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ASSESSMENT OF NURSES' KNOWLEDGE AND PRACTICES REGARDING NOSOCOMIAL INFECTION CONTROL MEASURES AT A TERTIARY CARE HOSPITAL IN MARDAN, KHYBER PAKHTUNKHWA, PAKISTAN: A CROSS-SECTIONAL STUDY

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Abstract

Background: *Healthcare-associated infections (HAIs) or nosocomial infections are a global challenge in patient safety. They are associated with a longer hospital stay, more treatment expenses, and death. Nurses have a vital part to play in preventing HAIs and help reduce patient risk and healthcare quality, by taking a strict approach to infection control.*

Objective: *To evaluate knowledge and practices of the nurses about Nosocomial Infection Control Measures at Tertiary Care Hospital, Mardan, KP Pakistan.*

Methodology: *A descriptive cross-sectional study was conducted at Mardan Medical Complex, Mardan. The sample size consisted of 141 Nurses with BSN, Post RN, General Nursing Degree working in Medical, Surgical and Intensive care Units in the selected hospital who were willing to participate and were selected by convenience sampling technique. The exclusion criteria were the Nursing Students and Adopted questionnaire was used to collect the data; SPSS version 26 was used for analysis of data, while frequencies and percentages were calculated for categorical variables. The study was conducted in an ethical manner.*

Results: *A total of 141 participants were included in the study, with 56% males and 44% females. Most participants were unmarried (64.5%) and had attended a workshop on infection prevention and control (66.7%). The majority (83.7%) had 1–5 years of experience, while 14.9% had 6–10 years and 1.4% had >10 years. Most participants were from the medical department (62.4%), followed by the surgical department (19.9%) and ICU (17.7%). In Most participants (89.4%) had good knowledge, while 10.6% had average knowledge. 69.5% Nurses demonstrated good practice, while 30.5% had average practice levels.*

Conclusion: *Based on the findings, most nurses demonstrated fair Knowledge and Practices for controlling the nosocomial infection. However, further improvement is needed in infection prevention practices. Regular education, training, and in-service refresher programs are recommended to enhance nurses'*

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knowledge and compliance with infection control measures. Strengthening adherence to standard infection prevention protocols and continuous monitoring can lower the risk of healthcare-associated infections and enhance patient safety.

INTRODUCTION

Healthcare associated infections (HAIs) are also referred to as nosocomial infections, are a major issue in patient safety worldwide, particularly in tertiary care hospitals, where patients receive complex medical interventions and are likely to be hospitalized for longer periods. While there have been great strides in healthcare, HAIs are still one of the most common adverse events that occur in hospitalized patients (World Health Organization, 2022). Healthcare-associated infections (HAIs) are crucial issue globally and are more prevalent in low and middle income countries. Hundreds of millions of patients are affected each year, with resulting higher morbidity, mortality, health care costs, according to the World Health Organization (2022). According to study (Allegranzi et al., 2022) the prevalence of HAIs in developing countries could be two to three times higher than in developed countries. Worldwide, infection is a major problem and causes delays in reaching optimal health outcomes, resulting in higher healthcare costs and impacting the delivery of healthcare services (Adegboye et al., 2018). These infections also contribute significantly to the ever-growing issue of antimicrobial resistance which complicates treatment outcomes for the healthcare system to be more challenging and expensive to be treated (Sawant et al., 2026). Pathogens spread by contaminated hands of healthcare workers, medical equipment or environmental surfaces are often responsible for these infections (Desta et al., 2021).

Infections are infections that develop when receiving health care, either within the hospital or in another health care setting, which are not considered to be present at the time of hospital admission, but first appear within 48 hours or more after hospital admission or within 30 days after receiving health care. In addition to posing a threat to patients, HAIs also have high economic costs on the health care system. The most common types of HAI infections are catheter-associated urinary tract infections (CAUTI), central line-associated bloodstream infections (CLABSI), surgical site infections (SSI), Hospital-acquired Pneumonia (HAP) and Ventilator-associated Pneumonia (VAP) (Nasiri et al., 2019).

