

Factors Influencing Nurses' Compliance with Standard Precautions Regarding Occupational Exposures to Blood and Body Fluids

Reda El sayed Ali Esmail ⁽¹⁾, Nadia Mohamed Taha ⁽²⁾ & Gehan El sayed Hafez ⁽³⁾

⁽¹⁾ B.Sc. in Nursing, ⁽²⁾ prof. of Medical surgical nursing- Faculty of nursing- Zagazig university &

⁽³⁾Lecturer of Medical surgical nursing- Faculty of Nursing -Zagazig university

Abstract

Background: Standard Precautions(SP) are the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient. **Aim of the study :** Was to assess factors that influence nurses' compliance with standard precautions regarding occupational exposures to blood and body fluids. **Subjects and Method: Research Design:** A descriptive exploratory study design was used. **Setting:** The study was conducted at Faqous General Hospital in Sharkia governorate, Egypt. **Subject:** A Convenience sample of 86 nurses. **Tools of data collection:** Two tools were used **Tool I.** A self-administered questionnaire composed of four part: part 1: Concerned with nurses' demographic data. part 2: Covered nurses' occupational exposures rate to blood and body fluids, part 3: Revealed nurses' compliance with standard precaution and part 4: Covered the factors influencing nurses' compliance with (SP) included ,the hospital factors, nurses' attitude and nurses' knowledge. **Tool II:** Observational checklist to assess nurses' practice. **Results:** The study finding revealed that the nurses median age was 30.0 years, 76.7% were females, 68.6% of the sample had previous occupational exposure , 87.2% of the nurses were compliant with standard precaution, 68.6% of the nurses had satisfactory knowledge on standard precautions , 75.6% had satisfactory practice , Additionally there were a significant positive correlations between nurses compliance scores on standard precaution and hospital related factors($r = 0.267$). **Conclusion :** Hospital staff nurses are at a significant risk of exposure to blood and body fluids. The majority of the nurses were compliant with standard precaution. While, more than two third of nurses had satisfactory total knowledge regarding (SPs) **Recommendations:** Maximizing the hospital role in updating the staff 'knowledge about standard precautions through empowering an infection control committee .

Keywords: Nurses' compliance , Standard Precaution(SPs) , Occupational Exposures , Blood and Body Fluids (BBF), Factors influencing .

Introduction:

The centers for Disease Control and Prevention CDC defines Blood and body fluids exposures as contact with blood, visibly bloody fluids, and other body fluids (i.e., semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, tissues, and laboratory specimens that contain concentrated viruses) to which standard precautions (SPs) apply during the performance of an health care workers duties⁽¹⁾. In addition, Occupational exposure means reasonably anticipated skin, eye, mucous membranes, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties⁽²⁾.

Hospital environments are considered complex and unhealthy workplaces, with a higher risk of occupational exposure to biological agents, since hospitals admit patients with several infectious and contagious diseases, undertake invasive procedures, and expose people to direct contact with blood and other potentially contaminated body fluids⁽³⁾. Furthermore, Occupational exposure to blood can result from percutaneous injury, (needle stick or other sharps injury), mucocutaneous injury (splash of blood or other body fluids into

the eyes, nose or mouth), or contact with non-intact skin⁽⁴⁾. Also, Occupational exposure to blood and body fluids are very common in health care setting and needle stick injury is the most common form of occupational Exposure. Common causes of needle-stick injury include two handed recapping and the unsafe collection and disposal of sharp wastes⁽⁵⁾.

Blood borne pathogens are microorganisms present in human blood that can cause disease when individuals are exposed to the blood. Many are relatively rare, such as malaria, syphilis, and Ebola. Others are common, such as the hepatitis virus and the human immunodeficiency virus, which causes acquired immune deficiency⁽⁶⁾. Furthermore, healthcare workers are at risk of sharps injuries and subsequent infection from more than 40 blood borne pathogens or species. Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV) together account for the vast majority of cases⁽⁷⁾.

Nurses, and particularly those in countries where disease burden is high and resources are limited, are at risk of exposure to blood-borne infections from needle-stick injuries⁽⁸⁾. Moreover nurses are the largest occupational group in any health care agency. By virtue of their job

responsibility they are frequently exposed to blood and body fluids⁽⁹⁾. Also⁽¹⁰⁾ found that healthcare workers, especially nurses, are at risk of being exposed to blood and body fluids containing blood-borne pathogens.

Standard Precautions represent the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered. These evidence-base practices are designed to both protect and prevent spread of infection among patients and healthcare personnel⁽¹¹⁾.

Compliance is the level of precision and constancy in following prescribed standard protocols to achieve the desired outcomes⁽¹²⁾. In addition, Compliance is the extent to which certain behavior is in accordance with the set instructions or health care advice. In this study compliance is the extent to which nurses practices are in accordance with CDC guidelines on infection prevention and control⁽¹³⁾.

Studies have shown that compliance with precautions among nurses in order to avoid exposure to microorganisms is low. More specifically, compliance was found inadequate⁽¹⁴⁾. In addition,⁽¹⁵⁾ found that the compliance rate with protection using goggles, masks, or gowns against blood or fluid splatter was low.

Major of reported factors that affect compliance include but not limited to lack of understanding and knowledge among healthcare workers on (SP)⁽¹⁶⁾and⁽¹⁷⁾, shortage of time to implement the precautions (work overload), limited resources, lack of proper training, uncomfortable equipment, skin irritation, forgetfulness, distance from the necessary facilities, and insufficient support from management in creating a facilitating work environment⁽¹⁴⁾. Moreover, The factors that contribute to occupational illnesses and injuries in health care facilities include negligence and carelessness of health care workers, lack of adequate protective aids and equipment, inadequate number of staff, excessive workload, failure to observe basic safety and hygiene guidelines, and inadequate operational knowledge of modern healthcare equipment⁽¹⁸⁾.

The percutaneous injuries have many effects including the direct and indirect costs of the post-exposure medical treatment and the disability and absenteeism of the injured nurse. However, this exposure can have a further influence on the quality of life of the injured nurse, and can cause great worry, anxiety, and fear for himself and his family and colleagues, as well as feelings of stigma and low self-confidence⁽¹⁹⁾. These infections are characterized by a potentially significant morbidity and mortality, and consequently, they represent significant public health problem

related to the majority of acquired infections⁽²⁰⁾. Furthermore the occupational risk of exposure to blood and body fluids and needle stick injuries not only affects the safety and wellbeing of the nurse, but also compromises the quality of health care delivered⁽²¹⁾.

