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Knowledge and Practice on Infection Prevention among Nurses at a Selected Tertiary Hospital in Bangladesh

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Abstract: Background: Worldwide infection is one of the most significant problems in health care services. Infection prevention is a crucial component to provide quality care in any health care setting. Infections are leading cause of death and preventable illness. Healthcare-associated infection (HAI) is a major health problem today. Health care providers, especially nurses and doctors are constantly exposed to microorganisms and most of them can be affected by serious as well as lethal infections. The estimations shows that the risk of nosocomial infection is 2 to 20 times higher in developing countries compared to developed countries. Objective: The objective of this study was to evaluate the level of knowledge and practice on infection prevention among nurses in a selected tertiary level hospital in Bangladesh. Methods: The descriptive study design was conducted among 110 nurses from National Institute of Cardiovascular Diseases & Hospital, Dhaka, by using purposive sampling technique. Data was collected by self-administered questionnaires that consist of socio-demographic questionnaire, nurses' knowledge on infection prevention related questionnaire and nurses practice on infection prevention related questionnaire. Descriptive statistics - percentage, frequency, mean was used. Results: Findings of this study showed that the knowledge and preventive practices mean score of knowledge was 17.04 (SD =2.55) out of maximum score 20 which indicate high level of knowledge regarding infection prevention. The mean score of nurses practice on infection prevention was 31.88 (SD=5.75). It means that nurses' preventive practice was low to moderate level. Conclusion: Study results showed that nurses' practice on infection prevention was low to moderate level. So, nurses should need to increase preventive practices for infection prevention. Study results also showed that those who have training their practice was good. It can be suggested that to increase preventive practice among the nurses, development of training program on infection control should be increased. Further study is needed with diverse population and culture. Future intervention study also necessary the improvement of preventive practice among nurses in Bangladesh

Keywords: Infection, Preventive Practices, Nurses, Tertiary Hospital

INTRODUCTION

Healthcare-associated infections (HAIs) are a major problem for patients' and healthcare workers' (HCWs') safety and their prevention must be a top priority for healthcare systems and organizations (Alhumaid, *et al*., 2021).

HAIs can consequence in low quality of life, or even reduce life expectancy of the infected person, as well as incur considerable costs in the long run. For example, the risk of HAIs following a needle-stick injury with needle from an infected source patient was 0.3% for HIV, 3% for hepatitis C and 6–30% for hepatitis B (US, 2021).

Many infection control measures such as appropriate ehand hygiene and the correct application of basic precautions during invasive procedures are simple and low cost, but require staff accountability and behavioral changes, in addition to improving staff education, reporting and surveillance system (Shrestha &Thapa, 2018). Health care providers, especially nurses and doctors are constantly exposed to microorganisms and most of the can be affected by serious as well as lethal infections.The estimations shows that the risk of nosocomial infection is 2 to 20 times higher in developing countries compared to developed countries (Akhter, Chowdhury, & Muhammad, 2018). It has been estimated that the risk of healthcare associated infections is 2 to 20 times higher in developing countries compared to developed countries and 5% and 10% of patients admitted to hospital in developed countries acquire this infection. Evidence shows inadequate knowledge and poor technical skill (20%) regarding infection prevention among the health workers in different areas of Nepal3 so it is felt to find out knowledge and practice of nurses in central level government hospital on infection prevention (Shrestha, & Thapa,2018).

In Pakisthan29.13% of patients acquired HCAIs out of which 30.1% were respiratory tract infections, 39.1% urinary tract infections (UTIs) and 23.7% blood borne infections (Riasat, Malik, Yousaf, & Imam, 2019). HCAIs have between 3.5–12% prevalence in high income countries and 5.7–19.1% prevalence in low tomiddleincome countries. These infections have resulted in 99,000 deaths inthe USA and 37,000 deaths in Europe with estimated annual financial losses of $6.5billion and €7 billion respectively in 2011 (World health organization (WHO) 2010 as cited as Riasat, *et al*., 2019).

Among the total death in Bangladesh 0.16% death

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occurs due to Hepatitis B (WHO, 2020). Globally, hundreds of millions of people are affected every year by avoidable infections in health care. In this respect, healthcare associated infections (HCAIs) affect patients, healthcare workers (HCWs), support staff, medical students and patient attendants. The associated burden of disease related to HCAIs is extremely high and the impact of HCAIs implies prolonged hospital stay, long-term disability, increased resistance of micro-organisms to anti-microbials, massive additional financial burden for health systems, high costs for patients and their family, and unnecessary deaths. HCAIs accounted for 16 million additional hospitals stay in Europe with estimated total costs of €7 billion, and this also cost the United State healthcare system to loss an estimated $ 30-45 billion each year. The worldwide estimated indicated more than 1.4 million people are suffering from infections acquired in hospitals. Such risk is 2-20 times higher in developing countries.

Despite the simplicity and clarity of precautions; understanding how poor practice could fuel up the transmission, the practice among health care worker is still low. This problem is exacerbated in resource limited settings, like Africa . Alike other African countries, HCAI in Ethiopia is a major public health problem with the magnitude is not clearly known or not well studied. Besides, adherence to the precautions of infection prevention practices among HCWs is questionable and not addressed well . Conversely, the Federal Ministry of Health (FMoH) of Ethiopia undertook a multitude of initiatives to protect patients and HCWs by setting standards and guidelines. Although, in many healthcare settings, resources are constrained and control of the risk of acquiring HCAIs is a bit challenging and HCWs lack adequate knowledge and motivation to implement the recommended infection prevention practice. Compliance with infection prevention measures is the only way to reduce and protect HCWs, patients and the community from the occurrence of HCAIs and unnecessary injuries.

On top of this, various multifaceted factors extremely play a great role to achieve the goal of infection prevention, like adequate knowledge towards infection prevention, availability of personal protective equipment's and materials, human power, training, policy and guidelines and essential environmental health conditions. Hence, it is important that HCWs must know and use the recommended infection prevention measures accordingly (Biniyam S. *et al*., 2018)

The need for infection control in healthcare facilities is born out of the need to prevent Healthcare associated infections (HCAIs). It contributes to significant morbidity and mortality, longer duration of hospitalization, as well as increased cost of treatment in both developed and resource-poor countries. Disparity in knowledge of infection control based on a cadre of health care worker (HCW) and their years of experience.

