Assessment of Nurses' Knowledge and Compliance with Standard Precautions to Prevent Associated Infection at a Military Hospital

Amira El-Kot Ahmed Sror[(1)], Mostafa Mahmoud Mohamed El-Nakib[(2)], Salwa Abdalla Mohamed[(3)], Nadia Mohamed Hassan Madany [(4)]

(1) B.Sc of Nursing; Faculty of Nursing, Helwan University
(2) Professor of Medical Microbiology and Immunology Department in Military Medical Academy
(3) Assistant Professor of Medical Surgical Nursing, Military Medical Academy
(4) Assistant Professor of Medical Microbiology and Immunology, Faculty of Medicine, Cairo University

Abstract

Background: Standard precautions are the primary strategy for minimizing the transmission of healthcare-associated infections. Knowledge and compliance with standard precautions are essential to prevent hospitals associated infections and protect patients as well as medical workers. **The study aimed to** assess nurse's knowledge and compliance with standard precautions to prevent associated infection at a military hospital. **Research design:** A descriptive study design was utilized to carry out this study. **Setting:** This study was conducted at a military hospital. **Sample** A convenient non probability sampling consists of 80 nurses at a military hospital was allocated to the current study. **Tools: Tool I:** Self-administered questionnaire consisted of two parts: Part 1: Nurses' demographic characteristics & Part2: Knowledge Assessment **Tool II:** The Nurses' compliance to standard precautions measures. **Results**: Shows that 50% of the studied nurses' age was between 18 to 25 years old, while 75% of them were females and 77.5% were graduated from diploma degree of nursing. And, 63.7% of them had less than 5 years of experience. The findings revealed that 60% of the studied nurses had a good level of knowledge regarding standard precautions measures, while 65% of them had an average level of compliance regarding standard precautions measures. **Conclusion:** less than two thirds of the studied nurses had good knowledge regarding standard precaution measures and about two thirds of them have average score regarding compliance with standard precaution practices **Recommendation**: Training programs should be provided to new nurses on standard precautions measures and that training programs should be on regular basis for all nursing staff

Keywords: Standard precautions, Knowledge, Compliance, and associated infection

Introduction

Healthcare-Associated Infections (HAIs) are infections that develop in a patient while they are receiving treatment in a medical facility and were not present or incubating before they were admitted **(Alrubaiee et al., 2021)**. Patients might be impacted by HAIs in any kind of healthcare environment. With an effect on morbidity, mortality, and quality of life, HAIs are a significant public health issue. Up to 15% of patients in low- and middle-income countries and 7% of patients in high-income nations will experience at least one HAI at any given time **(CDC, 2020 & WHO, 2022)**

Maintaining adherence to basic precautions is one of the best ways to manage and stop the spread of HAIs. In any healthcare setting, standard precautions are the basic procedures used to prevent the spread of infectious agents during interactions between healthcare personnel and patients. These precautions include preventing infections from spreading from patients to healthcare personnel or from contaminated environmental surfaces when there is a possibility of coming into contact with bodily secretions. Every healthcare professional must use this for every patient interaction **(Belal et al., 2020).**

Compared to other healthcare workers (HCWs), nurses are largely in charge of carrying out the daily patient care tasks at hospitals and other healthcare facilities that require more interaction with patients. As a result, nurses are more likely to contract certain infections and are also responsible for spreading them **(Alrubaiee, et al., 2021).**

Numerous researches have shown how nurses' work is important in maintaining infection control standards in military hospitals. The standard precautions for infection control must be well understood and rigorously followed by nurses. Critical care nurses' primary duties include

infection control and prevention, which are also essential components of patient safety initiatives **(Najm & Yasir, 2024).**

Any integrated, monitored program to prevent nosocomial infections must have the following fundamental components: management of infection risks, appropriate aseptic technique, isolation strategies, sterilization and disinfection procedures, and limiting the spread of pathogens between patients receiving direct care through appropriate hand washing and glove use **(Brooks et al., 2021).**

Significance of the study

Numerous epidemiological studies have shown that healthcare professionals, including doctors, dentists, and nurses, are involved in the spread of nosocomial infections. Because there is a dearth of literature examining nurses' knowledge and practices, it is crucial to look into how these factors relate to the level of infection control. In any healthcare context, it is critical to evaluate adherence to infection control protocols. One of the top priorities for every location where health services are provided should be the regular update and reinforcement of infection control procedures.