The rate of HAIs has been found to be very different from country-to-country, from 5.7% in low-income countries to 19.2% in high-income countries, according to Melariri et al. (2024). The rates of nosocomial infections vary across different countries in Europe and the United States, ranging from below 1% to more than 40% in some parts of Asia, Latin America, and Sub-Saharan Africa (Voidazan et al., 2020). If done right, Infection Prevention (IP) measures can save patients, healthcare providers, and communities. When it is done properly, Infection Prevention (IP) measures can save patients, healthcare providers and communities.

According to European data, 1.75 million people are affected every year, with 175,000 deaths annually and the United States data show that around 90,000 people with nosocomial infections die every year and about 2 million become ill each year (Monegro et al., 2024). The impact of NIs on the economy is significant. In China alone, the direct economic costs of HAIs is estimated to be $1.5 billion to $2.3 billion per year (Martín-Madrazo et al., 2009). This places a heavy cost on the healthcare system, and each patient.

Hand hygiene is one of the fundamental measures to reduce nosocomial infections and the transmission of multi drug resistant organisms according to the World Health Organization (WHO). Proper hand washing using soap and water and alcohol-based sanitizers can help reduce the risk of hospital-acquired infections, as suggested by WHO (2023).

In Pakistan, inadequate infection control protocols and insufficient formal training compound the challenge, leading to a high burden of multidrug-resistant organisms in both urban and rural healthcare settings (Yazie et al., 2019). Recent studies indicate that while nurses in Pakistan generally possess adequate knowledge of

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infection transmission, but this knowledge does not always translate into effective clinical practice (Hamid et al., 2020). Factors contributing to insufficient infection control practices include varying years of experience, educational backgrounds, levels of awareness, workload, and a lack of ongoing training or adherence to recommendations (Bayleyegn et al., 2021).

Recent studies, however, have commented that knowledge does not necessarily translate to compliance, and that there is a knowledge to action gap. Several studies have been conducted in the last few years that have documented the lack of knowledge–practice gap among nurses in the tertiary care hospitals between 2021 and 2024. For instance, Shrestha et al. (2023) found that, although most nurses knew about the infection control measures, there was a variation in hand hygiene and use of personal protective equipment. Similarly, Iliyasu et al. (2022) concluded that knowledge was satisfactory, while the compliance with the infection control guidelines was low, with a number of system and organizational factors mentioned. Nurses' knowledge and practices concerning infection control are influenced by a number of factors. These include education, years of clinical practice, training opportunities, workload and institutional support. There is a correlation between compliance with infection control practices and in-service training and continuing education among nurses (Haile et al., 2021). However, staffing shortages, workload, limited supplies, and inadequate supervision may be barriers to following infection control measures (Iliyasu et al., 2022).

Hands of healthcare workers serve as the most important vehicles for transmission of microorganisms from patient to patient, patient to various sites of his/her body, and contaminated environment to patient. Hence, it is essential to have strict hand hygiene (Blot et al., 2022). Kelman's knowledge, attitude and practice theory indicated that changing practice requires knowledge as a precondition and attitude is a catalyst for changing behaviour (Jiang et al., 2017). Assessment of Knowledge and Practices of nurse for preventive measures to control infection is important in tertiary care hospitals where there is a high risk for infection transmission. These assessments can be used to identify knowledge and practice gaps that require attention and to guide the planning of interventions to address these gaps. This can involve formal training courses, ongoing assessment and evaluation, and providing the required resources. The importance of ongoing professional development, regular audit and feedback to improve compliance with infection control practice is a strong message in recent literature. Other novel approaches such as simulation training and digital learning platforms are found to be supportive for the Knowledge and Practical skills of nurses (Shrestha et al., 2023).

The use of educational interventions, simulation training, and frequent workshops greatly enhances nurses' adherence to hand hygiene and aseptic techniques and the use of PPE. The study conducted in tertiary care hospitals of Pakistan revealed that nurses who were exposed to regular infection control training had better knowledge and positive attitude towards infection control practices as compared to those who were not exposed to any infection control training (Anayat et al., 2024).

