

Relationship between Nurse's Knowledge and Compliance with Standard Precautions in the Operating Room

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Abstract

Background: The compliance with standard precautions is a primary strategy for the prevention of operating room infections. **Aim;** the study aimed to assess the relationship between nurses' knowledge and their compliance with standard precautions in operating room. **Design;** descriptive research design was used. **Setting;** this study was conducted in the operating room at general surgery department at Benha University Hospitals and Benha Teaching Hospital, Egypt. **Sample;** All available nurses (60) working at operating room. **Tools;** two tools were used, tool (1); Self-assessment questionnaire to assess nurses' knowledge regarding standard precautions and tool (2): Compliance checklist to assess nurses' practice regarding standard precautions. **Results;** found that 45% of nurses their age ranged between 21≤30 years, 63.3% of them were females, while 53.3% of them were graduated from Technical Institute of Nursing and not attended training courses in standard precautions against infection during the past year, Meanwhile 68.3% of the studied nurses had unsatisfactory level of total knowledge about standard precautions in the operating room. Also 73.3% of nurses were not adherent with standard precautions in operation room. This study showed that there were highly statistically significant positive correlation between total nurses' knowledge score and total nurses' compliance score regarding standard precautions in the operating room. **Conclusion;** The present study shows that more than two thirds of the studied nurses had unsatisfactory level of total knowledge about standard precautions in the operating room, and less than two third of them were not adherent with standard precautions in operation room. There was a highly statistically significant positive correlation between total nurses' knowledge and total nurses' compliance about standard precautions **Recommendation;** there is a need for continuous monitoring and evaluating of nurses' performance regarding compliance with standard precautions and correction of poor performance is essential.

Key Words: Compliance, Infection, Knowledge, Operating Room Nurses, Standard Precautions.

Introduction

The Operating Room (OR) plays an important role in delivering vital medical services to patients in hospitals and many types of surgical procedure are performed. This room is one part of the restricted area of the surgical suite to provide the best possible conditions for surgery. The operating room is situated in the

location that is central to all supporting services (e.g., pathology, x-ray, laboratory) and special air filtration devices to screen out contaminating particles, dust and pollutants (*Facco Rodrigues, 2019*).

Each year, more than three million healthcare workers are at risk of exposure to pathogens that can be transmitted through the

skin, this is especially important in the operating room due to the large number of exposure-prone activities and high risk of acquiring infection (*Michinov et al., 2015*). Occupational blood-borne pathogen exposure refers to injuries sustained by health care workers, who can be infected with blood-borne pathogens through blood, body fluid exposure, needle-stick injuries and sharp instruments. Operating room nurses experience a substantial risk of occupational blood borne pathogen exposure from blood, body fluid exposure, needle-stick injuries and sharp instruments owing to the nature of their work. Accidents may result from low levels of knowledge, lack of adherence to all precautions, and a lack of availability of equipment necessary to prevent occupational blood exposure (*Fathi, Barati & Zandiyeh, 2017*).

Standard Precautions are designed to protect healthcare workers (HCWs) from infection of microorganisms that can cause morbidity and mortality. Standard Precautions are infection control practices to reduce the risk of acquiring the occupational infection when handling equipment and devices that are contaminated with blood, body fluids, secretions, and excretions except for sweat and non-intact skin and mucous membranes in the healthcare setting (*Amin et al., 2013*). Standard Precautions have two objectives, which are to protect HCWs from percutaneous injuries and to prevent the transmission of nosocomial infection. Constantly, HCWs are exposed to microorganisms including exposure to blood-borne infections such as HIV and hepatitis B and C virus (HBV and HCV) infection from sharps injuries and contact with body fluid as they perform their clinical

activities in a hospital (*Sreedharan, Muttappillymyalil & Venkatraman, 2019*).

Standard Precautions include hand hygiene, use of gloves, and other barrier protectors like masks, eye protection, gown, and safe injection practices, safe handling of contaminated equipment or surfaces in the patient environment. The compliance with Standard Precautions (SPs) guidelines, as a primary strategy for the prevention of healthcare associated infections, is still suboptimal among healthcare providers (*Donati, et al., 2019*).