The benefits of effective infection control measures span wide from improving morbidity and mortality, prevention of disease transmission to enhancing a cost-effective healthcare. Infectious diseases are a major cause of human suffering in terms of both morbidity and mortality throughout human history. The spread of infectious diseases was influenced by various steps in human civilization. For example, parasitic and Zoonotic diseases have become more common after domestication of animals, airborne viral and bacterial infections after large settlements and urbanization. Throughout the ages, humanity suffered from large pandemics such as plague, smallpox, cholera, and influenza but also from the more silent killers of chronic infectious diseases such as tuberculosis and syphilis (Riasat, Malik, Yousaf, & Imam, 2019).

Nurses should be knowledgeable and updated in their practice to prevent NI all healthcare in everywhere including Bangladesh.Nurses, as a part of the health care team, play an essential role in providing care to both infectious and non-infectious patients in the same ward. Prevention and control of infection nurses are the vital person. However, few studies done that assess nurses' knowledge & practice of infection control standards in ICUs and other areas. However, researcher highlighted to knowledge and practice on Infection Prevention among Nurses in hospital setting.

Justification of the Study

Healthcare-acquired infections are a typical global problem mainly in low socio-economic countries. Based on World Health Organization (WHO) 2019 Healthcare Associated Infections (HCAI) fact sheet report globally 100 million patients are affected by healthcare-associated infection annually. An estimated 10% of hospitalized patients in developed countries and 25% in developing countries develop HAI.

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Bangladesh is a densely populated country with insufficient healthcare resources; the control of infection would be difficult here in without adequate knowledge of healthcare workers on mentioned disease. Nursing is one of the essential components of medical care, and nurses' knowledge regarding infection and consequences patient's outcomes. It was therefore necessary to evaluate the nurses' knowledge and Practice onInfection Prevention among Nurses at a Selected Tertiary Hospital in Bangladesh. The purpose of the study was to assess nurses' knowledge and Practice onInfection Prevention among Nurses at a Selected Tertiary Hospital in Bangladesh. This could reduce the government's burden in combating the outbreak strategies. The findings of the study might be helpful to the health workers especially for the nurses to acquire up-to –date information and deliver the best practice to prevention and control of Infection. Consequently, patients would be benefited; crisis of hospital bed would be minimized, lessen the hospital burden and economical scarcity would be reduced. On the other hand, there were a few studies that have been conducted in the country which address these issues.

So, it was necessary to conduct study on Knowledge and Practice on Infection Prevention among Nurses at a Selected Tertiary Hospital in Bangladesh.

LITERATURE REVIEW

This chapter present the review of literature related to evaluate the level of knowledge and practice on infection prevention among nurses in selected tertiary level hospitalof Dhaka City". Also, the review informed the approach to the analysis of the research problem. The literature review covered by the following areas:

1. Concept of infection prevention and control
2. Incidence and prevalence of infection prevention and control
3. Studies on knowledge and practice related on infection prevention of nurses

Concept of Infection Prevention and Control

Infection prevention is a practical, evidence-based approach to prevent infection of patientsand health workers from being harmed by avoidable infections. Patientsafety and quality of care is universally relevant to every health worker and patient, at every health care interaction. Ineffective infection prevention and control causes harm and can kill and impossible to achieve quality health care delivery.

Infection prevention and control affects all aspects of health care, including hand hygiene, surgical site infections, injection safety, antimicrobial resistance and how hospitals operate during and outside of emergencies (World Health Organization., 2022). Hospitals around the world, health workers are playing a major role in treating patients with health-related problems and infections. Hospital-acquired infections (HAIs) are the major challenge across the globe as the HAI smarkedly influence the quality of healthcare delivery, mainly by adding burden to the underdeveloped and developing countries (Jeyasheelan, *et al*., 2020).

Incidence and Prevalence of Infection Prevention and Control

A cross-sectional survey study conducted in Abuja South Africa, among 277 healthcare workers (HCWs) by using a structured questionnaire. Only 16.61% of participants had knowledge of the basic concept of standard precautions and 42.24% knew potential sources of occupational exposure. The association between the knowledge of the potential sources of occupational exposures and profession was significant (p=0.011). Hand washing was practiced by 97.46%; 97.83% reported regular use of hand gloves; 88.44% use gown or plastic apron; 68.95% use masks and eye protector. The major factor reported for non-adherence was non-availability of the materials. Practice of recapping used needle was more common among doctors than nurses (p=0.01). The HCWs hepatitis-B vaccination status was poor; 32.53% of doctors and 28.87% of nurses had ≥1 dose of hepatitis-B vaccine. The difference in hepatitis-B immunization status of doctors and nurses was not significant (p=0.556) (Okechukwu, &Motshedisi, 2012).

Studies on Knowledge and Practice Related on Infection Prevention of Nurses

One systematic study revealed that nurses in most studies had adequate knowledge (n = 10, 40%-90%) and positive attitude (n = 4, 37%-100%) and most studies reflected average and poor nursing practices with regard to adherence to infection control and prevention standards. The most frequent recommendations proposed for improving nurses' knowledge, attitude, and practice included periodic training via scientific conferences and relevant practical courses (n = 12), combining up-to-date theoretical and practical programs (n = 6), and training at the beginning of hospital employment (n = 4). Although nurses in most

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studies had adequate knowledge of and positive attitude toward health care-associated infections, because of average and poor practices, they need systematic and integrated implementation of the presented recommendations (Nasiri, *et al*).

Infection prevention is a crucial component to provide quality care in any health care setting. Infections are leading cause of death and preventable illness. Another study was conducted to find out the knowledge and practice among nurses regarding infection prevention. Methods: A descriptive study design was adopted for the study. Total 170 nurses were included by using census technique to assess knowledge on infection prevention. Probability systematic sampling technique was used by selecting every odd number from staffs' list to observe the practice of 85 nurses. Semi-structured self-administered questionnaire and observation checklist was used for data collection.The study showed that 57.1% of respondents had adequate knowledge and only 48.2% had good practice on infection prevention through hand hygiene, use of adequate personal protective equipment, decontamination, cleaning of instruments, sterilization, and use of antiseptics, disposal of sharps and waste disposal. Similarly, 88.8% of the respondents had not received any training related to infection prevention. This study conclude that respondents had better knowledge than practice on infection prevention. The study suggest that need for organizing regular training, monitoring, development and implementation of guideline to improve knowledge and practice of nurses for prevention of infection in the hospital. Keywords: Infection prevention; knowledge; practice; standard precautions (Shrestha, &Thapa, 2018).