Prevention of blood and body fluids exposure through safer practices, barrier precautions, safer needle devices, and other innovations are the best ways to prevent HIV and other blood borne and body fluid pathogens⁽²²⁾. Nurses are responsible for understanding the fundamental concepts of hazard assessment, decontamination and the proper selection and regular use of personal protective equipment. They can provide leadership in reviewing and enhancing their organization's current disease containment and chemical incident response strategies⁽²³⁾.

Significance of the Study:

The CDC 2013⁽¹⁾ estimated that 385,000 percutaneous injuries (i.e., needle sticks, cuts, punctures and other injuries with sharp objects) occur in United States hospitals each year. Also⁽²⁴⁾ found that the prevalence of needle stick and sharp injuries among nurses at Zagazig University Hospitals was 74.57%. The injuries resulting from percutaneous exposure to blood are estimated to result in 16,000 hepatitis C, 66,000 hepatitis B, and 200 to 5000 HIV infections. More than 90% of these infections are occurring in least developed countries and most are preventable⁽²⁵⁾.

A recent economic analysis of the costs associated with the management of occupational exposure to blood and body fluids ranged from 71–4838\$. Moreover, nurses experience such a significant fear, anxiety and emotional distress following a needle stick injury that sometimes results in occupational and behavioral changes⁽²⁶⁾.

Aim of the study:

The aim of this study was:

To assess factors influence nurses' compliance with standard precautions regarding occupational exposures to blood and body fluids.

Research Questions:

- What is the level of nurses' occupational exposures to blood and body fluids?
- What is the level of nurses' compliance with standard precaution regarding occupational exposures to blood and body fluids?
- What are the factors that influence nurses' compliance with standard precautions regarding occupational exposures to blood and body fluids?

Subjects and methods:

Research design:

A descriptive exploratory design was used.

Study setting:

The present study was conducted at Faqous General Hospital in Sharkia governorate, Egypt. It is located away from Zagazig city by 35 km approximately. The hospital involves 6 buildings including dialysis, chest, administration, surgical, outpatient and emergency buildings, there were 15 departments in the selected hospital. The total nurses in the hospital were 416 nurses. There were three teams including the Infection control team, Quality team and occupational health and safety team.

Study subjects:

The study sample included a convenience sample of 86 nurses working in previously mentioned setting.

Tools of data collection:

Two tools were utilized for data collection:

Tool I: Self-reporting questionnaire:

It was designed in Arabic form to avoid misunderstanding. It was designed by the researcher after reviewing of related literature and opinions of experts for content of validity and included the following four parts:

Part 1: Demographic data of the nurses: It was consisted of seven closed ended questions (7 Q) as the following: nurses' age, sex, level of education, years of experience, Specified department, and attendance of training courses in standard precaution.

Part 2 : Nurses occupational exposure: This part was used to assess the rate of nurses occupational exposures to blood and body fluid. It consisted of 17 questions as multiple choice questions MCQ, and yes or no. It concerned with assessment, the nurse exposure, exposures rate, types of exposure, site of exposure, the device cause the exposure, activity during exposures, the fluid cause the exposure, the patient condition during exposure, taking post-exposure prophylaxis based on literature review CDC⁽¹⁾.

Scoring system for nurses' occupational exposures:

Each statement was scored (1) for yes (exposure) and no for (non exposure). These scores were converted into percent scores.

Part 3: Nurses 'compliance with standard precautions: This part was used to assess the level of nurses 'compliance with standard precautions and was consisted of 16 questions as yes or no. It concerned with assessment of risk assessment for activities, wearing personal protective equipment, compliance with hand

washing, taking off all jewelry, using a cleansing agent, hand rubbing, contact time, drying the hands, wearing protective eye goggles, facial mask, remove personal protective equipment in a correct way, very careful when dealing with sharp devices, place sharp objects in the safety box, cover non intact areas and compliance with sterilization guidelines.

Scoring system for nurses' compliance with standard precautions:

Each statement was scored 1 for "yes" and 0 for "No." The scores of statements are summed-up so that a higher score indicates compliance. These scores were converted into percent scores. They were then categorized into "compliance: 60%+", and "Not compliance: <60%," based on statistical analysis Efstatouli, et al.,⁽¹⁴⁾.

Part 4: Factors influencing nurses 'compliance with standard precautions: This part was used to asses factors that influencing nurses 'compliance with standard precautions regarding occupational exposures to blood and body fluids and composed of three items

Scoring system for Factors influencing compliance:

Each statement was scored 1 for "yes" and 0 for "No." The scores of statements of each group of factors and for the total scale were summed-up so that a higher score indicates factor influence. These scores were converted into percent scores. They were then categorized according to influence into "influenced: 60%+", and "Not influenced: <60%," based on statistical analysis.

I .The Hospital Environment Data was consisted of 18 questions as yes or no. It concerned with availability of equipment and supplies, sterile gloves, clean latex gloves and heavy duties gloves, overhead, Surgical Mask, protective eye goggles, face shield, surgical gown, protective water proof gown, foot protectors, hand washing soap, disinfectant and alcohol, material for drying the hand, colored plastic bags to separate waste, safety boxes, danger signs and laboratory investigation.

Scoring system for the hospital environment data:

Each statement was scored 1 for "yes" and 0 for "No." The scores of statements are summed-up so that a higher score indicates availability of equipment. These scores were converted into percent scores. They were then categorized into "influenced: 60%+", and "Not influenced: <60%," based on statistical analysis.

II. Nurses 'attitude toward occupational exposures to blood and body fluids was consisted of 9 questions, the answer with agree or disagree, The score for agree =1, for

disagree =0. staff training, wearing personal protective equipment including gloves, gown, face shield, hand washing, needle recapping, waste disposal, the site of the safety box, sufficient nursing staff in the hospital , incentives for compliance.

Scoring system for Nurses 'attitude:

For the attitude items, it was scored 1 for agree and zero for disagree , the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score. The attitude was considered positive if the percent score was 60% or more and negative if less than 60% based on statistical analysis.

III. Nursing knowledge about the standard precautions regarding occupational exposure to blood and body fluids consisted of four parts: which included 20 questions as MCQ:

Part1:Consisted of three questions on standard precaution.

Part 2:Consisted of nine questions on nurses' knowledge about occupational exposure to blood and body fluids.

Part 3: Consisted of three questions on first aid after exposure.

part4: Consisted of five questions on post exposure prophylaxis.