Compliance describes the degree to which health care worker follows recommendations of standard precautions. Standard precautions established by the Centers for Disease Control and Prevention, adopted worldwide, and intended to protect health care professionals and ensure safe patient care, preventing infections in the provision of care. Demands from health professionals appropriate attitudes during long periods of time, requiring motivation and technical knowledge (*Bouchoucha & Moore, 2018*).

Throughout surgery, nursing responsibilities include providing the safety of the patient, performing scrub role, including performing hand hygiene, setting up the sterile equipment, tables and sterile field, preparing sutures, ligatures and special equipment and circulating activities and protect herself from stick injury as use of preventive measures and wearing double gloves may also help protect the surgical team from viral transmission. Gloves should be changed immediately after any accidental puncture and should be given post exposure prophylaxis (*Woodhead & Taylor, 2015*) (*Susan, Holly, & Dallred, 2017*).

Significance of the study

The World Health Organization (WHO) estimated that each year, 35 million HCWs worldwide, 3 million experience percutaneous exposure to blood borne pathogens (2 million to HBV, 0.9 million to HCV, and 170,000 to HIV). These injuries result in 70,000 HBV infections, 15,000 HCV infections, and 500 HIV infections. Moreover, occupational blood exposures result in substantial psychological stress, such as job-related depression and considerable management costs (*Mannocci, De Carli, & Di Bari, 2016*).

Aim of the study

This study will be aimed to:

Assess the relationship between nurses' Knowledge and Their compliance with standard precautions in operating room through:

- 1-Assessing nurses knowledge about standard precautions.
- 2- Assessing level of compliance for nurses with standard precautions.

Research Question:

Is there a relationship between nurses' Knowledge and compliance with standard precautions in operating room?

Operational definition:

Compliance describes the degree to which health care worker follows recommendations of standard precautions. Standard precautions intended to protect health care professionals and ensure safe patient care, preventing infections in the provision of care. [emand from health professionals appropriate attitudes during long periods of time, requiring

motivation and technical knowledge (*Bouchoucha & Moore, 2018*).

Subject and Methods

Research Design:

Descriptive research design was utilized to fulfill the aim of this study.

Setting:

This study was conducted in operating room at general surgery department at Benha University Hospitals and Benha Teaching Hospital; the operating rooms at Benha University Hospitals has two rooms, one room includes two operating tables and another rooms including three operating tables. The operating rooms at Benha Teaching Hospital has four rooms, three rooms of them includes one operating table and one room including two operating tables.

Subjects:

All available nurses (60) nurses working in operating room at general surgery department at Benha University Hospital and Benha Teaching Hospital were included in this study. 32 nurses working at Benha University Hospital and 28 nurses working at Benha Teaching Hospital.

Tools for Data Collection:

Two tools were used to collect data for this study; self-assessment questionnaire and compliance check list.

Tool I: -Self assessment questionnaire:

This tool aimed to assess nurses' knowledge regarding standard precautions, It was developed by researchers. It included the following two parts.

Part (1): Demographic Characteristics of Nurses

This part was aimed to identify nurses' demographic characteristics including age,

gender, educational qualifications, years of experience in OR, training course in infection control, and vaccination status against HBV.

Part (2): Nurses' Knowledge questionnaire:

This part adapted by *Shehata, Elsawi & Hashem, (2016)* and modified by researchers.

It consisted of questions about standard precautions knowledge it considered closed end questions, which included (32) questions, divided into; infection control (8 questions), standard precautions (9 questions), handling sharp instruments (6 questions) and disposing wastes, blood, body fluid (9 questions).

Scoring system:

Knowledge obtained from nurses were scored and calculated according to answers, their responses were evaluated using model key answer sheet prepared by the researcher. Total questions (32) questions it divided to multiple choice questions were include (17 questions) and true or false questions were include (15 statement); they were scored as the following.

- Each correct answer was given one score.
- Each incorrect answer was given zero.

The knowledge score converted into percentage and categorized into:

- $\geq 80\%$ satisfactory level of knowledge more than or equal 26 score.
- $< 80\%$ unsatisfactory knowledge level less than 26 score.

Tool II: Compliance observational checklist (Appendix II)

This part adapted by *Awadalla et al., (2013)* and modified by researcher.