In addition, infection prevention and control are now considered to be an important measure of healthcare quality globally. The World Health Organization and the Centers for Disease Control and Prevention, among other international organizations, strongly recommend regular audits, monitoring systems and feedback mechanisms for enhancing compliance by healthcare workers. Continuous monitoring of nurses' practices can provide insights into areas that need improvement in infection control practices, which can help guide the development of targeted interventions for healthcare institutions (CDC, 2023).

METHODOLOGY

A descriptive cross sectional study design and convenience sampling technique were used to evaluate Knowledge and Practices of Nurses about Nosocomial Infection Control Measures in Tertiary Care Hospital of Mardan KP Pakistan. This study was performed at Mardan Medical Complex and Teaching Hospital which is a well established tertiary care hospital of Mardan. Prior

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to Data collection, Formal permission and approval were obtained from the Ethical Review Board of the relevant department.

The study was conducted with a sample size calculated using Cochran's formula with a 95% confidence level, a margin of error of e = 0.05, and an estimated proportion of p = 0.5 and margin of error = 5%. The size of the population (N) was found to be 220. The formula for the calculation is Cochran's formula: $n_0 = Z^2\ p(1 - p) / e^2$. The calculated sample size (n) was 141 using Cochran's formula and the finite population correction.

Nursing staff with BSN, Post RN and General Nursing Degree, currently working in Medical, Surgical and Intensive care unit of the selected hospital who were willing to participate were considered as Participants of the study. Nursing Students and others who were not interested in participating in the study were considered to be the Exclusion Criteria.

Data Collection Procedure

The nursing staff completed the adopted questionnaire. The questionnaire was divided into three major parts: Section A comprised of demographic information, Section B comprised of knowledge about nosocomial infection control measures and Section C comprised of practices concerning nosocomial infection control measures.

Data Analysis Procedure

The data obtained was statistically analysed with caution for a thorough understanding of Knowledge and Practices of Nurses Regarding Nosocomial Infection Control Measures. The data were subjected to descriptive statistics analysis using SPSS version 26. The categorical variables, including gender, In-service training courses, Place of work, and Working experience were presented using frequency and percentage tables.

The study was approved for ethical consent from the Ethical Review Committee of concerned department including prior authorization from the relevant authorities, informed consent with possibility of withdrawal at anytime, respecting the participant autonomy and maintaining data confidentiality. The study was conducted independently without external financial support, thereby eliminating potential conflicts of interest.

RESULT

This study aimed to assess the Knowledge and Practices of Nurses regarding Nosocomial Infection Control Measures in Tertiary Care Hospital of Mardan KP Pakistan. A total of 141 nurses completed the questionnaire, The demographic profile is summarized in Table 1. The overwhelming majority of respondents 98(70%) were female and 43(30%) were male, with the age of majority 86(61%) are between 18-25 years, followed by 52 (37%) in the 26-45 age group, and only 3 (3%) aged 46 and above. The marital status distribution shows that 91 (64.5%) of participants are unmarried, while 50 (35.5%) are married. Most Participant 85 (60%) held Post RN and Diploma, While 56 (40%) held a Bachelor degree in Nursing (BScn) Qualification.

Majority of Nurses 94 (66.7%) reported that they have attended the workshop on infection control prevention measures, while 47 (33.3%) did not. Upon asking about the experience, participants reveals that the vast majority 118 (83.7%) have 1-5 years of experience, while 21 (14.9%) have 6-10 years of experience. Only 2 (1.4%) individuals have more than 10 years of experience. Medical 88 (62.4%) and Surgical 28 (19.9%) wards were more represented work settings, followed by ICU 25 (17.7%).

The level of knowledge distribution Table 2 indicates that majority of participants Nurses126 (89.4%) demonstrates "Good Knowledge," while minority 15 (10.6%) exhibits "Average Knowledge." The level of practice distribution shows 98 (69.5%) of participants Nurses report having "Good Practice," while 43 (30.5%) consider their practice level to be "Average."