A cross-sectional study was conducted in North West bank governmental hospitals in Palestine among 271 nurses. The study revealed that, approximately half (53.9%) of the studied sample had fair knowledge level (>80%). However, the majority (91.1%) of the studied sample had Good practice (>80%). No significant statistical differences were found between mean knowledge scores towards age, years of experience, and training course (f=2.263, 1.607, 0.210) respectively at $p < 0.05$(0.082, 0.188, 0.647) respectively. Significant statistical differences were found between mean knowledge scores towards gender and qualification (F=4.205,4.531) respectively at $p<0.05$ (0.041, 0.012) respectively. No significant statistical differences were found between mean practice scores towards age, years of experience, training course, and qualification (f=1.482, 2.625, 0.129, 0.727) respectively at $p < 0.05$(0.220, 0.051, 0.720, 0.484) respectively. Significant statistical differences were found in mean practice scores only in relation to gender, ($F = 8.569$) at $p < 0.05$ (0.004) (Fashafsheh, I., Ayed, A., Eqtait, F., Harazneh, F. 2015).

According to Shrestha & Thapa (2018), conducted study on Knowledge and Practiceon Infection Prevention among Nurses of Bir Hospital, Kathmandu. They found that 57.1% of respondents had adequate knowledge and only 48.2% had good practice on infection prevention through hand hygiene, use of adequate personal protective equipment, decontamination, cleaning of instruments, sterilization, and use of antiseptics, disposal of sharps and waste disposal. Similarly, 88.8% of the respondents had not received any training related to infection prevention (Shrestha & Thapa, 2018).

A study conducted in Eket, AkwaIbom, State to determine the level of knowledge and practice of infection control among nurses in Immanuel General Hospital. The results revealed that 60 (75%) were females and 60 (75%) aged 31-50 years, single and mostly Christians 70 (88%) and Diploma holders 64 (84%). Further results showed that majority of the nurses (62.2%) in IGHEhad good knowledge of infection control. Fifty (63%) respondents "always' washed their hands before and after each procedure; 88 (70%) said sharp containers should be securely closed and puncture proof; 50 (63%) said used needles should be resheath or bent after use; 55 (69%) puncture resistant gloves were never provided or used for handling soiled linen and soiled linen were not sent in leak proof labeled bags to the laundry. Pearson Product Moment Correlation analysis also showed that there was no significant relationship between knowledge and practice of infection control.

Based on the results, although nurses have good knowledge of infection control, the Hospital Management should provide more personal protective equipment, organize and sponsor seminars and workshops to improve infection control practices (Samson- Akpan&Bassey, 2015).

A study conducted in Bahir Dar city hospital by Woldegioris, *et al*., in 2019, the nurses' knowledge and practice in regard to the prevention of SSI. The scores for the nurses' knowledge and practice in regard to the prevention

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of SSI were 74.5% and 45.1%, respectively. Learning institution (AOR6;95%CI 2.52–14.22), service year (AOR 8.9; 95% CI 3.21–21.4) and history of training on infection prevention (AOR 5.3; 95% CI 2.11–13.7) were associated significantly with the nurses' knowledge about prevention of SSI. History of training in infection prevention (AOR4.75;95%CI1.9–12.05), type of learning institution (AOR21.35;95% CI 8.01–56.22) and years of service (AOR 29.3; 95% CI 6.89–124.9) also were associated significantly with the nurse's practice in preventing SSI (Woldegioris, *et al*., 2019). Surgical Site Infection (SSI) is one of the most common healthcare-associated infections, its account for up to 16% of all healthcare- associated infections worldwide. A cross-sectional study was conducted on four hospital in Jordan. The mean of the total knowledge scores of the sample was 3.28 out of nine (SD = 1.72, range = 0 - 7), the median was 3 out of nine. There were a statistically significant correlation between all tested continuous socio demographics variables and the total knowledge score ($p > 0.05$). There is a significant difference in nurses' knowledge between those who are attending to special surgical related training course and who are not. The most significant predictors of Jordanian nurses' knowledge were: the number of credit hours attended by nurses for surgical-related training courses and the total years of work experience in nursing. These variables explained 16.7% of variance (Qasem&Hweidi., 2017).

The study carried out at Dhaka Medical college Hospital and Shaheed Suhrawardi Medical college Hospital Dhaka, Bangladesh. From the study found that among 139 respondents, mean age were 31.97±7.412(SD).51.8% (n=72) .2% (n= 67) were male. In this study, 99.3% (n=138) of the respondents were aware of infection control.

The current study shows that the100% (n=139) of respondents know about nosocomial infection. 95.7% (n=114) know infection control technique prevent nosocomial infection and 82% (n=114) of the respondents know infection can occur after discharge from hospital. Maximum 63.3% (n=88) of the respondents know the most effective method to control infection were hand washing properly and the minimum 4.3% (n=6) know prudent use of antibiotics, 38,8% (n=54) know wearing caps, masks and shoe cover and 9.4% (n=13) knows regular vaccination of health care worker. Maximum of the respondents 48.2% (n=67) practice often, 33.8% (n=47) practice always, 17.3% (n=24) practice sometime and minimum .7% (n=1) of the respondent never practice infection control guideline (Ali, &Alam, 2022).

Surgical site infection is a major hazard for surgical patients and compromises their quality of life.

The study was among Ethiopiannurses who are directly involved in the care. The aimed to assess surgical wound infection prevention practice among nurses who are directly involved in the care from March 1–31, 2020. The risk of healthcare associated infections is 2 to 20 times higher in developing countries compared to developed countries and 5% and 10% of patients admitted to hospital in developed countries acquire this infection. Bivariable and multivariable analysis was undertaken and p-value less than 0.05 at a 95% confidence interval was considered statistically significant.

The overall good self-reported surgical site infection prevention practice of nurses was 46% (95% CI: 41.3, 50.7). Nurses who were BSc degree (AOR = 2.04; 95% CI: 1.31, 3.18), working in the units having surgical site infection prevention guidelines (AOR=2.45;95% CI:1.34,4.47), had ever taken (AOR=2.23;95% CI:1.42,3.49), had good knowledge (AOR=1.82;95% CI:1.13,2.90) and had good attitude (AOR=2.61;95% CI:1.67,4.10) performed good surgical site infection prevention activities as compared to their counterparts. Nurses' surgical site infection prevention practice was found to be low. To upgrade nurses', practice the hospitals should develop their surgical site infection prevention guidelines based on WHO recommendations and provide training on it (Tesfaye, *et al*., 2022).

Understanding the level of knowledge and identifying factors associated with nurses' knowledge gaps can inform targeted interventions and educational programs aimed at improving infection control practices. By addressing these gaps, healthcare facilities in Bangladesh can enhance their infection prevention and control efforts, leading to a reduction in the burden of NCI and improved patient outcomes. Hence, study aimed to assess nurses' knowledge and practice on infection (NCI) preventive measures and its associated factors in Bangladesh.

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Study Framework
This study framework clearly illustrates the structure of the study plan or hypotheses and helps to formulate relevant study questions. Study framework concepts of this study project and assumed relationships between socio-demographic factors and knowledge related variable.