It was aimed to assess nurses' practice related to standard precautions, It was developed by the researcher It included standard precautions related to; head cover, surgical mask, OR boots, surgical hand

washing, surgical gown, surgical gloves and handling sharp instruments.

- Head cover: 1 steps during wearing and 1 steps during removing, (2 steps).
- Surgical mask: 4 steps during wearing and 1 steps during removing, (5 steps).
- OR boots: 2 steps during wearing and 1 steps during removing, (3 steps).
- Surgical hand washing: (18 steps).
- Surgical gowning: 5 steps during wearing and 4 steps during removing, (9 steps).
- Surgical gloving: 6 steps during wearing and 4 steps during removing, (10 steps).
- Handling sharp instruments: (6steps).
- Total steps: (53 steps)

Scoring system:

- Done was assigned score (1).
 - Not done was assigned score of (0).
- Total score was $53 \times 1 = 53$ and classified into:
- $\geq 80\%$ satisfactory more than or equal 42 score, (adherent).
 - $< 80\%$ unsatisfactory less than 42 score (not adherent).

Content validity:

Was established for testing content of tools for comprehensiveness, relevance, simplicity, clarity and ambiguity through a jury of five experts in the field of nursing including two assistant professors and three lecturers in medical surgical nursing, Benha University.

Reliability:

Reliability of the tool was tested to determine the consistency of the measurement instrument. the researcher used knowledge – compliance – methods to test the internal consistency of the tools, by administration of the same tools to the same subjects under

similar condition on two different occasions the reliability of tool one (knowledge) was 0.81, tool two (practice) was 0.95.

Ethical Considerations:

- Each nurse was informed that tools not cause any harm or pain for nurses.
- Also, it will not cause risks of physical or psychological, social and don't run with ethical beliefs.
- An oral consent was obtained from nurses after explaining the purpose of the study.
- Confidentiality was ensured throughout the study process, and the nurses were assured that all data will be used only for research purpose
- The researcher emphasized that participation is voluntary and they have right to decide to participate or not. They could withdraw at any time without giving any reason.

Pilot Study:

It was conducted on 6 nurses (10%) of all nurses at operating room in general surgery in order to test the clarity and applicability of the study tools and guidelines to estimate the time needed for filling the sheets as well as to identify any possible obstacles that may hinder data collection. Nurses involved in the pilot study were excluded from the main study.

Field Work

- Before conducting the study, an exploratory visit was done to the operating room in general surgery department at Benha University Hospital and Benha Teaching Hospital in order to estimate total number of nurses and suitable time for collecting data. Besides, personal communication was done with nurses to explain the purpose of the study and gain best possible cooperation.

- Data were collected through the period from beginning of June ,2019 to end of November, 2019.
- The process of data collection was achieved through two steps :
 - The first is assessment about nurses level of knowledge was answered by nurses using tool I.
 - The second is assessment about nurses' compliance was observed by researcher using tool II.
- The estimated time spent with each nurse for collecting data lasted between one to two hours to answer questions and observation during operation including, 3 times of observation for each nurse was participated in the study and the average mean was considered as the final score for each nurse.
- Data were collected from general surgical operations at Benha Teaching Hospital two days (Monday and Wednesday) per week during morning and afternoon shifts.
- Data were collected from general surgical department at Benha University Hospital two days (Saturday and Sunday) per week during morning and afternoon shifts.

Administrative Design

Permissions for data collection were generated from hospitals directors and head managers of the operating room at general operation at Benha University Hospital and Benha Teaching Hospital and by the submission of a formal letters from the faculty of nursing, Benha University.

Statistical Design

Data analysis was performed using IBM SPSS (statistical package for social sciences). Descriptive statistics with mean and standard

deviation (SD) for continuous variables and frequency for categorical variables were analyzed. Number (N) and percent (%) were used for presenting qualitative variables. Chi-square test (X^2) was used to examine the relation between qualitative variables. Correlation (r) was used to test the correlation between quantitative data. Probable P error should not exceed 5%. Statistical significance was considered as follow:

-p value >0.05 non statistical significant relation

-p value <0.05 statistical significant relation

-p value <0.01 highly- statistical significant relation

Results

Table (1) shows that, 45% of nurses regarding their age ranged between $21 \leq 30$ years, the mean age of them was 31.70 ± 5.09 years. As regards to gender 63.3% of nurses were females, In relation to the educational level of the nurses, it was found that 53.3% of them graduated from technical institute of nursing. Also, 56.7% of them their years of experience ranged between $6 \leq 10$ years, the mean of years of experience was 6.97 ± 5.80 year. Moreover 76.7% of nurses not attended training courses in standard precautions against infection during the past year, 50% of them were attended one course. Also 65% of them didn't vaccinated against hepatitis B virus. Meanwhile 75% of them didn't have documented procedures and policies for standard infection control precautions in operating theaters.

