

Knowledge and practices of healthcare workers regarding infection prevention and control in public and private hospitals of Timergara, Dir Lower, Pakistan

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Abstract:

Infection control is fundamental to ensuring patient safety and providing quality healthcare. Healthcare-associated infections (HAIs) are infections acquired during medical care, posing serious risks to patients, including increased morbidity, longer hospital stays, and mortality. This study aimed to assess the knowledge and practices of healthcare workers (HCWs) regarding infection prevention and control (IPC) at Dir Lower. It employed a descriptive cross-sectional design with a sample of 254 HCWs selected via the Raosoft sample size calculator from a population of 740. Participants were chosen through convenience sampling, following matching inclusion and exclusion criteria. The study took place in both public and private hospitals in Dir Lower, using a modified self-administered questionnaire for data collection, and the data were analyzed using SPSS version 26.0. Results showed HCWs had good knowledge of IPC, while their practice scores were moderate. Knowledge levels varied significantly with age ($p = 0.046$), and among medical professionals, the p -value was 0.000. Additionally, significant differences in practice scores were observed by gender ($p = 0.0009$), department ($p = 0.006$), and total professional experience ($p = 0.005$). Overall, findings suggest that HCWs possess strong knowledge of IPC, but current practices remain average.

Keywords: Knowledge level, Practice level, Infection prevention and control, Healthcare worker, Patient safety, Medical care, Quality healthcare, Increased morbidity.

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1. Introduction

Infection control is the cornerstone for patient safety and quality healthcare delivery. The World Health Organization (WHO) defines infection control as a set of procedures and practices aimed at preventing the spread of infections in healthcare facilities (WHO, 2020). Infections acquired during healthcare delivery, known as healthcare-associated infections (HAIs), pose major risks to patients, leading to increased morbidity, prolonged hospital stays, and even mortality (Monegro *et al.*, 2017).

Among the significant challenges faced by healthcare systems and organizations are HAIs, which pose a substantial risk to patient and healthcare workers' safety (Al-Omari *et al.*, 2020; Alhumaid *et al.*, 2021). HAIs can adversely affect an individual's quality of life, potentially reduce their life expectancy, and ultimately incur high financial costs (Alhumaid *et al.*, 2021; Iliyasu *et al.*, 2016). The WHO reports a global rise in the incidence of HAIs in both developed and developing nations, with an annual average prevalence of approximately 5–10% among patients. Currently, around 1.4 million individuals worldwide are affected by HAIs each year (Haque *et al.*, 2018). It has been observed that developing countries are 25% more susceptible to acquiring HAIs compared to their developed counterparts (Hassan, 2018). Finding of a study revealed that healthcare workers (HCW) may exhibit a limited knowledge of infection prevention and control (IPC) protocols (Nofal *et al.*, 2017). In Pakistan, the burden of HAIs is particularly concerning, with studies indicating that the prevalence of these infections can be as high as 20% in some hospitals (Arif *et al.*, 2021).

Hospital in Dir Lower serves as a vital healthcare facility for the population of four districts, providing essential medical services to a diverse community. However, the effectiveness of infection control measures in these hospitals is largely unknown. Healthcare workers, consisting of doctors, nurses, and allied health professionals, play an important role in implementing IPC practices. Their knowledge and adherence to these practices are essential for minimizing infection risk (Kubde *et al.*, 2023).

In healthcare settings, the prevalence of HAIs is rising dramatically, and there is a great concern about patient safety. Research indicates that many healthcare providers lack adequate knowledge of infection control protocols, which can lead to poor adherence to recommended practices (Babore *et al.*, 2024). The purpose of this research was to assess the knowledge and practice level of healthcare providers regarding infection prevention and control in Dir Lower hospitals at Timergara. By identifying the strengths and weaknesses of their current practices, this research aims to provide insights to inform the development of targeted educational interventions and policies to enhance infection control measures. This research is significant for several reasons. Firstly, it contributes to current knowledge on infection control in healthcare settings by providing empirical evidence on healthcare professionals' knowledge and practices.