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Table 1: Frequencies and Percentages for Demographic Characteristics of Nurses (n = 141)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	43	30
	Female	98	70
Age (Years)	18–25	86	61
	26–45	52	37
	≥46	3	3
Marital Status	Married	50	35.5
	Unmarried	91	64.5
Qualification	Post RN and Diploma	85	60
	Bachelor degree in Nursing (BScn)	56	40
Workshop Attendance	Yes	94	66.7
	No	47	33.3
Work Experience	1–5 Years	118	83.7
	6–10 Years	21	14.9
	>10 Years	2	1.4
Department	Medical	88	62.4
	Surgical	28	19.9
	ICU	25	17.7

Table 2. Distribution of Participants According to Level of Knowledge and Level of Practice (n = 141)

Variable	Category	Frequency (n)	Percentage (%)
Level of Knowledge	Average Knowledge	15	10.6
	Good Knowledge	126	89.4
Level of Practice	Average Practice	43	30.5
	Good Practice	98	69.5
	Total	141	100.0

DISCUSSION

The subjects in the study were 141 of which 56% were males and 44% were females. The majority of participants were unmarried (64.5%) and had participated in a workshop on infection prevention and control (66.7%). The participants with 1 to 5 years' experience were in majority (83.7%), while 14.9% had range of experience from 6 to 10 years and 1.4% had broad experience of >10 years. Participants were predominantly from the medical department (62.4%), followed by the surgical department (19.9%) and the ICU (17.7%). In accordance with our findings, research done in Sana'a City, Yemen revealed that most of the nurses were male (61.2%), aged 25 years and above (71.8%) and with less than 5 years of work experience (56.5%). Furthermore, 64.7% of them had taken training courses, while 78.8% had worked with infection control. (Alrubaiee et al., 2017). As opposed to our study, a study in Lahore, Pakistan showed majority participants were female (95.8%). Participants from 21-30 years age group were the largest group (43.3%) and most nurses had a general nursing diploma (66.7%) (Mudassar et al., 2019). In our study, most participants (89.4%) had good knowledge, while 10.6% had average knowledge. Similarly, a study conducted in Yemen found that most nurses had fair knowledge of hand hygiene (72.9%), safe waste handling (81.1%), and equipment reprocessing (82.8%), while 52.9% had good knowledge of routine hospital cleaning and 35.3% had good knowledge of PPE (Alrubaiee et al., 2017). In our study, 69.5% of participants demonstrated good

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practice, while 30.5% had average practice levels. The prevention and control of infections among nurses plays a crucial role in minimizing nosocomial infections, morbidity, mortality, hospital stay, and treatment costs.

CONCLUSION

Based on the findings of this study, it may be inferred that majority of the nurses were with fair knowledge and practices about Nosocomial infection control measures. But there are some reports that the infection control practices and implementation of infection prevention measures are still sub-optimal and there is still a need for improvement among health care workers. Hence, education, training programs, and in-service refresher courses should be emphasized so that the infection prevention practices of the nurses can be improved in the future. The effectiveness of the interventions needs to be measured by the evaluation of nurses' knowledge and practices before and after the implementation of the training.

Key strategies should include adherence to hand hygiene protocols, proper sterilization and disinfection practices, appropriate use of personal protective equipment, isolation of infected patients, and regular training of healthcare personnel. Furthermore, continuous monitoring, surveillance, and enforcement of hospital infection control policies are crucial steps that must be taken. By prioritizing nosocomial infection prevention, healthcare facilities can minimize risks, improve patient outcomes, and ensure a safer environment for both patients and healthcare workers.

Recommendations

It is recommended that hospital administration should conduct regular in-service training programs, seminars, and workshops on infection prevention and control to update nurses' knowledge and skills. Educational materials such as posters, pamphlets, and digital modules should be made available in clinical areas for continuous learning. To improve practices, Managers should provide positive reinforcement, constructive feedback, and role modeling to promote culture of safety and accountability. Regarding practices, strict monitoring and supervision of hand hygiene, use of personal protective equipment, and aseptic techniques should be implemented with periodic audits.

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