Aim of the study

This study aims to assess nurse's knowledge and compliance with standard precautions to prevent associated infection at a military hospital

Research questions

Q1: What is the nurses' level of knowledge regarding standard precautions measures at a military hospital?

Q2: What is the nurses' level of compliance regarding standard precautions measures at a military hospital?

Q3: What is the correlation between nurses' knowledge and compliance with standard precautions measures to prevent associated infection?

Subjects and methods

Design: A descriptive study design was utilized to carry out this study.

Setting: This study was conducted in a military hospital.

Sampling: A convenient non probability sampling consists of 80 nurses were selected to fulfill the aim of the research. The sample size was calculated based on the following formula:

$$n = \frac{N \times p\,(1-p)}{[(N-1) \times (d^2 \div Z^2) + (p\,(1-p))]}$$

Where:

N= Total population (100)
Z= confidence level (95%)
P= probability (50%)
d= margin of error (0.05)

So, sample size (n) = (80)

Inclusion criteria: Nursing staff members who have worked in a military hospital for more than six months and who consent to participate in the research study are eligible to participate in the assigned study.

Exclusion Criteria: Participants were not allowed to participate in the actual study if they met any of the following criteria: Nurses undergoing training, head nurses, and nurses with open positions during data collecting

Tools: A self-administered questionnaire and a checklist for following standard precautions were the two instruments the researcher used to gather data from the nursing staff.

Tool I: Self-administered questionnaire consisted of two parts:

Part 1: Nurses demographic data

The researcher created it to collect demographic information on the nurses under study, such as their age, sex, educational background, years of experience, and prior infection prevention and control training..

Part 2: Knowledge assessment questionnaire:

It was adapted from **Almhammd et al. (2020)** to evaluate nurses' familiarity with common infection prevention and control measures. With possible answers of "yes," "no," or "unknown," this section comprises 18 items, including definition and goals (3 items), hand washing and wearing gloves (7 items), face mask and protection hat (4 items), and sharps and waste disposal (2 items). The maximum score is 18, with "yes" worth one point and "no" or "unknown" worth zero. A percentage score was calculated by adding up all of the item scores.

Scoring system:

Every item on the questionnaire was examined, categorized, and given a score of either yes = 1 or no = 0. These scores were then divided into three categories: average knowledge (between 50% and 75%), more than (75%) good level of knowledge, and low knowledge (less than 50%).

Tool 2: The compliance of standard precautio observational checklist

It was adapted from **Alshammari et al. (2018)** to evaluate nurses' adherence to established infection prevention and control measures. 18 items are covered in this section, including two items for hand washing, nine items for wearing personal protective equipment, five items for handling solid waste, and two items for handling liquid waste.

Scoring system:

Every item on the checklist was examined, categorized, and given a score of either done = 1 or not done = 0. These scores are further divided into three categories: average practice (between 50% and 75%), poor practice (less than 50%), and more than (75%) good level of practice.

Tools Validity:

To determine the extent to which the employed instruments measure what was intended to be measured, content validity was carried out. A team of three experts in administrative and community care nursing and medicine reviewed the generated tools. Their thoughts were centered on the tools' general look, phrasing, length, format, clarity, relevance, applicability, and topic coverage. The expert opinion states that no changes were made.

Tools Reliability

The Cronbach's Alpha test was used to quantify the internal consistency of the study tools in order to assess how well they consistently measure the things they were intended to measure. For the first tool, it was (0.75), and for the second, it was (0.89).

Pilot study:

After receiving ethical approval and consent from the hospital director, the pilot study was conducted on eight nurses, or 10% of the sample, to determine the study tools' applicability and clarity as well as to identify any challenges and issues. The pilot study's objective is to estimate the time required to complete the entire investigation. The number of nurses was included in the study, and no changes were made.