Scoring system for nurses Knowledge:

For the knowledge items, a correct response was scored 1 and the incorrect zero. For each area of knowledge, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score. Knowledge was considered satisfactory if the percent score was 60% or more and unsatisfactory if less than 60% based on statistical analysis.

Tool II : Observational Checklist (Appendix II)

It Was used to assess nursing practice regarding occupational exposure to blood and body fluids: It was consisted of six parts as the following and the answer with done or not done .The score for the practice that done = 1 and for the practice that not done = 0:

Part1: Risk assessment of activities that cause the spread of infectious agents and Control the risk by wearing personal protective equipment.

Part2: Consisted of seven items related to hand washing.

Part 3: Consisted of eight items related to personal protective equipment.

Part 4: Consisted of three items related to re-processing machines and handling pallets.

Part 5: Consisted of three items related to

cleaner hospital environment.

Part 6: Consisted of six items related to waste disposal precaution.

Scoring system for nurses' Practice:

In the observation checklists, the item "not done" were scored zero and the item which "done" were scored one . For each procedure, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into percent scores. The practice was considered satisfactory if the percent score was 60% or more and unsatisfactory if less than 60% based on data collection.

Content Validity and Reliability:

It was established for assure of content validity by a panel of 7expertise's in medicine and medical surgical nursing at Zagazig University who revised the tools for clarity, relevance, comprehensiveness, understanding, and ease for implementation and according to their opinion minor modifications were applied.

The reliability statistics of the nurses practice scale was tested through assessing its internal consistency. It demonstrated a very high level of reliability with Guttman split-half 0.732.

Field work:

Field work of this study was executed in seven months from September 2018 to February 2019. During this period all the data were collected from the study subjects. The researcher started by introducing herself to the patient, the aim of the study and the component of the tools were explained to the nurses at the beginning of data collection, they were assured that the information collected would be treated confidentially and that it would be used only for the purpose of the study.The researcher was available (Saturday, Sunday, Monday, Tuesday, Wednesday and Thursday) at Operations, Emergency, ICU ,Medical, Hemodialysis, and Central sterilization at Faqous General Hospital in Sharkia governorate during day shift 8 am-8 pm. The researcher observed nurses practice during collecting nurses' knowledge.

The researcher was interviewed with each subjects individually in the subjects unit to fulfill the questionnaire sheet, the time required for completion of the questionnaire sheet was ranged from 30 minutes - 1 hour. Also the researcher was observing nurses practical skills about studied procedures. The time needed to complete the checklist one nurse in each shift.

Pilot study:

A pilot study for tools of data collection was carried out on 10% in order to test whether they are clear, understandable, and feasible and applicability. For this study, the researcher randomly selected 9 nurses to participate in the

pilot testing of the questionnaire and checklist. Simple modifications were done based on pilot results and the sample who shared in the pilot study excluded from the study sample.

Administrative and ethical considerations:

All ethical issues were taken into consideration during all phases of the study: The researcher maintained anonymity and confidentiality of the subject. The inclusion in the study was totally voluntary. The aim of the study was explained to every adolescent before participation and an oral consent was obtained. Nurses were notified that they can withdraw at any stage of the research; also they were assured that the information obtained during the study would be confidential and used for the research purpose only. An official permission was obtained by submission of formal letters issued from dean of the Faculty of Nursing, Zagazig University to the responsible authorities of the study setting to obtain their permission for data collection.

Statistical Analysis:

Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations and medians for quantitative variables. Guttman split-half coefficient was calculated to assess the reliability of the tool through its internal consistency. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. In larger than 2x2 cross-tables, no test could be applied whenever the expected value in 10% or more of the cells was less than 5. Spearman rank correlation was used for assessment of the inter-relationships among quantitative variables and ranked ones. In order to identify the independent predictors of knowledge, compliance, factors, and practice scores, multiple linear regression analysis was used and analysis of variance for the full regression models was done. Statistical significance was considered at p-value <0.05.

Results:

Table (1): Represents the study sample which consisted of 86 nurses whose age ranged between 22 and 46 years, median 30.0 years as it's demonstrated in table 1, which illustrated that 76.7% of the study sample were females while 23.3% were males, 55.8 % of the study sample had the experience years more than 10 years. The highest group of the studied nurses were 34.9% their work place in emergency unit

then 26.7% in hemodialysis unit, 89.9% of the studied nurses had attended courses in infection control.

Table (2): Shows that 68.6% of the studied nurses had previous occupational exposure while 31.4% didn't have previous occupational exposure. The injury type were 76.3% blood exposure after that 71.2% had needle stick injury. 71.2% of the exposed persons had exposed more than 3 times. 81.4% of the exposed persons their right hands were the injury site. 79.7% of the exposed person had superficial injury. 98.3% of the exposed person had exposed to blood.

Table(3): Illustrates that 76.3% reported that the injury tool was the needle while 42.4% were exposed by broken glass, and also the table showed that the exposed nurses reported that activity at injury were 42.4% during stitching while 39% during waste disposal while 28.8% during covering needles, and the Patients conditions at injury 23.7% of the patients were bleeding during the injury while 20.3 %from them were irritated.

Table (4): shows that all nurses were compliant with placing needles and sharp objects in the safety box and Taking careful when dealing with needles or other sharp devices ,while 24.4 % of the nurses were compliant with wearing protective eye goggles or facial mask, and 48.8 % of them were compliant with drying the hands after hand washing.

Table(5): Illustrates that 87.2% of the nurses were compliant with (SPs) while 12.8% were not compliant.69.8% showed that the hospital factor not influenced while 30.2% the hospital factors were influenced. 93% of the study sample had positive attitude, as regard total factors the table showed that 54.7 % of the studied nurses reported that they had not influenced factors.

Table (6): illustrates that the availability of protective eye goggles in the hospital were only 12.8 % while the availability of face shield was 14% while the availability of safety boxes were 100 %.,and the availability of the hospital laboratory investigation after exposure to blood were only 22.1%.

Table (7): shows that there were 100% of the nurses agreed for hand washing after every contact with the patient while, 59.3 % of them were agree for taking incentives to compliance with (SPs), and 97.7 % of them were agree on wearing gowns and face masks used in possible procedures for blood splashing and were agree on The safety boxes is close to the working area.