Table (2) shows that 63.3%, 70% and 60% of the studied nurses had correct answer about indications of hand washing, personal protective equipment and methods to ensure

that the equipment are free of germs respectively. While, 68.3%, 63.3% and 60% of them had incorrect answer about Principles of surgical hand washing, importance of applying infection control measures and precautions to protect nurse against the risk of hepatitis B and C respectively.

Figure (1) Distribution of the studied nurses according to their total knowledge about standard precautions in the operating room (n=60).shows that 68.3% of the studied nurses had unsatisfactory level of total knowledge about standard precautions in the operating room. While, 31.7% of them had satisfactory level of total knowledge.

Figure (2) shows that 73.3%, 75%, 63.3% & 68.3% of nurses were not adherent with wearing personal protective equipment, surgical hand washing, wearing surgical gloves and handling sharp instruments respectively. While, 56.7% of them were adherent with wearing surgical gown.

Figure (3) shows that 73.3% of nurses were not adherent with standard precautions in operation room. While 26.7% of them were adherent.

Table (3) shows that, there were highly statistically significant positive correlation between total nurses' knowledge score and total nurses' compliance score regarding standard precautions in the operating room.

Table (1): Distribution of the studied nurses according to their demographic characteristics (n=60).

| Items | N | % |
|--|--------------|------|
| Age (year) | | |
| ≥ 20 | 11 | 18.3 |
| 21 ≤ 30 | 27 | 45 |
| 31 ≤ 40 | 16 | 26.7 |
| >40 | 6 | 10 |
| Mean SD | 31.70 ± 5.09 | |
| Gender | | |
| Male | 22 | 36.7 |
| Female | 38 | 63.3 |
| Educational level | | |
| Diploma of Nursing | 10 | 16.7 |
| Technical Institute of Nursing | 32 | 53.3 |
| Bachelor of Nursing | 14 | 23.3 |
| Postgraduate | 4 | 6.7 |
| Years of experience | | |
| 1 ≤ 5 years | 16 | 26.7 |
| 6 ≤ 10 years | 34 | 56.7 |
| > 10 years | 10 | 16.7 |
| Mean SD | 6.97 ± 5.80 | |
| Past attended training courses in standard precautions. | | |
| Yes | 14 | 23.3 |
| No | 46 | 76.7 |
| If yes, how many courses (n=14) | | |
| One | 7 | 50 |
| Two | 5 | 35.7 |
| Three | 2 | 14.3 |
| Vaccinated against hepatitis B | | |
| Yes | 21 | 35 |
| No | 39 | 65 |
| Presence of documented procedures and policies for standard infection control precautions in operating theaters | | |
| Yes | 15 | 25 |
| No | 45 | 75 |

Table (2): Distribution of the studied nurses according to their knowledge regarding standard precautions in the operating room (n=60).

| Items | Correct | | Incorrect | |
|---|---------|------|-----------|------|
| | N | % | N | % |
| Definition of Standard precautions | 26 | 43.3 | 34 | 56.7 |
| Importance of standard precautions to prevent the spread of infection | 28 | 46.7 | 32 | 53.3 |
| Importance of Hand washing | 32 | 53.3 | 28 | 46.7 |
| Indications of hand washing | 38 | 63.3 | 22 | 36.7 |
| Principles of surgical hand washing | 19 | 31.7 | 41 | 68.3 |
| Importance of applying Infection control measures | 22 | 36.7 | 38 | 63.3 |
| Personal protective equipment. | 42 | 70 | 18 | 30 |
| Methods to ensure that the equipment are free of germs. | 36 | 60 | 34 | 40 |
| Precautions to protect nurse against the risk of hepatitis B and C. | 24 | 40 | 36 | 60 |