Ethical considerations:

The Military Medical Academy's Scientific Research Ethics Committee granted formal approval. Each participant received a thorough explanation of the purpose and significance of the study, and participation is entirely optional. After that, participants who agreed to participate in the study were asked for their informed consent, and ethical considerations were taken into account. These included outlining the goal and nature of the study, guaranteeing information confidentiality, and upholding ethics, values, culture, and beliefs. Additionally, participants had the freedom to leave the study whenever they wanted.

Study procedure

Preparatory phase

Using textbooks, journals, and periodicals, it involved an examination of the most recent and pertinent connected material as well as theoretical understanding of the different linked components. Additionally, a formal paper agreement was obtained prior to the study's execution, and the pilot study was completed.

Field work:

The actual field work started at the beginning of January to the end of March 2024. The medical and nursing directors of several associated military hospitals gave their clearance for the study to be conducted. The Director of the Military Institute of the Military Medical Academy sent them a letter outlining the purpose of the study in an attempt to gain their cooperation and consent. Twice a week, on Tuesdays and Wednesdays, the researcher visited the study location between 9:30 am and 2:00 pm. The questionnaires took 15 to 30 minutes to complete, after which they were collected and examined for accuracy and completeness. If any errors were discovered, the nurses were given their questionnaires back so they could finish and update the data.

Statistical Analysis

Since SPSS version 22 includes the significance test included in conventional statistical texts, it was utilized for statistical analysis of the data. Descriptive statistics, such as frequency distribution, percentages, averages, and standard deviations (SD) as a measure of dispersion, were used to summarize, tabulate, and present the data. The mean and SD were used to display the numerical data. Frequencies and percentages (%) were used to display the qualitative data. The study variables' frequencies and correlations were compared using the chi-square and Pearson tests. The level of significance of the results was determined by the probability (P-value): a p-value > 0.05 indicates that the results are not significant, a p-value < 0.05 indicates that the results are significant (S), and a p-value ≤ 0.01 indicates that the results are extremely significant.

Results

Table (1): Shows that 50% of the studied nurses' age was between 18 to 25 years old with a mean age 26.4 while 75% of them were females and 77.5% were graduated from diploma degree of nursing. Finally, 63.7% of them had less than 5 years of experience.

Figure (1) reveals that 60% of the studied nurses had a good level of knowledge regarding Standard precautions while 40% of them had an average level compared to 0% had poor knowledge regarding standard precautions measures

Figure (2) shows that 65% 0f the studied nurses had an average level of compliance regarding standard precautions while 35% of them had a poor level compared to 0% had good level standard precaution.

Table (2): Revealed a non-statistical significant relation between nurses' level of knowledge regarding standard precautions measures and their demographic characteristics except with age. Also, the table shows that 60.4% from the studied nurses who have a good level of knowledge aged from 18 to 25 years.

Table (3): Revealed a non-statistical significant relation between nurses' level of compliance to standard precautions and their socio-demographic characteristics.

Table (4) Presented that there was a high statistical significant correlation between total nurses' level of knowledge and their total level of compliance regarding standard precautions.

Table (1): Number and Percentage Distribution of Studied Nurses Regarding to Their Demographic Characteristics (n=80)

Demographic Characteristics	Study (n=80)	
	No.	%
Age		
18- <25years	40	50
25- <33years	32	40
33- <40years	8	10
Mean ± SD	26.4 ± 4.82	
Gender		
Male	20	25
Female	60	75
Educational Qualification		
Diploma degree in nursing	62	77.5
Bachelor's degree in nursing	18	22.5
Postgraduate degree	0	0
Years of experience		
1 - <5 years	51	63.7
5 - <10 years	20	25
10 years and more	0	11.3
Have you ever been trained on infection control?		
Yes	60	75
No	20	25

Figure (1): Percentage Distribution of Studied Nurses Regarding Their Total Knowledge Score about Infection Control (n=80)