RESEARCH METHODOLOGY

The research methodology describes the whole process of the study which covers the areas on research design, study place, study population study period and sample size, sampling technique, selection criteria for the study, research instruments, pre-test and finalizing of the questionnaire, data collection procedures, data processing, analysis, and presentation, and ethical considerations.

Study Design

A descriptive type of cross-sectional studydesign was used to assess thelevel of knowledge and practice on infection prevention among nurses in selected tertiary level specialized hospital of Dhaka City".

Study Place
This study was conducted at National Institute of Cardiovascular Diseases and Hospital (NICVD), Dhaka, is a tertiary level and referral hospital in Bangladesh. It is one of the biggest and central location of Dhaka city. Patients come from different regions of country to take cardiac treatment in this hospital. On the other hand, a large number of nurses are working with the patients in this hospital. This hospital can be a representative of all types of tertiary level hospital and provides the opportunity in finding of adequate measurement in the nursing practice to prevention of infection.

Study Period
The Study period was from July 2023 to June 2024.

StudyPopulation
The entire population in this study consisted of registered nurses who were working in Medicine, Surgery department, post-operative, Operation Theater and others ward of National Institute of Cardiovascular Diseases and Hospital (NICVD), Dhaka, Bangladesh,

Study Sample
The study sample consisted of registered nurses who were working in Medicine, Surgery department, post-operative, Operation Theater and others ward of National Institute of Cardiovascular Diseases and Hospital (NICVD), Dhaka, Bangladesh, Convenient sampling technique used to recruit the sample based on the following inclusion criteria; Respondent who was willing to participate in the study. Respondent who was available in the office period during data collection.

Sampling Technique
Purposive sampling technique used to recruit the sample based on the following inclusion criteria; due to time and resource constraint the purposive sample size was be 110.

Selection Criteria
InclusionCriteria
Nurse who has at least one year working experience in the current ward
Nurses who are willing to participate in this study
Nurses who are present during data collection period.

Exclusion Criteria
Respondent who was not meet the inclusion criteria.

Research Instrument
Researcher was developed a self-administered questionnaire. It was consisted of three parts: part one constructed with nurse's socio-demographic questionnaire; part two nurse's knowledge on infection prevention related questionnaire; and part three nurse's practice on infection prevention related questionnaire.

PartI:Socio-DemographicQuestionnaire-
A structured questionnaire was developed by the researchers to collect the nurses' demographic characteristics. This part consisted of 10 items addressing age, gender, designation, marital status, family income, religion, professional education, work setting, working experience, training on infection control and prevention etc.

Part II: Nurse's Knowledge on Infection Prevention Related Questionnaire- This questionnaire was consisted of 20 items regarding Nurse's knowledge on Infection Prevention. Participant was asked to answer questions with Yes/No/Do not know responses. The dichotomy response as 1= Yes and 0= No or don't know. The 'don't know' response was coded as incorrect. The score was ranged from 0 to 20. Each correct answer received 1 point while an incorrect answer received 0 point. The participant's knowledge was categorized into three levels: low, moderate and

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high based on the Blooms cut off point. Mean scores less than 12 indicate low level knowledge, 12-15 indicates moderate and 16-20 indicates high level of knowledge.

Part III: Nurse's Practice on Infection Prevention Related Questionnaire- A 14- items nurse's practice on infection prevention related questionnaire developed by the researcher based on literature was used to identify the practice level on nurses on infection prevention. The participants were asked to answer the question with 3-point Likert scale, which was ranged from 1= never practice, sometimes practice=2 and 3= always practice. The score was ranged from 14-42 and converted in to percentage. High score indicates higher level of practice.

The content validity of the instrument was checked by three panel of expert who are knowledgeable and expert in the area of research and instrument development in nursing. Reliability of the instrument was tested by Cronbach's alpha coefficient. The study tool was prepared in English language.

Development of the Instrument

The semi- structured Questionnaire tools was developed based on study objectives and variables after reviewing related literatures by the researcher and consultation with respected guide teacher and subject teachers and taken expert opinion and suggestions from the guide teacher and subject teachers for essential correction. The questionnaire was pre-tested among 10 (ten) nurses at ShSMCH before finalizing the questionnaire for validity and reliability. Then questionnaire was finalized by 3 (three) experts in related field.

Validity and Reliability

Validity of the Instrument

The validity of the instrument examined by a panel of three experts in related field. The researcher modified the instruments based on expert recommendations.

Reliability of the Instrument

Pre- test conducted on 10 (ten) nurses in Dhaka with the same characteristics of the targeted respondents for reliability and acceptability of the questionnaire. After reviewing and pretesting of the questionnaire, the necessary corrections were made for finalizing the data collection procedure by the researchers.

DataCollection Method

Data was collected after obtain approval from the Institutional Review Board (IRB) of the SAIC Nursing College, Dhaka, Bangladesh, and the Institutional Review Board (IRB) of University of Dhaka, Bangladesh. After permission was received from the Director and Nursing Superintendent of selected specialized hospital (NICVD), Dhaka, Bangladesh data was collected. After obtaining permission from the director of the NICVD, the researcher was met with the head nurse and briefly explains the purpose of the study. The head nurse of each unit was approached, informed about this research, and asked for their cooperation in data collection. To assure the protection of human rights, participants was informed that participation in this study was voluntary, they may withdraw or discontinue at any time without any negative consequences, and it will not have any effect on their performance evaluation. Researcher was instructed them to fill up the questionnaire independently and individually without any help or sharing with others. It takes 25- 30 minutes. During return back researcher was checked the questionnaires for completeness; if any missing researcher requested subjects to make it complete. All the data was kept by the researcher for further data analysis. Collected data was used only for study purpose.

Data Management

The collected data was entered using a data analysis program and the editing and cleaning of data was performed. Data was analyzed as per objectives of the study and additional analysis was completed to support the research findings. The collected data were processed using SPSS for analysis including descriptive statistics and inferential statistics. Descriptive statistics consisting of frequency, percentage, range, mean, and standard deviation were to used analyze the subjects' Socio-demographic characteristics. Inferential statistics was used to find out the relationship between socio-demographic and Nurse's practice on Infection Prevention.

