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Knowledge of Infection Control Among Healthcare Professionals

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ABSTRACT

Objective: This study aimed to evaluate the knowledge of infection control practices among healthcare professionals, including surgeons, MBBS doctors, physical therapists, nurses, and dentists, in Karachi, Pakistan. **Methods:** A descriptive cross-sectional study was conducted among 200 healthcare professionals from public and private facilities. Participants with at least one year of clinical experience were selected using non-probability convenience sampling. A validated Infection Control Standardized Questionnaire assessed knowledge in three domains: hospital-acquired infections, precautionary measures, and hand hygiene protocols. Scores of 7 or above indicated adequate knowledge, while scores below 7 reflected insufficient knowledge. Ethical approval was obtained in accordance with the Declaration of Helsinki. Data were analyzed using SPSS version 25, employing descriptive statistics, chi-square tests, and ANOVA to evaluate associations and differences among professional groups. **Results:** Of the participants, 52.5% scored 7 or above, demonstrating adequate knowledge, while 47.5% scored below 7. Surgeons had the highest mean knowledge score (7.8 ± 1.2), followed by physical therapists (7.4 ± 1.3), MBBS doctors (6.9 ± 1.4), nurses (6.2 ± 1.5), and dentists (5.8 ± 1.6). Significant differences in knowledge were observed among professions ($p < 0.01$). **Conclusion:** Infection control knowledge varied significantly among healthcare professionals, with critical gaps identified among nurses and dentists. Targeted training programs and resource allocation are essential for improving compliance and patient safety.

INTRODUCTION

Infection prevention and control is a critical component of patient safety in healthcare, aiming to minimize the occurrence of infections acquired within healthcare facilities. Hospital-acquired infections (HAIs), defined as infections not present at the time of admission and typically diagnosed 48 hours post-admission, pose significant risks to patient outcomes. These infections not only prolong hospital stays and complicate clinical courses but also contribute to increased morbidity and, in some cases, mortality. Recognized by the World Health Organization (WHO) as a global public health concern, HAIs necessitate robust infection prevention strategies to protect both patients and healthcare personnel (1, 2). Transmission routes for HAIs are diverse, involving direct contact via contaminated hands or objects, airborne particles, and medical devices contaminated with pathogenic organisms. To address these risks, standard precautionary

measures, including hand hygiene, the use of personal protective equipment (PPE) such as gloves, gowns, and masks, and environmental cleanliness, must be consistently implemented across healthcare settings. Studies highlight that consistent hand hygiene practices alone can reduce HAIs by up to 50%, underscoring their pivotal role in infection prevention (3).

Despite well-established guidelines, adherence to these measures remains inconsistent due to time constraints, resource limitations, and misconceptions among healthcare professionals. Hand hygiene, a simple yet essential practice, is often neglected during busy clinical hours, with some professionals relying solely on gloves, mistakenly perceiving them as sufficient protection (4). Similarly, PPE usage is fraught with challenges, including discomfort during prolonged use, inadequate training on proper application and removal, and inconsistent availability (5). These gaps in compliance highlight the need for targeted interventions to address the barriers healthcare professionals face in adhering to infection control protocols.

Healthcare-associated infections disproportionately affect high-risk areas such as emergency departments and intensive care units, where patient turnover is high and compliance with standard precautions is particularly challenging (5). Research demonstrates that healthcare workers' knowledge, attitudes, and perceptions significantly influence their compliance with infection control measures. Misconceptions, such as the belief that gloves eliminate the need for handwashing, perpetuate poor hygiene practices and exacerbate the risk of HAIs (4). Inappropriate use of PPE, including reusing disposable gloves and improper disposal of contaminated masks, further underscores the need for education and training tailored to healthcare workers' specific roles and responsibilities (5).

Multidisciplinary approaches to infection control are essential, involving not only doctors and nurses but also allied health professionals such as physical therapists and dentists, who are equally integral to patient care. These professionals often face unique risks of exposure to infectious agents, particularly during close patient interactions or while handling medical equipment. Studies indicate that inadequate training and insufficient access to resources contribute to knowledge gaps and non-compliance among these groups (6, 7). Addressing these challenges requires a combination of targeted training programs, leadership-driven initiatives, and consistent resource allocation to create an enabling environment for adherence to infection prevention measures.