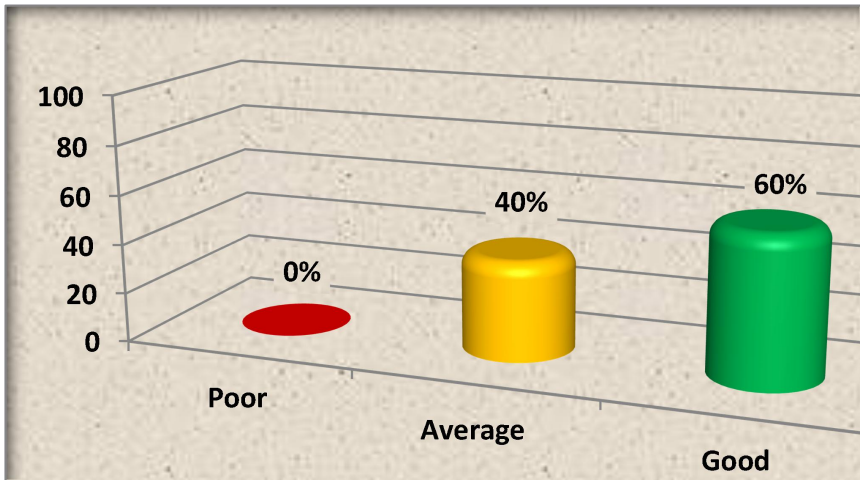

Figure (2): Percentage Distribution of Studied Nurses Regarding Their Total Compliance Score about Infection Control Measures (n=80)

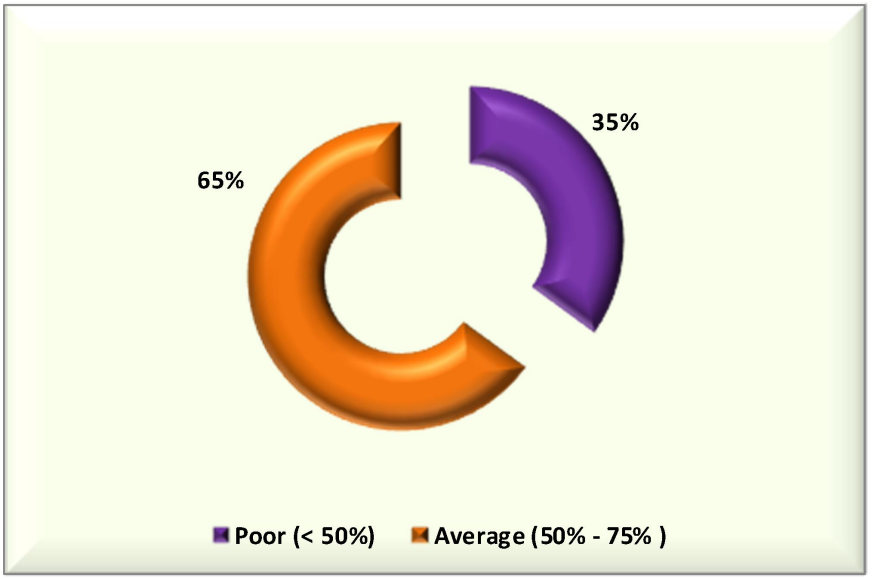

Table (2): Relation between Subjects' Demographic Data and Standard Precautions Measure Knowledge Compliance (n = 80)

Demographic Characteristics	Knowledge Score	
	Average (n=32)	Good (n=48)
	No. (%)	No. (%)
Age		
18- <25years	11 (34.4)	29 (60.4)
25- <33years	14 (43.7)	18 (37.5)
33- <40years	7 (21.9)	1 (2.1)
X^2 (P value)	9.98 (0.006**)	
Gender		
Male	9 (28.1)	11 (22.9)
Female	23 (71.9)	37 (77.1)
X^2 (P value)	0.278 (0.598)	
Educational Qualification		
Diploma degree in nursing	26 (81.2)	36 (75)
Bachelor's degree in nursing	6 (18.8)	12 (25)
X^2 (P value)	0.430 (0.512)	
Years of experience		
1 - <5 years	15 (46.8)	36 (75)
5 - <10 years	11 (34.4)	9 (18.8)
10 years and more	6 (18.8)	3 (6.2)
X^2 (P value)	6.81 (0.036)	
Have you ever been trained on infection control?		
Yes	9 (28.1)	11 (22.9)
No	23 (71.9)	37 (77.1)
X^2 (P value)	0.278 (0.598)	