Ethical Consideration

Ethical consideration for this study was granted from Saic Nursing College. Permission was sought from the concern authority and granted before undertaking the study. Participants were informed about the objectives and method of study and a written consent was taken from the participants prior to participation. The researchers were explained clearly about the purpose of the study; the procedure; the possible benefit; and ensured free from risk of the study of the participants. Respondents' anonymity and confidentially was

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strictly maintained and their willingly participation. Participants were informed about their right to withdraw from the study without any repercussions

Data Analysis, Interpretation and Data Presentation

The descriptive statistics involves description of data using typical values. The obtained data were analyzed by using descriptive statistics like measures of frequency, percentage and mean. The analyzed data were shifted to the master chart for conceptualized it at a glance, then it was inserted into the computer software program for converting into graphical form and all results were presented into the form of tables, pie chart, and bar Chart. The finding of the results was interpreted for writing the discussion.

RESULTS

This chapter presents the results of the major variable. The findings are described under the following headings such as:

1) Socio-demographic characteristics of the participants, 2) Nurse's knowledge on Infection Prevention, 3) Nurse's practice on Infection Prevention, and 4) knowledge and practice on infection prevention among the participants. The findings are described bellows-

This chapter presents the results of the major variable. The findings are described under the following headings such as 1) Socio-demographic characteristics of the participants, 2) Nurse's knowledge on Infection Prevention, 3) Nurse's practice on Infection Prevention, and 4) knowledge and practice on infection prevention among the participants. The findings are described as areas

Table1: Distribution of Socio-demographic Characteristics of Participants (n=110)

Variables	Categories	(f)	n(%)	M(±SD)
Age (yrs.) Min25 - Max52 years.			110	37.12±7.72
Gender	Female		109(99.1%)	
	Male		1 (0.9%)	
Designation	SSN		110 (100%)	
Marital status	Married		95(86.4%)	
	Unmarried		15(13.6%)	
Religion	Muslim		67(60.9%)	
	Hindu		36(32.7%)	
	Others		7 (6.4%)	
Professional education				
	Diploma		70 (63.6%)	
	BSc		29(26.4%)	
	Master		11 (10%)	
Family income				63818.18 (±54298.73)
Work settings	Medicine ward		27(24.5%)	
	Surgery ward		20 (18.2%)	
	OT		7 (6.4%)	
	Others		10(9.1%)	
Working experience				11.27(±7.84)
Training regarding				
Infection prevention	Yes		28(25.5%)	
	No		82 (75.5%)	

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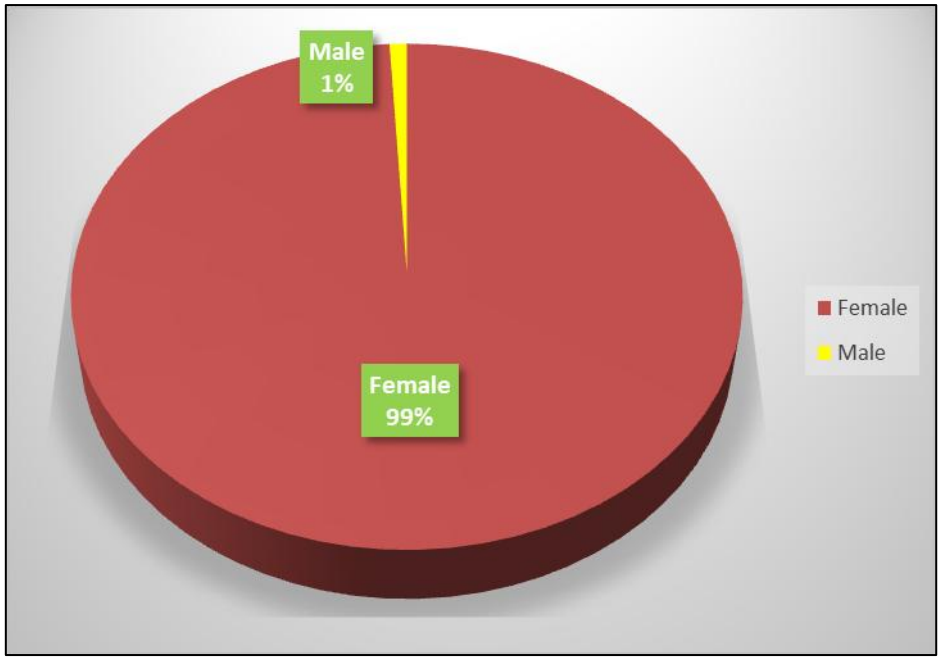


Figure: 1 Distribution of respondents by Gender
n = 110

Description: This pie chart shows that among total number of respondents most of them were female (99%) and the rest 1% male.

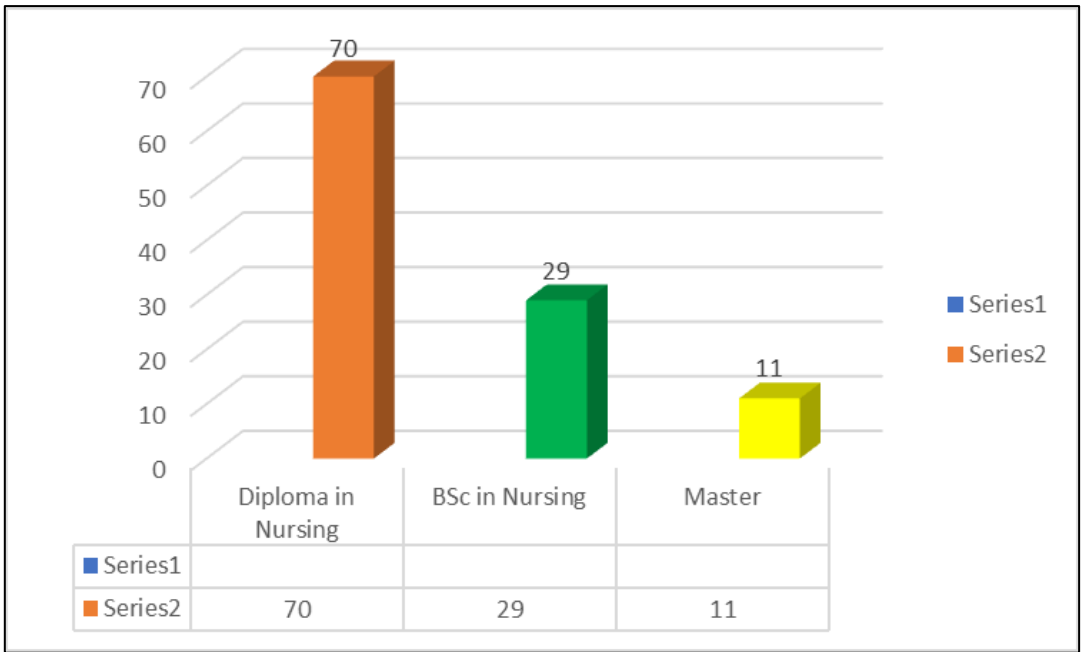


Figure: 2 Distribution of respondents by Gender
n = 110

Description: This figure showed that more than half of the respondents (70) have passed Diploma in Nursing; the remaining 29 have completed B.Sc. in Nursing and 11 have completed MPH/ MSc degree.