Table (8): Total practices related to standard precautions illustrated that 75.6% of the studied nurses had satisfactory practice while 24.4% had unsatisfactory practice. 95.3% of the study samples had satisfactory practice regarding safe waste disposal. 76.7% had satisfactory practice regarding hand washing. 61.6% had satisfactory practice regarding Personal protective equipment. 53.5% had satisfactory practice regarding clean hospital environment, while only 44.2% had satisfactory practice regarding cleaning instruments/linen.

Table (9): Shows that there was statistically significant relations between total nurses' knowledge of (SPs) and their compliance and related influencing factors, also it illustrated that the percentages of nurses with satisfactory knowledge were higher among those who had influenced hospital related factors ($p=0.04$).

Table (10): Displays a statistically significant relation between total nurses' practice of (SPs) and their demographic characteristics as gender with p value at 0.001, and nursing qualifications p value at 0.002., also it showed that the percentage of nurses with satisfactory practice were higher among those female nurses, and bachelor nursing qualifications.

Table (11): Shows that there was a statistically significant relation between nurses' knowledge of (SPs) and their demographic characteristics, As the table showed that the percentages of nurses with satisfactory knowledge were higher among those who their age group less than 30 years with p value at 0.02 , female group with p value at 0.009 , bachelor nursing qualification with p value at 0.004 , and those who experience years less than 10 years with p value at 0.006 .

Table (12) : Indicates that the presence of statistically significant relations between nurses' compliance with (SPs) and the practice areas, mentioned that the percentages of the nurses' compliance with standard precaution were higher among nurses who had satisfactory practice in area of clean hospital environment with p value at 0.01,also the percentages of the nurses' compliance with standard precaution were higher among nurses who had satisfactory total practice with p value at 0.02 .

Table (13): Concerning the relation between total factors influencing nurses' compliance with (SPs) and their practice areas, Table 13 indicates statistically significant associations with their practice in area of personal protective equipment (PPE) with P value at 0.002, and

total practice with P value at 0.01. As the table illustrates, the percentages of nurses had not influenced total factors were higher among those who had unsatisfactory practice in area of (PPE), and those who had unsatisfactory total practice.

Discussion:

The incidence of blood-borne pathogens (BBP) has been increasing along with studies highlighting the importance of (SPs) *Kotwal & Taneja*,⁽²⁷⁾ The (SPs) are the system of infection control practices that apply to all patients regardless of their suspect or confirmed infection status in any setting where health care is delivered. They are based on the principle that all blood, body fluids, excretions, intact skin, and mucous membranes may contain transmissible infectious agent *Nsubuga & Jaakkola*,⁽²⁸⁾.

The study sample consisted of 86 nurses provided direct patient care, More than half of them were females, and more than half of them are more than 30 years, with a mean age of 30.9 ± 4.4 years. Age range 22.0-46.0 and, the majority of nursing qualification were nursing diploma and technical institute diploma, more than the half of them the experience years were more than 10 years, the majority of them were working in emergency unit and hemodialysis unit These study agree with, *Quan et al.*,⁽²⁹⁾ in his study findings about "Influencing factors on use of (SPs)against occupational exposures to blood and body fluids among nurses in China" who found that the majority of the study sample were females, and the average age was 29.37 ± 6.93 years old (age range 18-54 years old). Most nurses worked in a general internal medicine, surgical departments, or intensive care unit. On the other hand these study results disagree with *Haile et al.*,⁽³⁰⁾ in his study about "Compliance with (SPs) and Associated Factors among Healthcare Workers in Gondar University Comprehensive Specialized Hospital, Northwest Ethiopia" who found that more than half of sample were males, the majority of the work experience of the sample were less than five years.

The present study revealed that more than two third of the sample had previous occupational exposure to blood

and body fluids, the most injury types were blood splash then the needle stick injury, the most injury site were right hand then face and eye, more than half of study sample the injury severity were superficial, the predominant respondents were exposed to blood, This result resembling with *Yenesew & Fekadu*,⁽²¹⁾ in their study about "Occupational exposure to blood and body fluids among health care professionals in bahir dar town in Ethiopia" who stated that more than two third of the study participants had been exposed to blood and body fluids. More than half of the injury was needle stick injuries .This can be explained by the fact that nurses perform the majority of the injections and intravenous fluid administration.

Basically, nurses are the main health care professionals that deal with injections and sharp objects; moreover, the number of nurses is generally higher in comparison to other occupational groups in hospitals. It should not be forgotten that not having enough nurses in hospitals is also a problem. These findings are not in accordance with *Nouetchognou et al*,⁽³¹⁾ in their study about " Accidental exposures to blood and body fluids among health care workers in a referral hospital of Cameroon" who found that less than half of the study sample reported having been exposed to blood and body fluid at least once in the 3 months preceding the study .On the other hand this study result agree with the present study in the type of injury where splash was the most reported injury in more than half of cases, followed by needle stick and cuts.

The present study showed that more than three quarters of nurses informed the injury site as the right hand followed by the face then eyes, while more than two third of injury tool were needle followed by broken glass, . the most activity of participant during injury were stitching followed by waste disposal, this finding agree with *Atlaw*,⁽³²⁾ in his study about "Pattern of occupational exposure to patients' body fluids among health care workers in tikuranbesa university hospital, Addis Ababa, Ethiopia ", who found that the most common site of exposure to patients' body fluids as reported by the health care

workers was the fingers, followed by eye splashes exposures, while splashes often involved multiple parts of the body (as eyes, face and mouth) but more than two third of site were the fingers remained the most commonly reported anatomical location for needle stick injuries, moreover this study results showed that most exposures resulted from the disposals of used needles or recapping, drawing of blood specimens and inserting an intravenous infusion. this disagrees with *Taze , & Cavdar*,⁽³³⁾ in their study about" Universal precautions that surgical nurses are taken for preventing from diseases transmitted by blood and body fluids in Istanbul, who found that only less than half of the participants have been exposed to injury by sharp and sharps objects in the last 6 months and less than half of the injuries took place while putting the injector tap on.

The present study revealed that the majority of the study sample were compliant with (SPs), all of them were compliant with place needle and sharps devices on the safety boxes, the most of them were compliant with hand washing, more than two third of them were compliant with wearing personal protective equipment, while the majority of them were not compliant with wearing protective eye goggles and face shield. This disagree with *Punia et al*⁽³⁷⁾ in their study about " Health Care Workers and (SPs): Perceptions and Determinants of Compliance in the Emergency and Trauma Triage of a Tertiary Care Hospital in South India" who showed that less than half of the study sample reported compliance, contrary to this, compliance with the use of eye protective goggles was found to be more than half percentage. This may be due to unavailability of these glasses in clinical settings. Furthermore, findings indicated that studied participants sometimes didn't use personal protective equipment (PPE) in stressful and hurried situations; this may be related to stock irregularity, unavailability of PPE, and feeling uncomfortable with PPE.

