels immediately post-program.

The marked improvement post-the program aligns with **Mohamed and Abdalla (2022)**, where more than **three-quarters** of nurses showed highly significant improvement in their practices after implementing nursing guidelines. Furthermore, **Farag, A., Eweda, S., Elsayed, N., & Yousef, G. (2024)** noted that their training program led to sustained improvements in the performance of most nurses even three months post-intervention.

The sustainability of satisfactory practice at the follow-up period is supported by **Abd El Hafez, M., El-Deen, G., & Mohamed, A.(2023)**, where the vast majority of studied nurses maintained high competence levels. The current study showed that post the completion of the educational program, the percentage of competent nurses was slightly reduced. This result might be explained by the fact that, without continuous reinforcement and periodic clinical audits, performance tends to decline slightly over time, which is supported by **Farag, A.,**

Eweda, S., & Elsayed, N. (2017), who observed that nearly one-third of nurses showed a slight decline in performance scores due to lack of ongoing training.

Concerning distribution of the studied nurses' attitudes regarding domains of attitude throughout the periods of the study, with regard to Nurses' Attitudes toward Safety Practices in High-Alert Medication (HAM) Administration . The current study results revealed a highly statistically significant improvement in the nurses' attitudes toward safety practices in HAM administration immediately following the implementation of the structured educational guidelines. As less than half of the studied nurses had positive attitudes pre-the educational guidelines, while nearly to three quarters followed by more than two-thirds of the studied nurses achieved positive attitudes immediately post-the educational guidelines, and at the 2-month follow-up period respectively.

This enhancement can be attributed to the effectiveness of the structured educational guidelines, which succeeded in reshaping the nurses' perceptions regarding critical safety protocols such as independent double-checking, proper labeling, and secure storage of HAMs. This

finding was in the same line with **Jayachandra and Al Rasheedi (2025)** who reported that despite nurses' overall commitment to safety, nearly half initially considered high-alert medication protocols complex or burdensome.

The initial lack of positive attitudes may be attributed to a lack of understanding of how these specific safety practices directly impact patient outcomes and a perception that some protocols are time-consuming or redundant. The marked improvement post-program aligns with **Abd-Elrahman, E., Mostafa, G., & Hasanin, A. (2022)**, who emphasized that most nurses developed a stronger commitment to medication safety practices and showed a significant shift toward more responsible attitudes after receiving targeted education. **Furthermore, Abd Elaziz, S., El Said, R., & Mohammed, E. (2023)** noted that the implementation of structured guidelines fosters a proactive safety culture among the majority of nursing staff.

The sustainability of positive attitudes at the follow-up period is supported by **Abd El Hafez, M., El-Deen, G., & Mohamed, A. (2023)** and **Farag, A., Eweda, S., Elsayed, N., & Yousef, G. (2024)**, where the vast majority of studied

nurses maintained improved attitude levels toward safety practices after the sessions. The current study showed that post the completion of the educational program, the percentage of nurses with positive attitudes was slightly reduced. This result might be explained by the fact that high workload and burnout can influence attitude sustainability if not continuously reinforced; this is supported by **Farag, A., Eweda, S., & Elsayed, N. (2017)**, who reported that nearly one-third of nurses show a slight decline in their commitment to some safety practices over time due to these factors, underscoring the necessity of continuous administrative support and periodic reinforcement.

Concerning Nurses' Total Attitude Levels toward High-Alert Medications (HAMs) Administration throughout the periods of the study. The current study results revealed a highly statistically significant improvement in the nurses' attitudes toward high-alert medication administration immediately following the implementation of the structured educational guidelines. As only a minority of the studied nurses had positive attitudes pre-the program, while a vast majority achieved positive attitudes immediately post-the program, and nearly three-

quarters of them maintained their positive attitudes at the 2-month follow-up period.

This enhancement can be attributed to the effectiveness of the structured educational guidelines, which succeeded in reshaping the nurses' perceptions and professional beliefs regarding medication safety. The initial lack of positive attitudes may be attributed to low awareness regarding the severity of HAM-related errors and the absence of a supportive safety culture.

The marked improvement post-the program aligns with **Abd Elaziz, S., El Said, R., & Mohammed, E. (2023)**, who emphasized that fostering a positive attitude is a cornerstone for ensuring long-term adherence to safe medication practices. Furthermore, **Farag, A., Eweda, S., Elsayed, N., & Yousef, G (2024)** noted that most nurses maintained a high sense of accountability and positive outlook toward medication safety months after the sessions.

Regarding the correlation between socio-demographic characteristics of the studied nurses and their total knowledge, performance, and attitudes post-intervention, the current study results revealed significant positive correlations between several key factors and the outcomes of the

educational program. Specifically, higher educational levels, more years of nursing experience, previous training on high-alert medications (HAMs), and a higher frequency of administering these medications were all closely linked to better knowledge, performance, and more positive attitudes.

This finding suggests that nurses with advanced educational backgrounds (such as a Bachelor's degree) possess a stronger theoretical foundation and critical thinking skills that allow them to better absorb and apply specialized safety guidelines. Furthermore, accumulated years of experience and frequent exposure to HAM administration likely foster a higher level of clinical intuition and confidence. The positive impact of previous training underscores the importance of cumulative learning, where existing knowledge serves as a base for further professional development. This result is in harmony with **Shittaya, Al-Rafay, Tantawi, & Ali, E. (2019)**, who found that nurses with higher educational levels demonstrated significantly better knowledge and practice scores, representing **more than half** of their high-achieving group.

The significant correlation between previous training and improved

outcomes is strongly supported by **Abd-Elrahman, Mostafa, & Hasanin, A. (2022)**, who reported that **nearly all** nurses who had attended prior workshops showed higher competence levels compared to those with no previous training. Similarly, **Abd Elaziz, El Said, & Mohammed, E. (2023)** emphasized that clinical experience and frequent handling of high-risk medications are vital factors that enhance the performance of the **majority** of nurses.

On the other hand, the study found that age and marital status showed weaker but still significant correlations. This may be explained by the fact that while age is often associated with experience, individual motivation and the quality of educational exposure are more direct predictors of competence than biological age alone. This observation aligns with **Albagawi (2024)**, who suggested that while older nurses may have more experience, **nearly one-third** of younger nurses with recent university education exhibited equally high or even superior theoretical knowledge.

Furthermore, the strong correlation between the frequency of administering HAMs and better performance highlights the principle of "learning by doing," as repeated

practice promotes adherence to safety protocols. This aligns with **Jayachandra and Al Rasheedi (2025)**, who found that most nurses with high HAM exposure developed more positive attitudes toward safety practices.

Conclusion and recommendations

Based on the findings of the present study, it can be concluded that the implementation of structured educational guidelines had a significant effect on increasing the level of nurses' theoretical knowledge and clinical performance regarding high-alert medication. Also, it had an obvious effect on improving the nurses' attitudes toward safety protocols regarding high-alert medication

Recommendations: Based on the finding of the current study, the following recommendations are derived and suggested:

Nurses should be encouraged to attend regular training programs, workshops, and seminars specifically focused on high-alert medications to be acquainted with the most recent safety protocols, administration techniques, and advanced clinical skills in the field. Also, Structured educational guidelines and illustrative booklets regarding high-alert medication should be integrated into the orientation programs for newly

recruited nurses at Mansoura University Hospitals. In addition to , Establishing a continuous monitoring and feedback system to evaluate nurses' adherence to safety protocols during the administration of high-alert medications.

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