2. Methodology

An essential component of healthcare is infection control, which directly impacts patient safety and health outcomes. A descriptive cross-sectional design was used for this study; data were collected at a single point in time. This approach is particularly effective for evaluating the healthcare worker's current knowledge and practice levels. The target population for this study was N = 740, including all healthcare providers working at different hospitals in Dir Lower,

such as Doctors, Nurses, and allied health professionals. A sample of $n = 254$ healthcare workers was selected using the Raosoft sample size calculator (Confidence Level: 95%, Margin of error: 5%, population proportion: 50%, with a 15% attrition rate) from the study population. A convenience sampling technique engaged suitable study subjects. The study took place between July 2025 and August 2025.

Data were collected from those healthcare providers who fulfilled the inclusion criteria, subjects having at least one year of experience in patient care, and willing to participate voluntarily in the study. Healthcare providers on leave are not directly involved in patient care, such as unit management staff. The response rate among research subjects was 100%, with 0% attrition. Approval was obtained from *Ref. No. 142/Principal/letter/ZCN/40 and the hospital management* before data collection. All participants in the study gave permission for their data to be collected. We kept all information private throughout the research and shared only overall results—never anything that could identify individuals.

Comprehensive data were collected using a structured, modified questionnaire. This questionnaire has three parts first part includes demographic questions, the second part includes knowledge questions, and the third part includes questions about perceived practices. All the questions in the questionnaire are closed-ended. KAP surveys are widely recognized for their effectiveness in assessing the knowledge and practices of healthcare professionals. The Content Validity Index (CVI) of the tool was 0.93, and its reliability was 0.85 after pilot testing with 10% of the sample. Part A was the general part of the questionnaire, including information regarding age, gender, marital status, medical profession, total professional experience, department, and training attained. Part B of the tool was regarding the knowledge section. Questions were aligned to assess the subject's knowledge of IPC. The knowledge section of the tool consisted of 14 true/false questions. The correct reply was assigned a "1" for every question, while the incorrect reply was assigned a "0." Subjects who answered more than 10 questions correctly were considered to have "good knowledge." Part C of the tool was linked to practice-level questions about IPC. There were 10 questions in a 3-point Likert scale (ranging from "Never practice = 0," "sometimes practice = 1," and "always practice = 2"). Subjects who were used to practicing control and preventive activities, for example, usually and regularly involved more than 14 questions, were classified as "Good Practice," whereas subjects who did not practice at all, rarely, or only irregularly were classified as "Poor Practice". To analyze the collected data, SPSS version 26.0 was used. The results were presented as pie charts and bar charts, along with a full description. For numerical variables, the mean and standard deviation were calculated, whereas for categorical variables, the frequency and percentages were computed. Associations of other variables were assessed by using parametric tests such as one-way ANOVA, t-tests for dichotomous variables, and the Chi-Square Test.

3. Results

There were 740 health care workers working in Dir lower at different departments such as Intensive care units (ICUs), Emergency Department (ER), surgical wards, medical unit, Laboratory, and Operation theaters (OT), by selecting the sample size of 254 health care providers in the current research, with a Participant reply rate of 100%.

Demographic data for study subjects are shown in Table-1. Many of the hospital's employees attended the infection control training with refresher courses, but a great number of study participants (68.4%) had not attended any IPC training showed (Table-1).

Table-1: Study participants' demographics

Variables	Categories	Mean ± SD/ Frequency (%)
Age	Mean ± SD	34.48± 6.215
Gender	Male	182 (71.4%)
	Female	72 (28.2%)
Marital status	Married	209 (82.0%)
	Unmarried	43 (16.9%)
	Divorced	02 (8%)
Medical Profession	Doctor	37 (14.5%)
	Nurse	142 (55.7%)
	Technician	75 (29.4%)
Total professional experience	1-5 year	94(36.9%)
	6-10 year	88 (34.5%)
	11-15 year	37 (14.5%)
	more than 15	35 (13.7%)
Department	Medical unit	30 (11.8%)
	Surgical unit	38 (14.9%)
	Emergency unit	31 (12.2%)
	OT	33 (12.9%)
	Lab	33 (12.9%)
	Other	89 (34.9%)
	Have you ever taken training regarding infection prevention and control?	Yes
No		174(68.4%)

The current study's findings revealed that 90.94% of the health care providers had a good knowledge level, 8.27% had a moderate knowledge level, and 0.79% had a poor knowledge level regarding infection prevention and control, as shown in Figure 1.

