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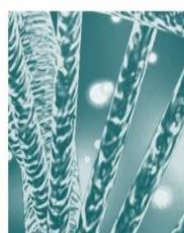
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Knowledge, Attitude and Practices of Infection Prevention and Control among Healthcare Workers at CDA Hospital, Islamabad

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ABSTRACT

Objective: To assess the knowledge, attitude and self-reported practices of infection prevention and control (IPC) among healthcare workers at CDA Hospital, Islamabad, and to compare them across professional groups and recent IPC training.

Methods: This cross-sectional study was conducted at CDA Hospital, G-6/2, Islamabad, over a period of six months from January 2026 to June 2026. A total of 163 doctors, nurses, paramedics and allied clinical staff were enrolled through consecutive sampling and completed a structured, pre-tested questionnaire. A score of 70% or more was taken as adequate knowledge, positive attitude and satisfactory practice. The chi-square test, independent samples t-test and one-way ANOVA were applied, and $p \leq 0.05$ was considered significant.

Results: The mean age was 31.45 ± 6.66 years, and nurses formed the largest group (39.3%). The mean knowledge score was 5.94 ± 1.68 out of 10, and only 58 (35.6%) participants had adequate knowledge. In contrast, 149 (91.4%) held a positive attitude and 147 (90.2%) reported satisfactory practices. Segregation of waste at source (50.3%) and use of hand rub on visibly soiled hands (52.8%) were the least known items. Participants trained in the preceding two years had higher knowledge scores (6.45 ± 1.60 vs. 5.27 ± 1.54 ; $p < 0.001$). Scores did not differ by profession. Only 44.2% had received IPC orientation in the past year.

Conclusion: Healthcare workers were well-disposed towards IPC and reported good practice, but their knowledge was weak. Regular, practical IPC training for all cadres, backed by a reliable supply of hand hygiene material and PPE, is needed.

Keywords: Infection control, Healthcare workers, Hand hygiene, Pakistan.

1. INTRODUCTION

Healthcare-associated infections (HAIs) continue to trouble hospitals everywhere, but they weigh most heavily on low- and middle-income countries, where crowded wards, limited laboratory support and overstretched staff make transmission easier¹. They lengthen hospital stay, drive antibiotic use and add to the cost of care, often borne by families out of their own pockets¹. A large share of these infections can be prevented with simple and well-known measures: hand hygiene, appropriate personal protective equipment (PPE), safe handling of sharps, safe injections and segregation of waste at source². Of these, hand hygiene with alcohol-based hand rub has remained the single most effective step for the past two decades².

Knowing these measures and applying them on a busy ward are two different things. A meta-analysis from low- and middle-income countries found that only about half of healthcare workers (53%) followed standard precautions³. Poor compliance has repeatedly been linked to gaps in knowledge, lack of training, shorter professional experience and shortage of supplies⁴. A recent review of IPC programs in these countries described weak governance, irregular training and little monitoring as common threads running through most health systems⁵.

Pakistan reflects the same pattern. When five public sector hospitals of Islamabad were assessed with the WHO Infection Prevention and Control Assessment Framework (IPCAF), every hospital scored below 200 out of 800, and almost no department met even half of the required standards⁶. Tertiary facilities in Gilgit-Baltistan, Azad Jammu and Kashmir and Khyber Pakhtunkhwa scored lowest on education, training and surveillance⁷. A nationwide IPCAF survey placed public sector hospitals at the basic level and named IPC training as the area most in need of attention⁸, and even military hospitals with better resources reported difficulties with training, monitoring and staffing⁹.

At the level of the individual worker, a multicenter study from Punjab found adequate knowledge of standard precautions in only 37.5% of 533 healthcare personnel, with a supportive attitude in 46.7% and safe practices in 46.3%¹⁰. In the same hospitals, 35.3% of staff had sustained a needle stick injury within six months, and most of these injuries went unreported¹¹. In Peshawar, 75% of healthcare providers admitted recapping needles and 56% complained of inadequate PPE¹². The COVID-19 pandemic briefly pushed infection control to the front of every hospital agenda; healthcare workers in Pakistan showed good knowledge of the new disease but named limited infection control material as a barrier¹³, and nearly 70% of frontline staff had received no PPE training before the pandemic began¹⁴. These figures come from other hospitals, and what holds true in one hospital does not always hold in the next. No published data were available for CDA Hospital, Islamabad, and without local figures, training and improvement activities tend to be planned on assumptions rather than evidence. This study was therefore carried out to assess the knowledge, attitude and self-reported practices of infection prevention and control among healthcare workers at CDA Hospital, and to compare them across professional groups and between those with and without recent IPC training.