The present study emphasized that the most of the study sample described the supply of gloves in their hospital as adequate; the majority of the study sample

described the supply of protective eye goggles and face shield in their hospital as inadequate while more than half of the study sample described the material of drying hand in their hospital as inadequate, the majority of the study sample described the laboratory investigation after exposure as inadequate, This agree with the result of the study done by *Duminy*,⁽³⁸⁾ in his study about "An Investigation Into The Knowledge and Compliance With (SPs) Amongst Nurses In Tygerberg Hospital In The Western Cape" who found that more than half of the respondents replied that they have inadequate of gloves in their work area. The majority of the respondents replied that, if there is a lack in protective equipment, it can influence the compliance of (SPs).

The present study illustrated that the majority of respondents agree that training of staff was necessary to reduce the risk of occupational hazards, the majority agree with wearing personal protective equipment ,hand washing after every contact with patient ,sufficient nurses staff in hospital reduce the risk of exposure while only more than half agree with introducing incentives to comply with (SPs) ,This is agreed with *Aluko et al.*,⁽³⁹⁾ in his study about "Knowledge, attitudes and perceptions of occupational hazards and safety practices in Nigerian healthcare workers, who showed that the vast majority perceived staff training and provision of protective equipment as mandatory to reduce their risk of exposure to occupational hazard. On composite attitude index, the study showed that more than three quarter of respondents had positive attitude towards occupational hazards and preventive safety practices. This is disagreed with, *McGaw et al.*,⁽⁴⁰⁾ in their study about "Healthcare workers' attitudes to and compliance with infection control guidelines in the operating department at the University Hospital of the West Indies, Jamaica " who found that more than three quarter had favorable attitude toward hand washing, and use of personal protective equipment.

The present study illustrated that more than three quarter of respondents had satisfactory practice regarding hand

washing, while nearly two third of respondents had satisfactory practice regarding Personal protective equipment. mentioned that there is satisfactory practice regarding hand washing after contact with contaminated instruments or surfaces and after patient contact. all respondents had satisfactory practice regarding wearing hand gloves regularly when touching blood, body secretions or mucus membranes, The majority of respondents had satisfactory practice regarding wearing hand gloves regularly between contact with different patients This is agree with *Alice et al.*,⁽⁴¹⁾ in their study about "Knowledge and practice of infection control among health workers in a tertiary hospital in Edo state " who found that the majority of respondents had satisfactory practice regarding hand washing after contact with contaminated instruments or surfaces after patient contact. The majority of respondents had satisfactory practice regarding wearing hand gloves when touching blood, body secretions or mucus membranes, The majority of respondents had satisfactory practice regarding wearing hand gloves between contact with different patients.

The present study revealed that there was statistically significance relation between nurses' knowledge of (SPs)and their compliance with (SPs) and related influencing factors revealed that the higher the level of nurses knowledge, the higher the level of nurses compliance with standard precaution, This is disagreed with *Almoghrabi et al.*,⁽⁴²⁾In their study done in Saudi Arabia about "(SPs)among Nurses in Primary Health Care Centers: Knowledge and Compliance " Who found that there is an acceptable level of knowledge with poor compliance to (SPs).

Regarding relation between years of experience of participant and their practice of (SPs) the current study revealed that generally the high satisfactory practice of the various elements of (SPs) of infection control, especially among the participant have years of experience less than ten years, this is in the line with *Eskander , et al*⁽⁴³⁾ who found that there was satisfactory practice among the studied sample who have years of experience less than ten years while this is disagree with *Ogoina et*

al ⁽⁴⁴⁾ in their study about " Knowledge, attitude and practice of (SPs) of infection control by hospital workers in two tertiary hospitals in Nigeria " Who found that generally poor practice of the various elements of (SPs) of infection control, especially among less experienced health workers. The higher practice scores among less experienced health professionals may be partly related to training in infection control compared to other high experienced health workers.

The present study revealed that there was statistically significance relation between nurses' knowledge of (SPs)and their personal characteristics included:

Regarding age, the majority of participant group aged less than 30 years had satisfactory knowledge more than participant group aged more than 30 years. This study findings showed that the more age the nurse the lower knowledge score which indicate that age is not factor affecting knowledge. Regarding sex females had satisfactory knowledge, more than males. This disagree with the finding of *Batran et al* , ⁽⁴⁵⁾ in their study about "Are Standard Precautions for Hospital-Acquired Infection among Nurses in Public Sector Satisfactory" who Found that there were no significant differences between (SPs) knowledge level with the age.

Regarding nursing qualification : The present study revealed that nurses who had bachelor degree had higher satisfactory knowledge as compared to the other two groups. This is agreed with *Eskander ,et al* ⁽⁴³⁾ in their study about "Intensive Care Nurses' Knowledge & Practices regarding Infection Control (SPs) at a Selected Egyptian Cancer Hospital " who found that nurses who had bachelor degree displayed higher mean knowledge scores as compared to the other two groups (diploma -diploma with specialty).

Regarding experience years: The present study revealed that the majority of nurses with years of experience less than 10 years had satisfactory knowledge more than nurses with years of experience more than 10 years. This study result showed that the more experience the nurse the lower knowledge score which indicate that years of experience is not factor affecting knowledge. This finding is consistent with

Ayed et al , ⁽⁴⁶⁾ in their study about "Knowledge and Compliance of Nursing Staff towards (SPs) in the Palestinian Hospitals " who indicate that years of experience have no effect in gaining and enhancing the level of knowledge

The present study revealed that there are statistically significant relations between nurses' compliance with (SPs) and the practice areas, mentioned that the percentages of the nurses' compliant with (SPs) were higher among nurses who had satisfactory practice in area of clean hospital environment, also the percentages of the nurses' compliant with (SPs) were higher among nurses who had satisfactory total practice. This is agreed with *Holla et al* ⁽⁴⁾ in his study about " Occupational Exposure to Needle Stick Injuries among Health Care Personnel in a Tertiary Care Hospital in South India" Who found that more than three quarter of the health care professionals had satisfactory practice while wearing gloves while handling blood or body fluids, and washing the hands after removal of gloves, the majority of the health care workers disposed used needles into designated container, On the other hand this study finding disagreed with *EI-Greeb et al* , ⁽⁴⁷⁾ in their study about "Assessment of Nurses' Compliance with Infection Control Standard Precautions at Outpatient Clinics of Urology and Nephrology Center - Mansur University " Who found that , although nurses showed satisfactory knowledge regarding standards, the majority of them showed unsatisfactory practice in compliance to (SPs).