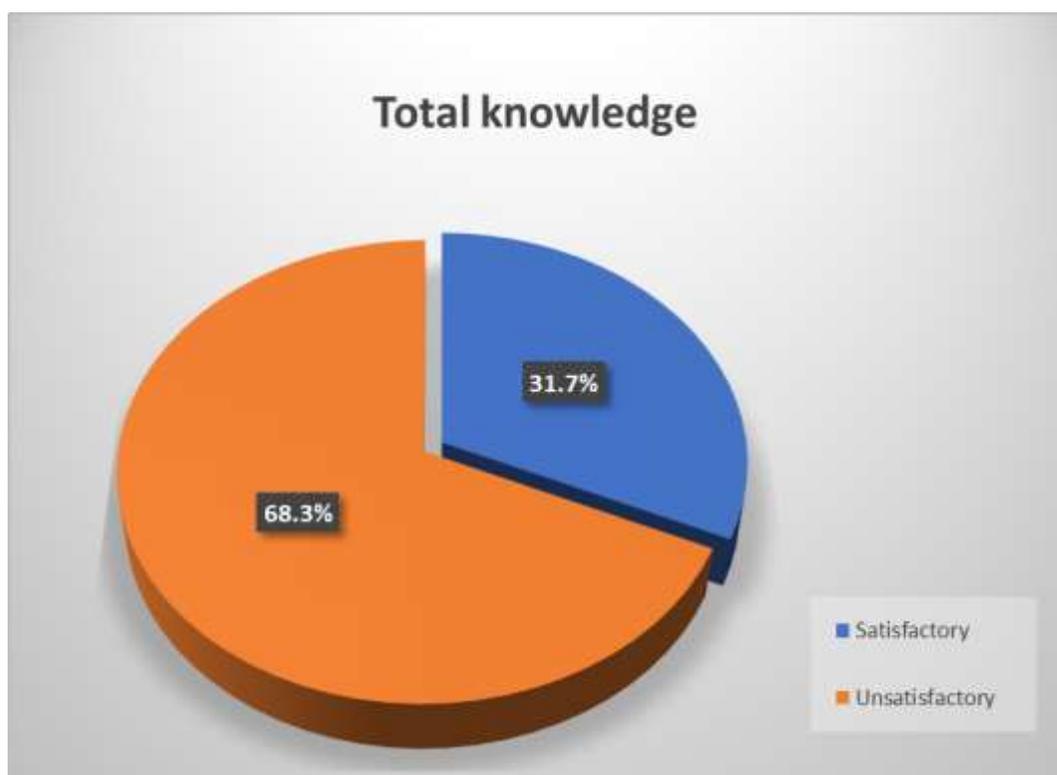


Figure (1): Distribution of the studied nurses according to their total knowledge about standard precautions in the operating room (n=60).

Relationship between Nurse’s Knowledge and Compliance with Standard Precautions in the Operating Room