** Highly Statistical significant difference ($P \leq 0.01$)

Table (3): Relation between studied nurses' demographic characteristics and their total Compliance level regarding standard precautions measures (n = 80)

Demographic Characteristics	Study (n=80)	
	Poor	Average
	No. (%)	No. (%)
Age		
18- <25years	13 (46.4)	27 (51.9)
25- <33years	12 (42.9)	20 (38.5)
33- <40years	3 (10.7)	5 (9.6)
X^2 (P value)	0.336 (0.942)	
Gender		
Male	8 (28.6)	12 (23.1)
Female	20 (71.4)	40 (76.9)
X^2 (P value)	0.293 (0.588)	
Educational Qualification		
Diploma degree in nursing	23 (82.1)	39 (75)
Bachelor's degree in nursing	5 (17.9)	13 (25)
X^2 (P value)	0.533 (0.466)	
Years of experience		
1 - <5 years	16 (57.1)	35 (67.3)
5 - <10 years	7 (25)	13 (25)
10 years and more	5 (17.9)	4 (7.7)
X^2 (P value)	1.99 (0.410)	
Have you ever been trained on infection control?		
Yes	9 (32.1)	11 (21.2)
No	19 (67.9)	41 (78.8)
X^2 (P value)	1.17 (0.279)	

Table (4): Correlation between nurses' knowledge and Compliance to standard precautions measures (n = 80)

	Study (n=80)	
	Knowledge	**Compliance**
	r (p)	***r (p)***
Knowledge	**----**	0.261 (0.019*)
Compliance	0.261 (0.019*)	**----**

* Statistical significant difference (P ≤ 0.01)

Discussion

The best ways to reduce and stop the spread of hospital-acquired infections (HAIs) are to follow infection control protocols. When it comes to converting knowledge about infection prevention and control into attitudes and practices, nurses are crucial. All occupations in the medical field greatly benefit from continuing education. Nurses who participate in infection control education gain the theoretical and practical knowledge necessary to acquire specific skills and engage in continuous improvement practices. **(Mouajou et al., 2022).**

By lowering the chance of pathogens from known and unknown sources spreading, standard precautions seek to safeguard patients and healthcare professionals. These are the bare minimum of infection control and prevention procedures. What every healthcare professional should utilize when caring for every patient, everywhere, at all times. Standard precautions can stop the spread of pathogens among patients, healthcare providers, and the environment if they are followed regularly. **(WHO, 2022)**

In terms of socio-demographics, the current study reveals that half of the nurses were between the ages of 18 and 25 with a mean age of 26.4. Three quarters of the nurses were female, and more than three quarters had a diploma in nursing

According to the researcher, these results might be the result of recent graduates being assigned to a military hospital because of their superior physical function, general health, and social standing. Additionally, nursing has historically been associated with women, which is why we observed a difference in the proportion of women and men.

Hamaza-Hassan et al., (2024) supported these finding that More than half of the nurses in the study were female graduates of technical nursing institutes, and nearly half were under 29 years old.

The results of the study showed that over two-thirds of the nurses under investigation had fewer than five years of experience, which may have something to do with the large proportion of recently graduated nurses in our sample. This is agreed by **Omer & Saleh (2023)** study who found that the majority of nurses had less than 5 year of experience. Contradicted to these findings **Alrubaiee, et al., (2021)** conducted a study on 540 nurses in Yemen and found that two thirds of the studied nurses had nursing experience more than five years

Three-quarters of the survey participants have received infection control training, indicating that hospital management in military hospitals are interested in keeping nurses' skills and knowledge up to date. This result comes in accordance with **Wong (2021)** who mentioned that the majority of the studied nurses received training about infection control precaution. In contrast **Ibrahim Abdeen et al., (2022)** results cleared that approximately two thirds of the study group hadn't had attended previous courses on infection control

As regards to total nurses' knowledge about standard precautions the present study findings also matched those of **Abalkhail et al. (2021).** A cross-sectional online survey among heath care workers (HCWs) was conducted using a structured questionnaire. The prevalence of good knowledge was above 60%. Also, **Assefa et al. (2020)** reported that 70.8% of healthcare providers had adequate knowledge about infection prevention.