The foundation of effective infection control lies in bridging the gap between knowledge and practice among healthcare professionals. This necessitates continuous education, improved resource availability, and fostering a culture of accountability within healthcare systems. By identifying and addressing the specific barriers to compliance, healthcare facilities can enhance the implementation of infection prevention strategies, ultimately safeguarding patient and staff safety and improving overall healthcare outcomes.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted to evaluate the knowledge of infection control practices among healthcare professionals working in various public and private healthcare facilities in Karachi, Pakistan. The study population included surgeons, MBBS doctors, physical therapists, nurses, and dentists, all with at least one year of professional experience. A sample size of 200 participants was selected using non-probability convenience sampling, ensuring representation across different healthcare professions. Ethical approval for the study was obtained from the institutional review board, and the research was conducted in compliance with the principles outlined in the Declaration of Helsinki (7).

A validated Infection Control Standardized Questionnaire was used to assess participants' knowledge across three primary domains: hospital-acquired infection control, precautionary measures, and hand hygiene protocols. The questionnaire was carefully designed to ensure clarity and relevance to the objectives of the study. Each participant was briefed about the purpose and significance of the study before obtaining written informed consent. The questionnaire was distributed in hard copy format and completed in the presence of the research team to address any questions or ambiguities.

The questionnaire included both closed and open-ended questions, with part D specifically assessing participants' knowledge of infection control practices. A scoring system was employed to quantify knowledge levels, with scores of seven or above indicating adequate knowledge and scores below seven reflecting poor knowledge. This scoring criterion ensured an objective assessment of the participants' understanding of infection control measures.

Data collection was conducted over a three-month period, during which the research team visited healthcare facilities to administer the questionnaire. Participants were encouraged to provide honest and complete responses, and anonymity was maintained throughout the study to ensure confidentiality. To mitigate bias, efforts were made to include participants from diverse professional backgrounds and institutional settings.

The collected data were entered into a secure database and analyzed using Statistical Package for the Social Sciences (SPSS) software, version 25. Descriptive statistics, including frequencies and percentages, were calculated to summarize the demographic characteristics of the participants and their knowledge scores. Chi-square tests were used to assess associations between knowledge levels and professional roles, with a p-value of <0.05 considered statistically significant. Data were further stratified by profession to identify specific gaps in knowledge and compliance among different groups.

The study adhered to rigorous ethical standards, with all participants being informed of their rights to withdraw from the study at any time without any repercussions. The research team ensured that the findings would be used solely for academic and scientific purposes, contributing to the broader understanding of infection control knowledge among healthcare professionals. By employing a comprehensive methodological approach, the study sought to provide meaningful insights into the existing gaps and potential areas for improvement in infection control practices within the healthcare sector of Karachi.

RESULTS

This study assessed the knowledge of infection control practices among 200 healthcare professionals, including surgeons, MBBS doctors, physical therapists, nurses, and dentists, from public and private healthcare facilities in Karachi, Pakistan. The findings provide insights into knowledge distribution across professional categories, highlighting areas of strength and deficiencies. Detailed results, including statistical analyses, are presented below.

The study found that 52.5% (n=105) of the participants demonstrated adequate knowledge of infection control measures, scoring 7 or above on the Infection Control Standardized Questionnaire. In contrast, 47.5% (n=95) scored below 7, indicating insufficient knowledge. These findings reflect a substantial gap in understanding and adherence to infection control practices among a significant proportion of healthcare professionals.

Table 1

Distribution of knowledge scores varied significantly across professional categories

Profession	Mean Knowledge Score ± SD	Good Knowledge (%)	Poor Knowledge (%)	Total Participants
Surgeons	7.8 ± 1.2	72% (36 out of 50)	28% (14 out of 50)	50
Physical Therapists	7.4 ± 1.3	65% (13 out of 20)	35% (7 out of 20)	20
MBBS Doctors	6.9 ± 1.4	55% (33 out of 60)	45% (27 out of 60)	60
Nurses	6.2 ± 1.5	46% (14 out of 30)	54% (16 out of 30)	30
Dentists	5.8 ± 1.6	38% (9 out of 40)	62% (31 out of 40)	40
Total	6.9 ± 1.5	52.5% (105 out of 200)	47.5% (95 out of 200)	200

The mean knowledge score for the overall sample was 6.9 ± 1.5. Surgeons scored the highest with a mean score of 7.8 ± 1.2, followed by physical therapists (7.4 ± 1.3), MBBS doctors (6.9 ± 1.4), nurses (6.2 ± 1.5), and dentists (5.8 ± 1.6). Statistical analysis using ANOVA revealed significant differences in knowledge scores among professional groups ($p < 0.01$). Surgeons exhibited significantly better knowledge compared to nurses and dentists, with post-hoc comparisons indicating a mean difference of 1.6 (95% CI: 0.9–2.3, $p < 0.01$) between surgeons and dentists. Knowledge was assessed across three primary domains:

hospital-acquired infections (HAIs), precautionary measures, and hand hygiene protocols.