Socio-Demographic Characteristics

The findings of socio-demographic characteristics of the participants showed that the mean age of the participants was 37.12±7.72. The majority of them were females 99.1% and 86.4% were married. Majority are senior staff nurse while 60.9% were Muslims. Most of them 63.6% had a diploma in nursing whereas only 26.4% were graduate nurses. The average family income was 63818.18±54298.73 and working experience was 11.27±7.84. Most of the participants 43.0% were

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from medicine ward, 40.1% from surgery ward, 3.5% from Operation Theater and 13.4% from others. Among the participants only 25.5% had training on infection prevention.

Table 2: Nurse's knowledge on Infection Prevention
(n=110)

	Knowledge on Infection Prevention				
	Correct		**Incorrect**		**M±SD**
	f	**%**	**F**	**%**	
Aware about safety precautions for infection prevention and control	96	87.3	14	12.7	1.21±.58
Aware of there commended guidelines for hand hygiene.	98	89.1	12	10.9	1.15±.45
Proper hand washing is the most effective methods of control infection	96	87.3	14	12.7	1.15±.40
Healthcare-associated pathogens canbe found on normal, intact patient skin	98	89.1	12	10.9	1.12±.35
Knowing about safety precautions	85	77.3	25	22.7	1.38±.75
Hand hygiene should be performed before and after direct patient contact	97	88.2	13	11.8	1.15±.45
Contaminated hands of health worker as a major sources of infection in the hospitals	100	90.9	10	9.1	1.11±.37
Gloves provide complete protection against acquiring/ transmitting infection	85	77.3	25	22.7	1.29±.58
Gloves should be worn if blood or body fluid exposure is anticipated	91	82.7	19	17.3	1.21±.49
When using alcohol-b a s e d antiseptics,it should keep rubbing hands until dry	76	69.1	34	30.9	1.42±.68
After performing wound dressing soiled materials should discard in the proper place	100	90.9	10	9.1	1.12±.40
I have a very low risk of acquiring infections from my patients.	79	71.8	31	28.2	1.36±.63
Prevention of HAIsis a valuable part of nurses'role	97	88.2	13	11.8	1.17±.50
The importance of hand hygiene is emphasized by my clinical supervisors	98	89.1	12	10.9	1.13±.39
Recapping, disassembly, and inappropriate disposal increase the risk of needle stick injury	91	82.7	19	17.3	1.22±.51
Catheterization is the causes of nosocomial infection	87	79.1	23	20.9	1.27±.57
Regular vaccination of health care workers is the most effective method of control infection	90	80.0	22	20.0	1.24±.54
Contagious disease is spread from person to person, or from the bite of an infected insect	96	87.3	14	12.7	1.15±.40
Every health care facility should prepare for any infection outbreak	99	90.0	11	10.0	1.15±.49
Aseptic techniques are needed during surgical wound dressing	97	88.2	13	11.8	1.18±.53
Knowledge					**17.04 ±2.55**

Table 2 shows the distributions of frequency, percentage, mean and SD of knowledge level of the participants on infection prevention.The result showed that the total mean score of knowledge was 17.04 (SD =2.55) out of maximum score 20 which indicate high level of knowledge regarding infection prevention. Results reflected that aware about safety precautions for infection prevention and control majority of the respondents (87.3%) had corrected answer regarding infection prevention, Majority ofthe respondents (89.1%) aware of the recommended guidelines for hand hygiene, also 87.3% respondents knew that proper hand washing is the most effective methods of control infection, almost majority of the respondents (89.1%)knew that healthcare-

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associated pathogens can be found on normal, intact patient skin. Majority (77.3%) of the respondent knowing about safety precautions. Nearly ninety percent(88.2%)knew that hand hygiene should be performed before and after direct patient contact. Most of the respondent (90.9%)knew that contaminated hands of health worker as a major source of infection in the hospitals. Gloves provide complete protection against acquiring/ transmitting infection (77.3%) knew that. More than eighty (82.7%) respondents knew that gloves should be worn if blood or body fluid exposure is anticipated, and 69.1% using alcohol based antiseptics, it should keep rubbing hands until dry. Most of the (90.9%) respondent knew that after performing wound dressing soiled materials should discard in the proper place. Majority of the(71.8%) respondent knew that they have a very low risk of acquiring infections from patients. About prevention of HAIs is a valuable part of nurse'srole (88.2%) respondent knew that, nearly ninety percent of the respondent knew that the importance of hand hygiene is emphasized by their clinical supervisors, and recapping, disassembly, and inappropriate disposal increase the risk of needle stick injury that is knew about (82.7%) of the respondent. Nearly eight percent (79.1%) of the respondent knew that catheterization is the causes of nosocomial infection and regular vaccination of health care workers is the most effective method of control infection. Around ninety percent of the respondent knew that contagious disease is spread from person to person, or from the bite of an infected insect. Majority of the respondent (90.0% and 88.2%) knew that every health care facility should prepare for any infection outbreak and aseptic techniques is needed during surgical wound dressing.

Table3: Distribution of Nurse's practice on infection prevention

Practice	Never		Sometimes		Always		M ±SD
	f	%	f	%	f	%	
Before contact a patient often washes hands with soap and water,or use an alcohol-based hands anitizer	8	7.3	12	10.9	90	81.8	2.75±58
Apply Stand and precaution for all the patients	11	10.0	20	18.2	79	71.8	2.62±66
Use separate disposable syringe for separate patients	10	9.1	6	5.5	94	85.5	2.76±60
Practice of recapping needles after use	18	16.4	16	14.5	76	69.1	2.53±76
Label or mark patients file or bed with diagnosed HBs Ag positive	10	9.1	20	18.2	80	72.7	2.64±65
Use sterile gloves for caring patient with diagnosed HBsAg positive	6	5.5	20	18.2	84	76.4	2.71±56
Use of needle destroyer	9	8.2	39	35.5	62	56.4	2.48±65
Wear a mask to cover the nose when entering the Operating room	10	9.1	13	11.8	87	79.1	2.70±63
Use disinfected linen for patients	8	7.3	21	19.1	81	73.6	2.66±61
Practice contaminated waste management properly	13	11.8	18	16.4	79	81.8	2.60±69
Before any procedure check all instrument is sterile	12	10.9	6	5.5	92	83.6	2.73±65
Use sterile surgical instruments with flash sterilization	8	7.3	7	6.4	92	83.4	2.79±56
Use separate sterile instrument during each invasive Procedure	6	5.5	6	5.5	95	89.1	2.84±50
Use sterile forceps and other dressing materials for Dressing surgical wounds	9.	8.2	14	12.7	87	79.1	2.71±61
Total Mean ±SD						**25.63±5.86**	