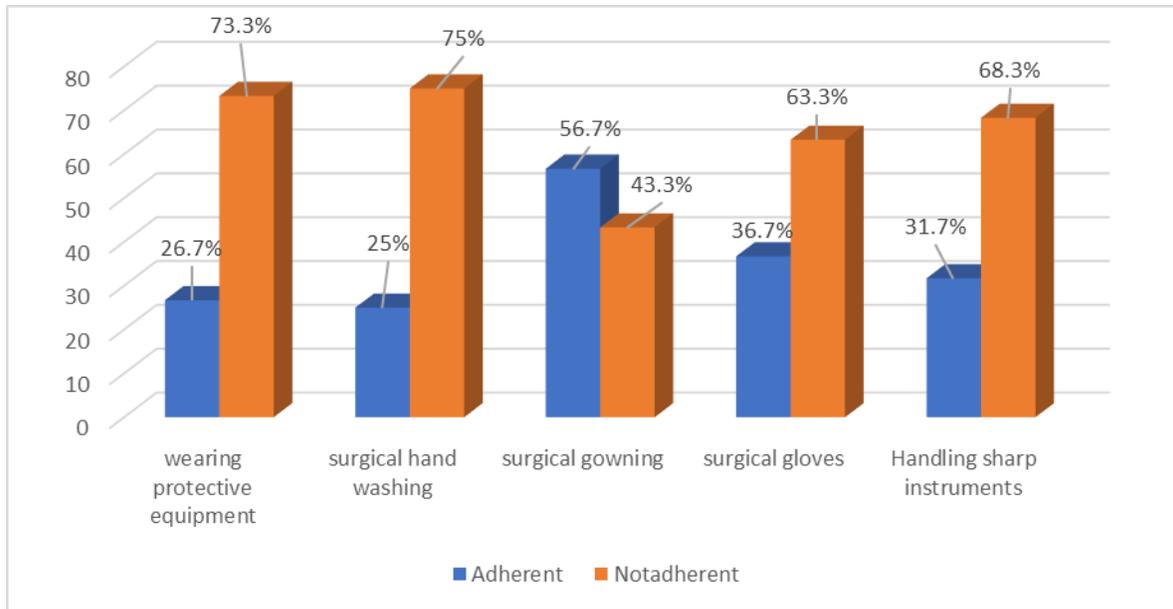


Figure (2): Distribution of the studied nurses regarding their compliance in operation room (n=60).



Figure (3): Distribution of the studied nurses according to their total compliance in operation room (n=60).

Table (3): Correlation between the total nurses' knowledge score and total compliance score in operation room about standard precautions in the operating room

| Items | Total compliance |
|-----------------|-------------------------|
| Total knowledge | r = 0.416 P = .000** |

(**) highly significant at $p < 0.01$

Discussion

Regarding nurses' demographic characteristics, the current study reported that nearly half of the studied nurses their age ranged between $21 \leq 30$ years, the mean of age of them was 31.70 ± 5.09 years. Also, more than half of them were female.

This result is agreement with the study done by *EL-Shafey, El-Dakhakhny and Mohammed, (2018)* who studied "Effect of an Educational Training Program for Nurses about Infection Control Precautions in their practice" and found that more than half of the participants were female and their ages were under 30 years old. While, these results are disagreement with the study done by *Dorgham, Shereen and Obied, (2016)* who studied "Factors Affecting Nurse Interns' Compliance with Standard Precautions for Preventing Stick Injury" and found that about two thirds of aged ≤ 21 years old, with mean age 21.4 ± 0.73 . and Majority of participant nurse were females.

Regarding educational level, the current study found that more than half of studied nurses had technical institute of nursing. Also, more than half of them were having years of experience ranged between $6 \leq 10$ years, the mean of years of experience was 6.97 ± 5.80 year. This result is agreement with the study

done by *Khalil and Hassan, (2017)* who studied "The Effectiveness of Structured Teaching Program regarding Prevention and Control of Methicillin in Resistant Staphylococcus Aurous on Nurses' knowledge and attitude" and found that more than have of the participants have from five to ten years of experience. This result is in disagreement with *Siyue and Kibrom, (2019)* who studied "Knowledge, Attitudes and Practices related to standard precautions among nurses, A comparative study" and found that their studied nurses at least two years of work experience and attributable to higher education.

Moreover, the current study found that more than three quarters of the studied nurses didn't have attended training courses about standard precautions. Meanwhile, three fourth of them didn't have procedures and policies for standard infection in operating theaters.

This result is in agreement with the study done by *Nour-Eldein and Mohamed, (2016)* who studied "Effect of Education Intervention on Prevention of Blood Borne Infections for Health care workers" and reported that more than two thirds of the participants didn't attend any training courses and didn't aware of presence of infection control policies and procedures. Also, these results are agreement with the study done by *La-Rotta, et al., (2020)*

who studied “Knowledge and Compliance as factors associated with Needle Stick Injuries Contaminated with biological material, Brazil and Colombia” and found that about more than two thirds didn’t attended training about standard precautions, more than one fourth did know when it was done.

Also, the current study found that more than two thirds of them didn’t vaccinated against hepatitis B, These results are agreement with the study done by *La-Rotta, et al ., (2020)* who studied “Knowledge and Compliance as factors associated with Needle Stick Injuries contaminated with biological material, Brazil and Colombia” and found that majority vaccination against Hepatitis B.