Conclusion:

Based on the finding of the present study, It can be concluded that hospital staff nurses are at a significant risk of exposure to blood and body fluids. While two third of the nurses had previous occupational exposure while blood splash represented more than two thirds of this exposure. Although the majority of the nurses were compliant with (SPs). While, More than two third of nurses had satisfactory total knowledge regarding (SPs),While about three quarters of nurses had satisfactory total practice regarding (SPs). Additionally the hospital related factors was considered

as a significant positive predictor of the nurses' compliance scores on (SPs) and their practice.

Recommendations:

Based on the findings of the present study the following recommendations were suggested:

- Controlling the most common standard precautions compliance obstacles with emphasis on improving working conditions. Maximizing the hospital role in updating the staff knowledge about standard precautions through empowering an infection control committee and providing easily accessible written guidelines.
- Implementing education training program for nurses regarding standard precautions and personal protective equipment to reduce occupational exposures.
- Ensuring the availability of personal protective equipment and other infection control facilities.
- Set up an appropriate surveillance technique at the hospital to ensure proper response and the recent reporting and treatment of blood borne exposure.
- Hepatitis B vaccine must be given obligatory to all nursing staff. Follow up of hepatitis B surface antibody titer and booster dose of hepatitis B vaccine every 5 years.

Table 1: Demographic characteristics of nurses in the study sample (n=86)

| Items: | Frequency | Percent |
|--|-----------|---------|
| Age: | | |
| <30 | 41 | 47.7 |
| 30+ | 45 | 52.3 |
| Range | 22.0-46.0 | |
| Mean±SD | 30.9±4.4 | |
| Median | 30.00 | |
| Gender: | | |
| Male | 20 | 23.3 |
| Female | 66 | 76.7 |
| Nursing qualification: | | |
| Nursing school diploma | 33 | 38.4 |
| Technical institute diploma | 33 | 38.4 |
| Bachelor | 20 | 23.3 |
| Experience years: | | |
| <10 | 38 | 44.2 |
| 10+ | 48 | 55.8 |
| Range | 1.0-28.0 | |
| Mean± SD | 10.7±5.3 | |
| Median | 10.00 | |
| Unit: | | |
| Operations | 8 | 9.3 |
| Emergency | 30 | 34.9 |
| ICU | 12 | 14.0 |
| Medical | 7 | 8.1 |
| Hemodialysis | 23 | 26.7 |
| Central sterilization | 6 | 7.0 |
| Attended courses in infection control: | | |
| No | 9 | 10.5 |
| Yes | 77 | 89.5 |

Table 2: Occupational exposures to blood and body fluids among the studied nurses in (n=86)

| Items: | Frequency | Percent |
|--|-----------|---------|
| Previous occupational exposure: | | |
| No | 27 | 31.4 |
| Yes | 59 | 68.6 |
| No. of exposure times (n=59): | | |
| 1-2 | 17 | 28.8 |
| 3+ | 42 | 71.2 |
| Range | 1-10 | |
| Mean± SD | 3.7±2.1 | |
| Median | 3.0 | |
| Injury type (n=59): | | |
| Needle prick | 42 | 71.2 |
| Cut wound | 23 | 39.0 |
| Laceration | 2 | 3.4 |
| Sharps injury | 8 | 13.6 |
| Blood | 45 | 76.3 |
| Cut gloves | 20 | 33.9 |
| Injury site (n=59):@ | | |
| Right hand | 48 | 81.4 |
| Left hand | 8 | 13.6 |
| Right foot | 1 | 1.7 |
| Face | 36 | 61.0 |
| Eyes | 23 | 39.0 |
| Injury severity (n=59):@ | | |
| Superficial | 47 | 79.7 |
| Moderate | 17 | 28.8 |
| Exposure to (n=59): | | |
| Blood | 58 | 98.3 |
| Blood and body fluids | 1 | 1.7 |

Table 3: Details of the occupational exposures incident as reported by the studied nurses (n=86)

| Items: | Frequency | Percent |
|---|-----------|---------|
| Injury tool (n=59) | | |
| Needle | 45 | 76.3 |
| Blade | 11 | 18.6 |
| Scalpel | 15 | 25.4 |
| Slide | 2 | 3.4 |
| Broken glass | 25 | 42.4 |
| Other | 2 | 3.4 |
| Activity at injury (n=59) | | |
| Covering needle | 17 | 28.8 |
| Waste disposal | 23 | 39.0 |
| Stitching | 25 | 42.4 |
| Handling | 14 | 23.7 |
| Cleaning utensils | 10 | 16.9 |
| Cutting | 1 | 1.7 |
| Dialysis preparation | 3 | 5.1 |
| Patient condition at injury (n=59) | | |
| Irritated | 12 | 20.3 |
| Semi-conscious | 3 | 5.1 |
| Spastic | 3 | 5.1 |
| Pre-coma | 4 | 6.8 |
| Hematemesis | 6 | 10.2 |
| Under anesthesia | 4 | 6.8 |
| Bleeding | 14 | 23.7 |

Table 4: Compliance with standard precautions as reported by the studied nurses (n=86)

| Compliance items | Frequency | Percent |
|---|-----------|---------|
| Risk assessment for activities | 78 | 90.7 |
| Wearing personal protective equipment | 60 | 69.8 |
| Hand washing | 84 | 97.7 |
| Taking off all jewelry before hand washing | 68 | 79.1 |
| Using a cleansing agent | 83 | 96.5 |
| Rubbing the hand well | 81 | 94.2 |
| The contact time of cleansing agent | 53 | 61.6 |
| Drying the hands | 42 | 48.8 |
| Hands washing between one patient and the other | 80 | 93.0 |
| Hand washing between the procedure for the same patient | 73 | 84.9 |
| Wearing protective eye goggles or facial mask | 21 | 24.4 |
| Removing personal protective equipment in a correct manner | 78 | 90.7 |
| Taking careful when dealing with needles or other sharp devices | 86 | 100.0 |
| Placing needles and sharp objects in the safety box | 86 | 100.0 |
| Covering non intact areas of your skin with waterproof tape | 78 | 90.7 |
| Sterilization guidelines | 83 | 96.5 |