Above table represents that nurses practice on infection prevention, the mean score of practice on infection prevention among nurses was 25.63 (SD= 5.86). The results reveal that the respondent had low to moderate level of practice (67.4%). Most of the participants (81.8%) often wash hands before contact a patientwith soap and water, or use an alcohol-based hand sanitizer. Among the respondent 71.8.% apply standard precaution for all the patients, and 85.5% respondent use separate disposable syringe for separate patients. More than 56.4% of the respondent's use of needle destroyer. Majority(69.1%) of the respondent practice of recapping needles after use.More than seventy two percent of the respondent label or mark patients file or bed with diagnosed HBsAg positive, and use sterile gloves for caring patient with diagnosed HBs Ag positive that is76.4% of the respondent.

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Nearly eighty percent of the respondent wear a mask to cover the nose when entering the operating room, and use disinfected linen for patient (73.6%).

Majority(81.8% and 83.6%) of the respondent practice contaminated waste management properly, and check all instrument is sterile before any procedure. More than eighty six percent respondent choose to use sterile surgical instruments with flash sterilization, use separate sterile instrument during each invasive procedure (89.1%) and (79.1%) of the respondent use sterile forceps and other dressing materials for dressing surgical wounds.

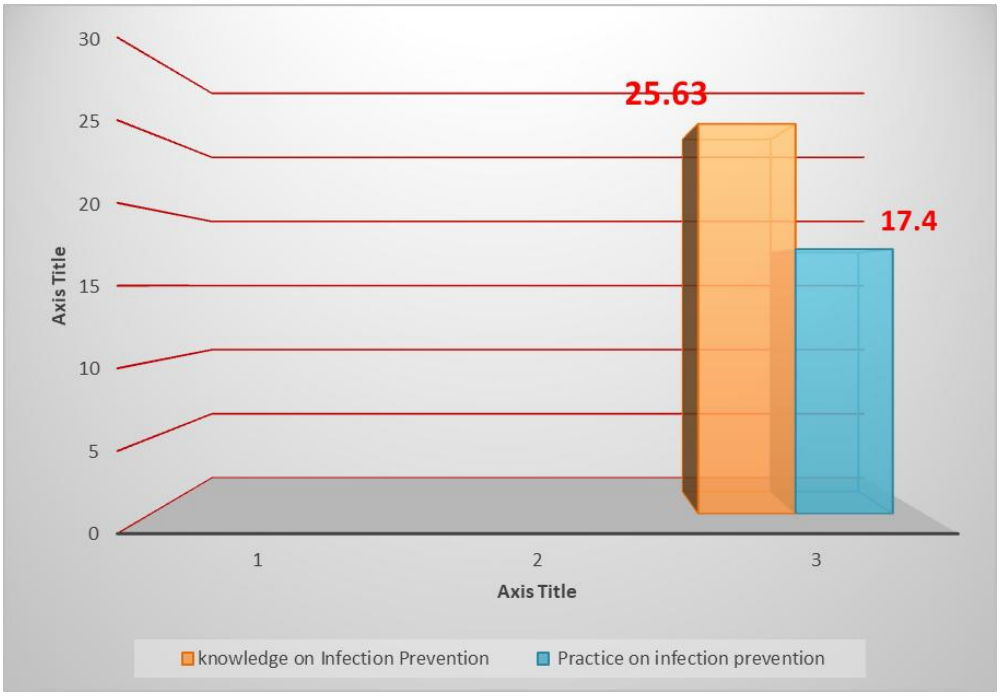


Figure: Distribution of the respondents by overall knowledge and Practice mean score regarding Infection Prevention

Description: This figure shows the overall knowledge and Practice mean score regarding Infection Prevention where mean score 25.63 regarding nurse's knowledge on Infection Prevention, whereas mean score 17.4 regarding nurse's practice on Infection Prevention.

DISCUSSION OF THE RESULTS

The study sought to explore the knowledge and practices on infection prevention among nurses at a Tertiary Hospital in Bangladesh. This current study found that knowledge and preventive practices on infection prevention among the participants was low to moderate. In this chapter the relevant findings of the study are discussed in detail.

Socio-Demographic Characteristics of Participants

The findings of socio-demographic characteristics of the participants revealed that the mean age of the participants was 37.12±7.72. The majority of them were females 99.1% and 86.4% were married. Majority are senior staff nurse while 60.9% were Muslims. Most of them 63.6% had a diploma in nursing whereas only 26.4% were graduate nurses. The average family income was 63818.18±54298.73 and working experience was 11.27±7.84. Most of theparticipants 43.0% were from medicine ward, 40.1% from surgery ward, 3.5% from Operation Theater and 13.4% from others. Among the participants only 25.5% had training on infection prevention. In 2021 Sebro, et.al conducted a facility-based cross-sectional study was conducted among 423 randomly selected nurses working at university referral hospitals in Southern, Nations, Nationalities and Peoples' Region, Ethiopia from 01 to 30 April 2021, the participant's ages ranged from 20 to 41years old with a mean age of 27.6 years. Among 398 participants 204 (51.3%) of the study participants were single.

Regarding Nurse's Knowledge on Infection Prevention

In this study, the distributions of frequency,

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percentage, mean and SD of knowledge level of the participants on infection prevention.The result showed that the total mean score of knowledge was 17.04 (SD =2.55) out of maximum score 20 which indicate high level of knowledge regarding infection prevention.

One study revealed that the proportion of nurses who had adequate knowledge of HAI prevention was 45.5% (40.6%–50.4%) which is consistent with the current study. However, this study was found higher than many other studies.

and studying period. On the other hand, the results of this study are lower than other studies conducted in Nepal 57.1%,23 Kosovo 90%,24 Ethiopia 57.2%,25 70.8%.19 This discrepancy could be due to sampling size, study area, and socio-demographic differences among study participants since Kosovo was an upper-middle-income country so nurses may get better access to facilities to update themselves with the recent evidence-based information and training about HAI prevention. Also, this study finding is lower than the study conducted in Ethiopia 68.5%,26 55.4%,12 53.7%,27 and 52.5%.28 This discrepancy could be due to differences in sample size and study subjects since those study conducted among HCW.