The current study reported that more than two thirds of them had incorrect answer about principles of surgical hand washing, importance of applying Infection control measures and precautions to protect nurse against the risk of hepatitis B and C. This result is in agreement with the study done by *Aguwa, Modebe and Nwamoh, (2018)* who studied the “knowledge and Practice of Standard Precautions by health-care workers in a tertiary health institution in Enugu” and stated that majority of the participants didn’t know duration of each type of hand washing.

The researcher point nurses need to presence continuous training courses in standard precautions against infection and presence of policies for standard precautions in operating theaters as types and steps of hand washing and importance of applying Infection control measures to increase level of nurses’ knowledge.

Regarding total knowledge about standard precautions, the current study reported that more than two thirds of the studied nurses had unsatisfactory level of total knowledge about standard precautions in the operating room. While, less than one third of them had satisfactory level of total knowledge.

This result is in agreement with the study done by *fawzi, sleem and shahien, (2019)* who studied the “assessment of knowledge and practice regarding infection control measure among staff nurses” and found that the majority of staff nurses had unsatisfactory level of total knowledge about infection control. While, less than one fourth of them had satisfactory level of total knowledge. But, this result is in disagreement with the study done by *Gizaw and Kibret, (2014)* who studied the “assessment of knowledge and practice regarding infection control and universal precautions among staff nurses in Ethiopia, and found that more than three quarters had adequate knowledge about infection control.

Regarding the correlation between the total nurses’ knowledge score and total compliance score in operation room about standard precautions in the operating room. The current study revealed that there was highly statistically significant positive correlation between total nurses’ knowledge score and total nurses’ compliance score regarding standard precautions in the operating room.

This result is in agreement with the study done by *Sadeghi, Hashemi and Khanjani (2018)* who studied the “impact of educational intervention based on the health belief model on observing standard precautions among emergency center nurses” and reported

presence of statistically significant correlation between participants' knowledge and their performance. Moreover, this result is in the same line with the study done by *Abdelrahman et al., (2017)* who studied "knowledge and practice of nurses regarding infection control operating room" and found a statistically significant correlation between participants' level knowledge and their performance level.

Conclusion

The studied nurses shows that more than two third had unsatisfactory level of total knowledge about standard precautions in the operating room. And less than two third of nurses were not adherent with standard precautions in operation room. This indicates a highly statistically significant positive correlation between total nurses' knowledge and total nurses' compliance about standard precautions in the operating room.

Recommendations

- There is a need for continuous monitoring and evaluating nurses' performance regarding compliance with standard precautions in operating room.
- Developing an Arabic version of WHO surgical standard checklist as a guide for nurses comply with standard precaution strategy in operating theatre.
- Establishing a data base for those nurses who exposure to needle stick injuries in operating suite.
- Replication of the study using a larger probability sample from different geographical areas to attain more generalization of results.
- There is a need for continuous educational programs for operating room nurses to

improve their knowledge and skills regarding compliance with standard precautions.

- Standard precautions and infection control must be applied in all sections based on the current conditions

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العلاقة بين معلومات الممرضة والتزامها للاحتياطات القياسية في غرفة العمليات

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يعد الالتزام بالاحتياطات القياسية إستراتيجية أساسية للوقاية من العدوى في غرفة العمليات. لذلك هدفت هذه الدراسة إلى تقييم العلاقة بين معرفة الممرضات والتزامهن للاحتياطات القياسية لمنع العدوى في غرفة العمليات. وقد أجريت الدراسة في غرفة العمليات بقسم الجراحة العامة في مستشفيات جامعة بنها ومستشفى بنها التعليمي ، على 60 من الممرضات. حيث أظهرت النتائج بأن حوالي نصف الممرضات لديهن معلومات غير كافية عن الاحتياطات القياسية في غرفة العمليات ، وكان هناك مستوى غير مرضي بالنسبة لالتزامهن بالاحتياطات القياسية في غرفة العمليات بالإضافة إلى وجود علاقة ذات دلالة إحصائية بين معلومات الممرضات والتزامهن بالإجراءات القياسية في غرفة العمليات ، كما أوصت الدراسة بضرورة تدريب الممرضات على الاحتياطات القياسية والتقييم المستمر لتحسين التزامهن بهذه الاحتياطات لمنع العدوى في غرفة العمليات.