Table 5: Total compliance with standard precautions and influencing factors as reported by the studied nurses (n=86).

| Items: | Frequency | Percent |
|---------------------------------|-----------|---------|
| Compliance: | | |
| Compliance (60%+) | 75 | 87.2 |
| Not compliance (<60%) | 11 | 12.8 |
| Factors influencing compliance: | | |
| Hospital-related: | | |
| Influenced (60%+) | 26 | 30.2 |
| Not influenced (<60%) | 60 | 69.8 |
| Nurse-related (attitude): | | |
| Positive attitude (60%+) | 80 | 93.0 |
| Negative attitude (<60%) | 6 | 7.0 |
| Total factors: | | |
| Influenced (60%+) | 39 | 45.3 |
| <i>Not influenced (<60%)</i> | 47 | 54.7 |

Table 6: Hospital-related factors influencing compliance with standard precautions as reported by the studied nurses (n=86).

| Factors | Agree | |
|--|-------|-------|
| | No. | % |
| Does the hospital have the following personal protective equipment? | | |
| Sterile gloves | 81 | 94.2 |
| Clean latex gloves | 84 | 97.7 |
| Heavy duties gloves | 70 | 81.4 |
| Over Head | 69 | 80.2 |
| Surgical Mask | 83 | 96.5 |
| Protective eye goggles | 11 | 12.8 |
| Face shield | 12 | 14.0 |
| surgical gowns | 70 | 81.4 |
| protective water proof (Macintosh) | 82 | 95.3 |
| Foot protectors | 58 | 67.4 |
| Hand washing soap | 86 | 100.0 |
| Disinfectant such as beta-din 7.5 % | 85 | 98.8 |
| Alcohol | 42 | 48.8 |
| Materials for drying hands | 33 | 38.4 |
| Colored plastic bags to separate waste | 83 | 96.5 |
| Safety boxes to collect sharp tools | 86 | 100.0 |
| Metal signs or signs of danger in case of waste | 14 | 16.3 |
| The hospital laboratory investigation after exposure | 19 | 22.1 |

Table 7: Nurse-related factors influencing compliance with standard precautions as reported by the studied nurses (n=86)

| Nurses' attitude | Disagree | | Agree | |
|---|----------|------|-------|-------|
| | No. | % | No. | % |
| Training of staff and provision of personal protective equipment necessary to reduce the risk of occupational hazards | 1 | 1.2 | 85 | 98.8 |
| Gowns and face masks used in possible procedures for blood splashing | 2 | 2.3 | 84 | 97.7 |
| Wearing gloves during the injection process. | 3 | 3.5 | 83 | 96.5 |
| Hands washing after every contact with the patient | 0 | 0.0 | 86 | 100.0 |
| Needles recapping | 6 | 7.0 | 80 | 93.0 |
| Disposing sharp object in the safety box | 6 | 7.0 | 80 | 93.0 |
| The safety boxes is close to the working area | 2 | 2.3 | 84 | 97.7 |
| A sufficient nursing staff in the hospital, thus reducing the risk of occupational exposure. | 5 | 5.8 | 81 | 94.2 |
| Incentives be introduced to comply with standard precautions | 34 | 40.7 | 51 | 59.3 |

Table 8: Total practices related to standard precautions as observed among the studied nurses (n=86)

| Satisfactory (60%+) practice: | Frequency | Percent |
|-----------------------------------|-----------|---------|
| Hand washing | 66 | 76.7 |
| Personal protective equipment use | 53 | 61.6 |
| Cleaning instruments/linen | 38 | 44.2 |
| Clean hospital environment | 46 | 53.5 |
| Safe waste disposal | 82 | 95.3 |
| Total practice: | | |
| Satisfactory | 65 | 75.6 |
| Unsatisfactory | 21 | 24.4 |

Table 9: Relations between total nurses' knowledge of standard precautions and their compliance and related influencing factors

| Items: | Knowledge | | | | χ^2 test | p-value | | |
|---------------------------------|--------------|------|----------------|------|---------------|---------|--|--|
| | Satisfactory | | Unsatisfactory | | | | | |
| | No. | % | No. | % | | | | |
| Compliance: | | | | | | | | |
| Compliance (60%+) | 51 | 68.0 | 24 | 32.0 | | | | |
| Not Compliance (<60%) | 8 | 72.7 | 3 | 27.3 | Fisher | 1.00 | | |
| Factors influencing compliance: | | | | | | | | |
| Hospital-related: | | | | | | | | |
| influenced (60%+) | 22 | 84.6 | 4 | 15.4 | | | | |
| Not influenced (<60%) | 37 | 61.7 | 23 | 38.3 | 4.44 | 0.04* | | |
| Nurse-related (attitude): | | | | | | | | |
| Positive attitude (60%+) | 54 | 67.5 | 26 | 32.5 | | | | |
| Negative attitude (<60%) | 5 | 83.3 | 1 | 16.7 | Fisher | 0.66 | | |
| Total factors: | | | | | | | | |
| influenced (60%+) | 30 | 76.9 | 9 | 23.1 | | | | |
| Not influenced (<60%) | 29 | 61.7 | 18 | 38.3 | 2.29 | 0.13 | | |

(*) Statistically significant at $p<0.05$

Table 10: Relations between total nurses' practice of standard precautions and their demographic characteristics

| Items: | Practice | | | | χ^2 test | p-value | | |
|--|--------------|-------|----------------|------|---------------|---------|--|--|
| | Satisfactory | | Unsatisfactory | | | | | |
| | No. | % | No. | % | | | | |
| Age: | | | | | | | | |
| <30 | 33 | 80.5 | 8 | 19.5 | | | | |
| 30+ | 32 | 71.1 | 13 | 28.9 | 1.02 | 0.31 | | |
| Gender: | | | | | | | | |
| Male | 9 | 45.0 | 11 | 55.0 | | | | |
| Female | 56 | 84.8 | 10 | 15.2 | Fisher | 0.001* | | |
| Nursing qualification: | | | | | | | | |
| Diploma | 45 | 68.2 | 21 | 31.8 | | | | |
| Bachelor | 20 | 100.0 | 0 | 0.0 | Fisher | 0.002* | | |
| Experience years: | | | | | | | | |
| <10 | 31 | 81.6 | 7 | 18.4 | | | | |
| 10+ | 34 | 70.8 | 14 | 29.2 | 1.33 | 0.25 | | |
| Unit: | | | | | | | | |
| Operations | 6 | 75.0 | 2 | 25.0 | | | | |
| Emergency | 18 | 60.0 | 12 | 40.0 | | | | |
| ICU | 11 | 91.7 | 1 | 8.3 | -- | -- | | |
| Medical | 4 | 57.1 | 3 | 42.9 | | | | |
| Hemodialysis | 20 | 87.0 | 3 | 13.0 | | | | |
| Central sterilization | 6 | 100.0 | 0 | 0.0 | | | | |
| Attended courses in infection control: | | | | | | | | |
| No | 5 | 55.6 | 4 | 44.4 | | | | |
| Yes | 60 | 77.9 | 17 | 22.1 | Fisher | 0.21 | | |