The study also results reflected that aware about safety precautions for infection prevention and control majority of the respondents (87.3%) had corrected answer regarding infection prevention, Majority of the respondents (89.1%) aware of the recommended guidelines for hand hygiene, also 87.3% respondents knew that proper hand washing is the most effective methods of control infection, almost majority of the respondents (89.1%)knew that healthcare- associated pathogens can be found on normal, intact patient skin. Majority (77.3%) of the respondent knowing about safety precautions. Nearly ninety percent(88.2%)knew that hand hygiene should be performed before and after direct patient contact. Most of the respondent (90.9%) knew that contaminated hands of health worker as a major source of infection in the hospitals. Gloves provide complete protection against acquiring/ transmitting infection (77.3%) knew that. More than eighty (82.7%) respondents knew that gloves should be worn if blood or body fluid exposure is anticipated, and 69.1% using alcohol-based antiseptics, it should keep rubbing hands until dry. Most of the (90.9%) respondent knew that after performing wound dressing soiled materials should discard in the proper place. Majority of the(71.8%) respondent knew that they have a very low risk of acquiring infections frompatients. About prevention of HAIs is a valuable part of nurse'srole (88.2%)respondent knew that, nearly ninety percent of the respondent knew that the importance of hand hygiene is emphasized by their clinical supervisors, and recapping, disassembly, and inappropriate disposal increase the risk of needle stick injury that is knew about (82.7%) of the respondent. Nearly eight percent (79.1%) of the respondent knew that catheterization is the causes of nosocomial infection and regular vaccination of health care workers is the most effective method of control infection. Around ninety percent of the respondent knew that contagious disease is spread from person to person, or from the bite of an infected insect. Majority of the respondent (90.0% and 88.2%) knew that every health care facility should prepare for any infection outbreak and aseptic techniques is needed during surgical wound dressing.

A facility based cross-sectional study design was conducted from February to March 2016, in Addis Ababa among 629 healthcare workers who were selected by multistage sampling technique from 30 governmental healthcare facilities. Data were collected using pre-tested interviewer administered structured questionnaire. Data were analyzed by multivariable logistic regression model was used to identify factors associated with infection prevention practices. The study results showed that six hundred five (96.2%) healthcare workers participated in the study. Four hundred (70.1%)) health care workers had good infection prevention practices. Having good knowledge on infection prevention measures having positive attitude towards infection prevention practices having awareness on availability of standard operating procedures and presence of continuous water supply were predictors of good infection prevention practices. (Sahiledengle, *et al*., 2018).

Regarding Nurse's Practiceon Infection Prevention

Above table represents that nurses practice on infection prevention, the mean score of practice on infection prevention among nurses was 25.63 (SD= 5.86) .The results reveal that the respondent had low to moderate level of practice (67.4%). Most of the participants (81.8%) often wash hands before contact a patient with soap and water, or use an alcohol-based hand sanitizer. Among the respondent 71.8.% apply standard precaution for all the patients, and 85.5% respondent use separate disposable syringe for separate patients. More than

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56.4% of the respondent's use of needle destroyer. Majority (69.1%) of the respondent practice of recapping needles after use. More than seventy two percent of the respondent label or mark patients file or bed with diagnosed HBsAg positive, and use sterile gloves for caring patient with diagnosed HBs Ag positive that is76.4% of the respondent. Nearly eighty percent of the respondent wear a mask to cover the nose when entering the operating room, and use disinfected linen for patient (73.6%). Majority(81.8% and 83.6%) of the respondent practice contaminated waste management properly,and check all instrument is sterile before any procedure. More than eighty six percent respondent choose to use sterile surgical instruments with flash sterilization, use separate sterile instrument during each invasive procedure (89.1%) and (79.1%) of the respondent use sterile forceps and other dressing materials for dressing surgical wounds.

In this current study found that the mean score 17.04 knowledge level of the participants on infection prevention. Another study also assessed the overall knowledge about infection prevention measures. Almost half (55.4%) of HCWs had good knowledge on infection prevention measures. This finding is consistent with the finding from West Arsi Zone of Ethiopia (53.7%) (18) but much lower than the finding of a study conducted in Northwest Ethiopia (84.2%) (17) and a study reported from Egyptian Cancer Hospital (63.6%) (24). The variation might be attributable to differences in sample size, study setting and nature of the population involved (Biniyam, *et al*., 2018)

On the other hand, another finding observed that a low-income country so the poor practice of nurses toward HAI prevention due to lack of training on infection prevention, lack of adequate supplies of materials and hand washing stations, and other infrastructure problems could be possible explanations. The reason for this discrepancy could be in current the study participants were selected through purposive sampling methods and different study set up which were conducted in a private hospital (Sebro, et.al 2023). The current observed that the overall knowledge and Practice mean score regarding Infection Prevention where mean score 25.63 regarding nurse's knowledge on Infection Prevention, whereas mean score 17.4 regarding nurse's practice on Infection Prevention.

A cross-sectional study was conducted from July to August 2021. A sample of 237 healthcare workers in the Hohoe Municipality was selected to participate in the study. Overall, most of the participants (69.2%) were not knowledge able about the preventive measures of NCIs. Nurses who were within the age group of 20–40 years and 41–60 years were significantly less likely to be knowledge able about the preventive measures of NCIs compared to those who those aged less than 20 years. Nurses who attended in-service training or workshop were approximately 10 times more likely to be knowledge able about preventive measures of nosocomial infection compared to those who had never attended in-service training or workshop (Salu,2023).

CONCLUSIONANDRECOMMENDATION

This study highlighted that nurse had not optimum level of Knowledge and Practice on Infection Prevention among Nurses at a Selected Tertiary Hospital in Bangladesh. the overall knowledge and Practice mean score regarding Infection Prevention where mean score 25.63 regarding nurse's knowledge on Infection Prevention, whereas mean score 17.4 regarding nurse's practice on Infection Prevention. Therefore, it is recommended that proper training programmes aimed at improving knowledge, thereby leading to proper management of infection. Appropriate knowledge and practice lead to prevent risk of spread of infection from patient to nurse and nurse to patient. Consequently, comprehensive training programme, targeting to all nurses should be provided to promote all precautionary and. preventive measures and to achieve equilibrium in terms of knowledge about infection prevention and control.

LIMITATION OF THE STUDY

There were some limitations during carrying out the research project is as follows:

- This study was conducted in one selected hospital. Therefore, the findings cannot be generalized to other hospitals.
- The study sample size was relatively small and selected purposively, so it does not necessarily represent the real picture of knowledge and practice of all the nurses around the country.
- Future intervention study also necessary the improvement of preventive practice among nurses in Bangladesh.
- Data was collected during working hours of the respondents, for that reason there may be some inconsistency in result due to lack of

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concentration toward completing the questionnaire.

- There was no budget for this research project.
- There was no available computing, printing and transport facilities.

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