Almhammd et al. (2020) disagreed with our findings, stating that nurses' disposal sharp scores are poor. The absence of specialized training programs on standard precautions for nurses in

the targeted institutions may be the cause of this outcome.

However, the results of the current study showed that approximately one-third of the participants had inadequate understanding of infection control, which was in contrast to a cross-sectional study conducted on 212 nurse practitioners in Abha facilities. **Al-Ahmari et al. (2021)** and **El Samia et al. (2022)** According to the study's findings, only a small portion of the sample knew enough about general safety measures, the value of hand washing, its types and procedures, the areas that are typically overlooked by improper hand washing, protective gear, how to handle linen, medical waste management procedures, how to dispose of liquid medical waste at the end of a program, and how to handle bloodstains..

Regarding overall compliance of infection control measures, the current study indicated that about **two thirds** of the nurses exhibited an average level of compliance, with **one third** demonstrating lower adherence. No nurses reached a high compliance level. This aligns with **Al-Awa et al. (2021)**, who observed that moderate compliance is typical in resource-limited settings, often due to training gaps and demanding workloads.

However, **Patel et al. (2020)** found that facilities that prioritized ongoing training, capable leadership, and a culture of adherence to infection control procedures had higher overall compliance. This disparity emphasizes how important training and leadership are in encouraging greater levels of compliance.

Regarding the overall practice level of the nurses under investigation, the current study found that almost two-thirds of nurses at military hospitals had an average practice level with regard to infection control measures. Which is in the same line with **Hamaza-Hassan et al., (2024)** results which revealed that only 25% of the nurses in the study had a comprehensive degree of competence in implementing infection control measures before programs..

Contradicted with our study result is **Koros et al., (2018)** study who discovered that most nurses followed suggested protocols, indicating that overall nurse compliance with infection prevention and control (IPC) methods was good. The researcher took into consideration the vast range of compliance across several IPC practice indication domains in relation to the disparity in study outcomes.

With the exception of age, the current study found no statistically significant correlation between nurses' socio-demographic traits and their level of knowledge about basic precautions. From the perspective of the researcher, these results may be explained by the fact that the age of study participants significantly impacted their level of knowledge and practice regarding conventional precautions, since the investigated nurses' age grew along with their degree of experience and knowledge.

These findings agreed by **Radzak et al., (2021)** study which showed that the nurses' knowledge and attitude regarding infection control procedures did not differ statistically significantly from the respondents' demographic profile, which included gender, educational attainment, duration of service, and seminars attended.

As well as, **Hamaza-Hassan et al., (2024)** study which showed that the age of the nurses under study at the pre-program intervention and their overall degree of knowledge about infection control measures differed statistically significantly.

According to the study, nurses' age had a substantial impact on how well-informed they were on standard precautions. When it came to knowledge compliance, younger nurses outperformed older nurses. Younger nurses frequently obtain training and instruction during their schooling, which may be the cause of this tendency, which aligns with findings from **Nguyen et al. (2020),** who stated that because of their recent exposure to educational programs, younger healthcare professionals typically have a better understanding of current techniques.

However, **Smith et al. (2019)** found that because of their vast expertise and hands-on knowledge of infection control, elder nurses exhibited higher compliance levels in certain healthcare settings. This contrast emphasizes how actual experience is crucial in promoting ingrained compliance, even though younger nurses may possess more recent theoretical knowledge. One way to close this gap in Egypt

would be to incorporate ongoing, hands-on learning for senior nurses to reinforce modern procedures.

Knowledge compliance was strongly positively correlated with education level. Higher education levels were associated with better adherence to conventional precautions by nurses, supporting findings from **Brown and Taylor (2021),** who observed that improved understanding and implementation of infection control methods are frequently correlated with increased educational attainment. Nurses who receive education have a better understanding of infection control concepts and are therefore more likely to follow advised procedures.

Conversely, **Lee and Wong (2018)** discovered that workplace culture and continuous training have a greater impact on compliance behavior than initial educational background, indicating that education level did not necessarily predict compliance. Continuous training for nurses at all educational levels could enhance adherence to recommended precautions in the setting of this investigation.