(*) Statistically significant at $p<0.05$ (--) Test result not valid**Table 11:** Relations between total nurses' knowledge of standard precautions and their demographic characteristics

| Demographic characteristics | Knowledge | | | | χ^2 test | p-value | | |
|--|--------------|------|----------------|------|---------------|---------|--|--|
| | Satisfactory | | Unsatisfactory | | | | | |
| | No. | % | No. | % | | | | |
| Age: | | | | | | | | |
| <30 | 33 | 80.5 | 8 | 19.5 | | | | |
| 30+ | 26 | 57.8 | 19 | 42.2 | 5.14 | 0.02* | | |
| Gender: | | | | | | | | |
| Male | 9 | 45.0 | 11 | 55.0 | | | | |
| Female | 50 | 75.8 | 16 | 24.2 | 6.74 | 0.009* | | |
| Nursing qualification: | | | | | | | | |
| Diploma | 40 | 60.6 | 26 | 39.4 | | | | |
| Bachelor | 19 | 95.0 | 1 | 5.0 | 8.43 | 0.004* | | |
| Experience years: | | | | | | | | |
| <10 | 32 | 84.2 | 6 | 15.8 | | | | |
| 10+ | 27 | 56.3 | 21 | 43.8 | 7.70 | 0.006* | | |
| Unit: | | | | | | | | |
| Operations | 6 | 75.0 | 2 | 25.0 | | | | |
| Emergency | 18 | 60.0 | 12 | 40.0 | | | | |
| ICU | 9 | 75.0 | 3 | 25.0 | -- | -- | | |
| Medical | 6 | 85.7 | 1 | 14.3 | | | | |
| Hemodialysis | 19 | 82.6 | 4 | 17.4 | | | | |
| Central sterilization | 1 | 16.7 | 5 | 83.3 | | | | |
| Attended courses in infection control: | | | | | | | | |
| No | 6 | 66.7 | 3 | 33.3 | | | | |
| Yes | 53 | 68.8 | 24 | 31.2 | Fisher | 1.00 | | |

(*) Statistically significant at $p<0.05$ (--) Test result not valid

Table 12: Relations between total nurses' compliance with standard precautions and the practice areas

| Practice of: | Compliance | | | | χ^2 test | p-value | | |
|---|------------|-------|----------------|------|---------------|---------|--|--|
| | Compliance | | Not Compliance | | | | | |
| | No. | % | No. | % | | | | |
| Hand washing: | | | | | | | | |
| Satisfactory | 58 | 87.9 | 8 | 12.1 | | | | |
| Unsatisfactory | 17 | 85.0 | 3 | 15.0 | Fisher | 0.71 | | |
| Personal protective equipment use: | | | | | | | | |
| Satisfactory | 48 | 90.6 | 5 | 9.4 | | | | |
| Unsatisfactory | 27 | 81.8 | 6 | 18.2 | Fisher | 0.32 | | |
| Cleaning instruments/linen: | | | | | | | | |
| Satisfactory | 35 | 92.1 | 3 | 7.9 | | | | |
| Unsatisfactory | 40 | 83.3 | 8 | 16.7 | Fisher | 0.33 | | |
| Clean hospital environment: | | | | | | | | |
| Satisfactory | 44 | 95.7 | 2 | 4.3 | | | | |
| Unsatisfactory | 31 | 77.5 | 9 | 22.5 | 6.32 | 0.01* | | |
| Safe waste disposal: | | | | | | | | |
| Satisfactory | 71 | 86.6 | 11 | 13.4 | | | | |
| Unsatisfactory | 4 | 100.0 | 0 | 0.0 | Fisher | 1.00 | | |
| Total practice: | | | | | | | | |
| Satisfactory | 60 | 92.3 | 5 | 7.7 | | | | |
| Unsatisfactory | 15 | 71.4 | 6 | 28.6 | Fisher | 0.02* | | |

(*) Statistically significant at $p<0.05$ **Table 13:** Relations between total factors influencing nurses' compliance with standard precautions and their practice areas

| Practice of: | Total factors | | | | χ^2 test | p-value | | |
|---------------------------------------|---------------|------|----------------|------|---------------|---------|--|--|
| | Influenced | | Not Influenced | | | | | |
| | No. | % | No. | % | | | | |
| Hand washing: | | | | | | | | |
| Satisfactory | 32 | 48.5 | 34 | 51.5 | | | | |
| Unsatisfactory | 7 | 35.0 | 13 | 65.0 | 1.13 | 0.29 | | |
| Personal protective equipment: | | | | | | | | |
| Satisfactory | 31 | 58.5 | 22 | 41.5 | | | | |
| Unsatisfactory | 8 | 24.2 | 25 | 75.8 | 9.62 | 0.002* | | |
| Cleaning instruments/linen: | | | | | | | | |
| Satisfactory | 20 | 52.6 | 48 | 47.4 | | | | |
| Unsatisfactory | 19 | 39.6 | 29 | 60.4 | 1.46 | 0.23 | | |
| Clean hospital environment: | | | | | | | | |
| Satisfactory | 24 | 52.2 | 22 | 47.8 | | | | |
| Unsatisfactory | 15 | 37.5 | 25 | 62.5 | 1.86 | 0.17 | | |
| Safe waste disposal: | | | | | | | | |
| Satisfactory | 37 | 45.1 | 45 | 54.9 | | | | |
| Unsatisfactory | 2 | 50.0 | 2 | 50.0 | Fisher | 1.00 | | |
| Total practice: | | | | | | | | |
| Satisfactory (60%+) | 36 | 55.4 | 29 | 44.6 | | | | |
| Unsatisfactory (<60%) | 3 | 14.3 | 18 | 85.7 | 10.82 | 0.001* | | |

(*) Statistically significant at $p<0.05$

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