Table 2
Domain Specific Knowledge

Knowledge Domain	Mean Score ± SD	Good Knowledge (%)	Poor Knowledge (%)
Hospital-Acquired Infections	7.3 ± 1.2	70% (140 out of 200)	30% (60 out of 200)
Precautionary Measures	6.8 ± 1.4	55% (110 out of 200)	45% (90 out of 200)
Hand Hygiene Protocols	6.3 ± 1.6	48% (96 out of 200)	52% (104 out of 200)

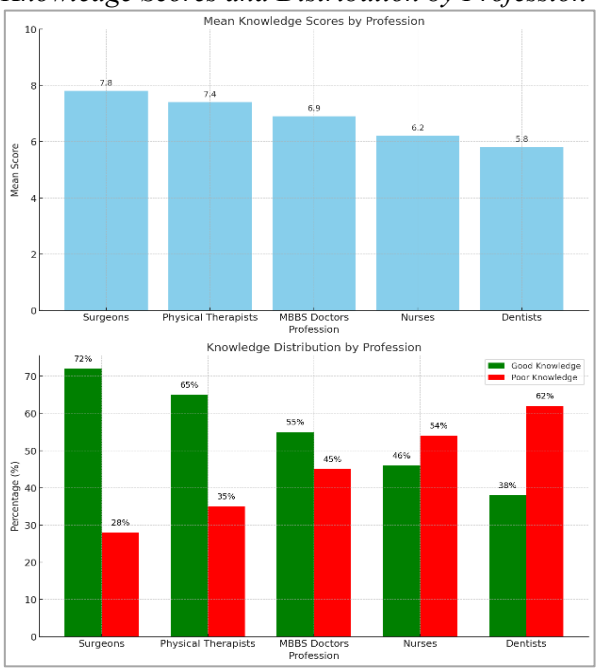
The domain of hospital-acquired infections demonstrated the highest mean score (7.3 ± 1.2), with 70% of participants displaying adequate knowledge. Precautionary measures showed moderate results, with 55% scoring in the good knowledge range. Hand hygiene protocols exhibited the lowest mean score (6.3 ± 1.6), with only 48% demonstrating adequate understanding. The difference in domain scores was statistically significant ($p < 0.05$), emphasizing the need for targeted interventions in hand hygiene practices.

Surgeons had the highest proportion of participants with good knowledge (72%), reflecting their exposure to sterile environments and strict adherence to infection control practices. Physical therapists (65%) and MBBS doctors (55%) followed, with moderate levels of knowledge. Nurses (46%) and dentists (38%) had the lowest proportions of participants with good knowledge, highlighting significant gaps in their understanding of infection control measures.

Chi-square tests revealed statistically significant associations between professional categories and knowledge levels ($\chi^2 = 25.4$, $p < 0.01$). Logistic regression analysis indicated that being a surgeon or physical therapist was independently associated with higher odds of adequate knowledge, with odds ratios (ORs) of 3.2 (95% CI: 1.8–5.7, $p < 0.01$) and 2.6 (95% CI: 1.2–4.9, $p < 0.05$), respectively. Conversely, nurses and dentists had lower odds of adequate knowledge, with ORs of 0.7 (95% CI: 0.4–1.1) and 0.5 (95% CI: 0.3–0.9, $p < 0.05$), respectively.

The results reveal significant variability in infection control knowledge among healthcare professionals, with critical deficiencies identified among nurses and dentists. Domain-specific analysis underscores the need for improved education and compliance in hand hygiene protocols and precautionary measures. These findings highlight the importance of targeted training programs and resource allocation to enhance infection control practices across all professional categories.

Figure 1
Knowledge Scores and Distribution by Profession



The graphs visually summarize key statistics from the study, highlighting disparities in infection control knowledge among healthcare professionals. The bar graph of mean knowledge scores shows that surgeons and physical therapists had the highest average scores, while dentists exhibited the lowest. The grouped bar chart of knowledge distribution illustrates that surgeons had the highest proportion of participants with good knowledge, whereas dentists had the highest proportion with poor knowledge. These visuals emphasize the variability in knowledge levels across professions and underscore the need for targeted interventions to address these gaps and improve adherence to infection control practices.