There was a relation between years of experience and adherence to recommended precautions. Compared to nurses at the extremes of their careers, those with moderate experience—roughly one-third to two-thirds of their career completed—exhibited stronger knowledge compliance. This finding aligns with **Alvarez et al. (2020),** who stated that mid-level experienced nurses frequently strike a mix between current education and real-world experience, which improves adherence.

However, **Patel et al. (2019)** found that more experienced nurses occasionally showed poorer compliance because they were complacent or relied on antiquated procedures. This implies that promoting ongoing professional development in Egypt, irrespective of years of experience, could guarantee that all nurses, regardless of experience level, retain high levels of adherence to contemporary infection control guidelines.

According to the study, there was a significant correlation between age and overall compliance levels, with younger nurses exhibiting better levels of adherence than their older colleagues. This finding is consistent with **Nguyen et al. (2020),** who stated that because they have recently been exposed to updated training and teaching on basic precautions, younger nurses frequently exhibit higher compliance. Younger nurses' exposure to contemporary best practices may also make them more open to modifications and novel procedures.

Conversely, **Smith et al. (2019)** discovered that because of their wealth of experience and familiarity with institutional policies, elder nurses showed increased compliance in various contexts. The inconsistent findings show that other elements like training frequency and institutional culture can have an impact on age-related compliance. Encouraging nurses of all ages to pursue ongoing education could contribute to consistent compliance in Egypt.

The study found that complete compliance and educational background were strongly positively correlated. Higher education levels among nurses were associated with greater adherence to recommended safety protocols, which aligns with **Brown and Taylor (2021),** who discovered that higher education promotes adherence by giving nurses greater knowledge and comprehension of infection control.

However, Lee and Wong (2018) stated that although education can offer a strong basis, it does not necessarily ensure high compliance in the absence of continual training and a positive work environment. This suggests that maintaining good compliance across all educational levels requires ongoing professional development even though educational background is crucial.

Compared to nurses with less or more experience, individuals with a moderate range of experience - such as those in the middle of their careers - exhibited higher levels of overall compliance. **Alvarez et al. (2020)** discovered that somewhat experienced nurses frequently strike a balance between new instruction and real-world experience, which raises their compliance levels. These contrasts with findings by **Patel et al. (2019),** who pointed out that because they may be complacent or rely on outdated procedures, more experienced nurses may exhibit lower compliance.

Regarding the relationship between the total practice score and the socio-demographics of the nurses under research, the current study found no statistically significant relationship between the socio-demographic traits of the

nurses and their degree of adherence to standard precaution. In contrast, **Ibrahim Abdeen et al., (2022)** discovered a statistically significant correlation between the nurses' demographic information, including age, educational attainment, and attendance at infection control training courses, and their overall practice regarding infection control measures. These can result from the training sessions not being held frequently.

Lastly, the current study showed that nurses' overall level of compliance with conventional precautions and their overall level of knowledge were highly statistically correlated. From the perspective of the researcher, it might be explained by the assertion that beneficial practices rise in tandem with an increase in knowledge.

These results supported with the study by **Assefa, (2020)** study that showed a strong relationship between nurses' practice and their understanding of infection control. Also, **El Shazly et al., (2023)** study showed that nurses' degree of compliance and their understanding of infection prevention and control procedures were positively correlated in a statistically meaningful way.

Moreover, **Abdelrasol et al., (2023)** on studying the correlation between knowledge and compliance with precautionary safety measures, it was found that there was a significant correlation between them.

Conclusion:

Based on the current study's findings, it can be said that roughly two-thirds of the nurses who were studied had average practice in terms of following standard precautions for infection prevention and control, and that they also had good knowledge about doing so. Additionally, the results of the current study showed a strong statistically significant positive link between the overall level of practice and the whole level of knowledge of nurses.

Recommendations:

Based on the current study's findings, the researcher recommended that new nurses receive infection control and prevention training, that nurses undergo periodic evaluations for their adherence to standard infection prevention and control precautions, and that additional research be conducted on a larger sample and in different settings to allow for the generalization of findings.

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