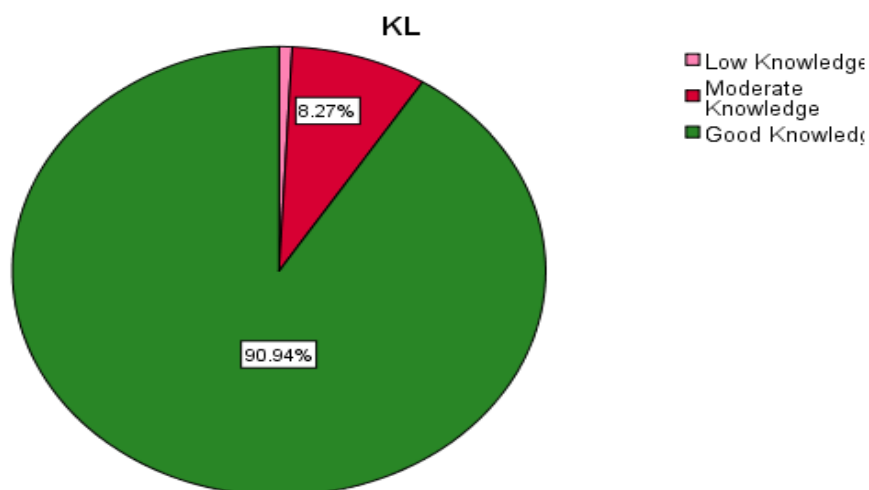


Figure 1: Knowledge level of the study participants

The findings of the current study revealed that a large number of healthcare workers (51.97%) had an average practice level score, 29% had poor practice level scores, and 19.29% had good practice level scores for IPC. Thus, it can be concluded that the majority of health care providers have average practices in infection prevention and control, as shown in Figure 2.

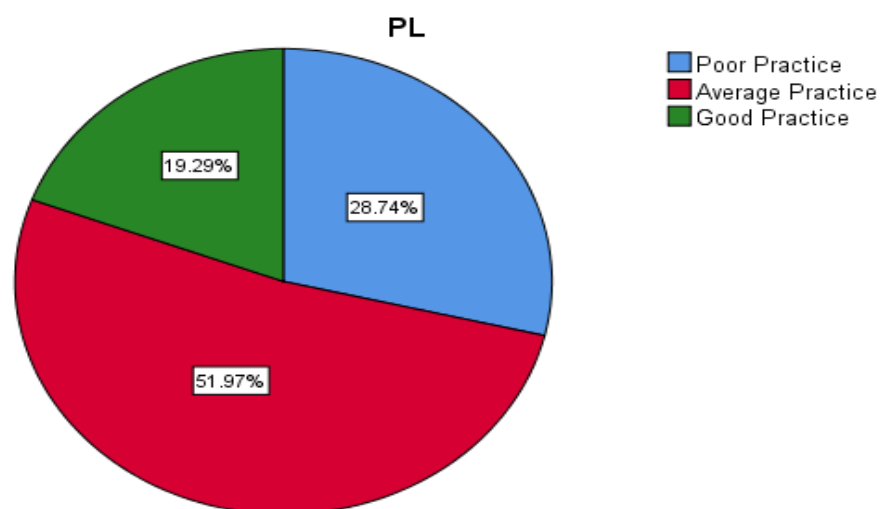


Figure 2: Practice Level of the study participants

The differences between knowledge and practice scores among the study subjects are shown in Table 2 by demographic characteristics. At the knowledge level, the p-value for age was 0.046. The level of knowledge did not differ significantly by gender. The findings revealed that participants from different professions had varying levels of knowledge, and this difference was statistically significant (p = 0.000).

Table-2: Comparison between demographic variables and knowledge and practice scores

Variable	Status	Knowledge Significance Status	Practice Significance Status
Age	Continue	p = 0.046	p =0.64
Gender	Male	p = 0.570 t = .448	p =0.009 t =1.948
	Female		
Marital status	Married	p = 0.165 F = 0.802	p =.488 F=.911
	Unmarried		
	Divorced		
Medical Profession	Doctor	p = .000 F = 4.897	p =.422 F=1.006
	Nurse		
	Technician		
Total professional experience	1-5 year	p = .005 F = .170	p =.372 F= 1.085
	6-10 year		
	11-15 year		
	more than 15		
Department	Medical unit	p = .003 F = 1.529	p = .006 F = 1.677
	Surgical unit		
	Emergency unit		
	OT		
	Lab		
	Other		
Have you ever taken training regarding infection prevention and control?	Yes	p = 0.630 t = .921	p = 0.327 t = 0.543
	No		

Similarly, there was a statistically significant difference in knowledge level ($p = 0.003$) across departments; healthcare workers in the Surgical unit were more aware of infection prevention and control. Moreover, a significant difference in knowledge levels was found among the research subjects by professional experience ($p = 0.005$). On the other hand, the current study's findings revealed that male study participants were very good at infection prevention and control practices compared with female health care providers ($p=0.009$). Similarly, there was a significant difference in practice level in the study participants based on their duty placements (departments), shown in Table-2.