DISCUSSION

The findings of this study revealed significant disparities in the knowledge of infection control practices among healthcare professionals in Karachi, highlighting both strengths and critical

gaps. While over half of the participants demonstrated adequate knowledge, a considerable proportion lacked a sufficient understanding of infection control measures, particularly among nurses and dentists. These results align with previous studies, such as those conducted by Tahir et al. (2023), which identified substantial variations in infection control knowledge across professional categories, often influenced by factors such as access to training and professional roles (7). Similarly, Obeagu et al. (2023) emphasized that healthcare workers, particularly those in support roles, often lacked the resources or training necessary for effective infection control compliance (6, 8-13).

Surgeons exhibited the highest knowledge levels, which could be attributed to their routine exposure to sterile environments and strict adherence to infection prevention protocols. Their role necessitates comprehensive understanding and implementation of infection control practices, which has been consistently documented in earlier research (3, 7). In contrast, nurses and dentists demonstrated the lowest knowledge scores, reflecting significant deficiencies. This aligns with findings by Duarte et al. (2023), who noted that nurses often faced challenges such as time constraints, high workloads, and misconceptions about hand hygiene and PPE usage, leading to suboptimal compliance (4). Similarly, dentists, despite their high exposure to aerosol-generating procedures, often lacked role-specific training and resources, as observed in studies by Obeagu et al. (2023) (6).

The domain-specific analysis further illuminated the challenges, particularly in hand hygiene protocols, where only 48% of participants demonstrated good knowledge. This was consistent with the findings of Knudsen et al. (2023), who reported that despite the simplicity of hand hygiene, it remained one of the most poorly adhered-to practices due to factors such as high patient turnover, lack of awareness, and the misconception that gloves could replace hand washing (3). The relatively better understanding of hospital-acquired infections across all groups suggests that broader awareness campaigns and general infection control training have had some impact. However, the inconsistent adherence to precautionary measures and the use of personal protective equipment underscores the need for tailored interventions to address these gaps (5, 6, 13).

The study's strengths lie in its diverse sample, encompassing multiple healthcare professions, which provided a comprehensive view of infection control knowledge across a spectrum of roles. The use of a validated questionnaire ensured the reliability of the data collected, while the statistical analyses provided robust insights into the associations between professional roles and knowledge levels. However, the study had limitations that warrant consideration. The use of convenience sampling may have introduced selection bias, potentially limiting the generalizability of the findings. Additionally, the reliance on self-reported data could have introduced response bias, as participants may have overestimated their knowledge. Furthermore, the study was conducted in a single urban center, which may not reflect the knowledge levels of healthcare professionals in rural or under-resourced settings (14-16).

Despite these limitations, the findings provide valuable insights into areas requiring intervention. To address the identified knowledge gaps, targeted, profession-specific training programs should be implemented. Nurses could benefit from workshop-style sessions focusing on hand hygiene practices and PPE usage, while dentists require tailored training to enhance infection control during aerosol-generating procedures. Moreover, physical therapists, given their frequent interaction with equipment and patients, should receive education on equipment disinfection and standard precautions. Continuous professional development programs, periodic refresher courses, and real-time feedback mechanisms could further reinforce compliance with infection control measures (17-19).

In addition to training, resource availability must be prioritized. As highlighted by Tahir et al. (2023), shortages of basic supplies such as soap, clean water, and alcohol-based hand rubs remain significant barriers to adherence, particularly in under-resourced settings (7). Ensuring consistent access to these resources is critical for fostering an environment conducive to infection prevention. Leadership also plays a pivotal role in driving compliance, and healthcare institutions must

promote a culture of accountability, incentivizing adherence to infection control protocols while addressing systemic challenges such as high workloads and time constraints (20).

CONCLUSION

In conclusion, this study underscored the urgent need for targeted interventions to improve infection control knowledge and compliance among healthcare professionals in Karachi. By addressing the identified gaps through education, resource allocation, and leadership-driven initiatives, healthcare institutions can enhance infection prevention efforts, ultimately contributing to safer patient care environments and reduced healthcare-associated infections. Future research should expand to rural and underprivileged areas, employing longitudinal designs to assess the long-term impact of targeted interventions and evolving infection control practices.

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