4. Discussion

The Centers for Disease Control (CDC) reported that about 1.7 million patients pick up infections during their hospital stay, resulting in over 98,000 fatalities each year (Haque et al., 2018). The estimated incidence of HAIs may exceed the recorded figures, as indicated by a study assessing infection control policies and practices in Islamabad, Pakistan (Yasin et al., 2019) and a study in Karachi of hospital infection control (Huda & Alisbinati, 2015). The study reported that most healthcare workers had very good knowledge, but the majority demonstrated only fair practices in infection prevention and control.

The current study found that 90.94% of health care providers had a good knowledge level, 8.27% had a moderate knowledge level, and 0.79% had a poor knowledge level regarding infection prevention and control. Moreover, in the present research, the knowledge of experienced, older-age health care workers was significant. A study conducted in Northwest Ethiopia had similar findings 84.7% almost two-thirds of HCW were found knowledgeable, and the knowledge of older age and more experienced subjects was significant regarding infection prevention and control (Desta *et al.*, 2018). In contrast, a study carried out at the University of Lahore hospital finding revealed that 23.9% possessed excellent knowledge, 46.5% had good knowledge, and 29.6% demonstrated poor knowledge (Nazeer *et al.*, 2022). Moreover, another study finding disclosed that the pre-intervention group reported inadequate knowledge and practices (Bibi *et al.*, 2022). The present research findings revealed a significant difference in the medical profession aspect. Doctors' knowledge scores more than that of other healthcare workers. A similar finding was found in a study conducted in Rawalpindi, Pakistan. Presented that doctors were more knowledgeable (Riasat *et al.*, 2019). In contrast, a few studies in Nigeria reported that there was no significant difference in the knowledge of doctors and nurses (Iliyasu *et al.*, 2016; Reda *et al.*, 2010).

In the current study, the majority of the study participants had an average practice level which are align with a study conducted in Yemen, the findings indicated that most healthcare workers performed only fair practices to ICP (Alrubaiee *et al.*, 2017). In contrast, a study conducted in Northwest Ethiopia revealed that 86 (57.3%) of subjects responded with a good practice on IPC (Nazeer et al., 2022). In the current study, gender and workplace department were found to be significantly associated with infection prevention and control practices. The male study participants were good at practices. Similar findings were found in a study of Northwest Ethiopia, that the male study participants were very good at practices of IPC (Nazeer et al., 2022). The findings of current research showed that there was no statistically significant difference in the practice level of HCW by their profession, supported by other studies in Northwestern Nigeria, Italy, and Pakistan (Ikramullah *et al.*, 2023; Iliyasu *et al.*, 2016; Parmeggiani *et al.*, 2010).

5. Conclusion

This study highlights that healthcare workers in Dir Lower possess strong knowledge of infection prevention and control. However, this knowledge is not consistently translated into optimal clinical practice. Despite the majority of participants demonstrating good theoretical understanding, the predominance of average practice levels indicates a critical gap between knowledge and implementation. The findings further reveal that factors such as age, professional role, department, gender, and years of experience significantly influence both knowledge and practice levels. Notably, the limited participation in infection prevention and control training among healthcare workers may contribute to the observed deficiencies in practice. These results underscore the need for targeted interventions, including regular training programs, continuous professional development, and strict monitoring of infection control practices across all departments. Strengthening practical adherence to established guidelines is essential to reducing healthcare-associated infections and improving patient safety outcomes. Based on these results, the researcher suggests regularly organizing appropriate IPC training for healthcare workers and focusing on infection prevention and control courses in academia. Moreover, future research should focus on identifying barriers to effective practice and evaluating the impact of structured training interventions on improving compliance with infection prevention and control measures.

Declaration of conflict of interest

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