2. METHODOLOGY

This cross-sectional study was conducted at CDA Hospital, G-6/2, Islamabad, over a period of six months from January 2026 to June 2026. Approval was obtained from the Institutional Ethical Review Committee and permission was taken from the Chairman of the hospital IPC Committee before data collection began.

The sample size was calculated with the WHO formula for a single proportion, $n = Z^2 p(1-p)/d^2$, taking a 95% confidence level ($Z = 1.96$), an expected frequency of adequate knowledge of 37.5% from a recent multicenter study in Pakistani tertiary care hospitals¹⁰ and an absolute precision of 5%. This gave 360.

Because the hospital employs about 250 healthcare workers, a finite population correction was applied, which reduced the requirement to 148. After allowing 10% for non-response and incomplete forms, the final sample size was 163. Participants were enrolled by non-probability consecutive sampling: eligible workers available during the study period were approached one after another until the required number was reached. Doctors, nurses, paramedics and allied clinical staff involved in direct or indirect patient care, at CDA Hospital, were included if they agreed to take part. Administrative staff with no patient care role, students, observers, and staff on extended leave were excluded.

Data were collected on a structured, self-administered questionnaire developed for this study after reviewing the WHO Hand Hygiene Knowledge Questionnaire for Health-Care Workers, the WHO IPCAF and questionnaires used in earlier local IPC studies^{10,12}. It had five sections, summarized in Table 1. The organizational support section drew on selected IPCAF domains, namely IPC governance, training and monitoring, and workload, staffing and bed occupancy. Since the IPCAF is designed to assess a facility rather than an individual, these items were described only and did not contribute to any individual score⁸.

In the knowledge section, “don't know” and unanswered items were counted as wrong. The negatively worded attitude statement, which proposed heavy workload as an acceptable reason to skip hand hygiene, was reverse-scored. The 70% cut-off followed the modified Bloom's criterion used in earlier IPC knowledge, attitude and practice studies.

Before the study, the questionnaire was reviewed by subject experts for content validity. Eligible staff was then approached in their own departments at times that did not interfere with patient care. The purpose of the study was explained, participation was voluntary, and returning a completed form was taken as consent. No names or employee numbers were recorded; each form carried a code only and was returned in a sealed envelope. The form took about 8 to 10 minutes to complete.

Data were entered and analyzed in IBM SPSS Statistics 26. Forms with more than 10% of items missing in any scored section were to be excluded, and 163 forms were included in the final analysis. Frequencies and percentages were calculated for categorical variables such as gender, professional category, department, IPC training and the classification of each domain. Mean and standard deviation were calculated for age, experience and the knowledge, attitude and practice scores. The chi-square test was used to assess association between categorical variables and domain classification. The independent samples t-test compared mean scores between trained and untrained participants, and one-way ANOVA compared mean scores across the four professional groups. A p-value of 0.05 or less was considered statistically significant.

3. RESULTS

A total of 163 healthcare workers completed the questionnaire. Their mean age was 31.45 ± 6.66 years (range 22–51) and means professional experience 5.30 ± 4.95 years. Slightly more than half were women, nurses made up the largest group, and medical wards contributed the most participants. Just over half had attended formal IPC training in the preceding two years (Table 1).

The mean knowledge score was 5.94 ± 1.68 out of 10. Correct responses ranged between 50.3% and 64.4%, and roughly one participant in five chose “don't know” for each statement (Table 2). The role of hand hygiene in preventing HAIs was the best-known item, while segregation of waste at source and the use of hand rub on visibly soiled hands were answered correctly by barely half.

Attitude and practice items scored consistently high, with most means close to 4 on the five-point scale. Still, 35 (21.5%) participants agreed that a heavy workload was an acceptable reason to skip hand hygiene, and hand hygiene before touching a patient was the least often reported practice (Table 3).

Overall, 58 (35.6%) participants had adequate knowledge, 149 (91.4%) a positive attitude and 147 (90.2%) satisfactory self-reported practices. Scores were similar across professional groups. Recent IPC training was associated with knowledge and with attitude classification, but not with practice (Table 4). Gender and department showed no association with any domain.

Organizational support was patchy. Hand rub, PPE, sharps containers and color-coded bins were available often or always to only 50–60% of participants, and fewer than half could confirm an IPC team, written guidelines, and hand hygiene monitoring or training in the past year (Figure 1). Asked about the main barrier in their department, participants most often named irregular hand hygiene supplies (33, 20.2%), intermittent PPE shortage (32, 19.6%), the need for refresher training (30, 18.4%) and heavy workload with limited staffing (25, 15.3%).

Table-2: Sociodemographic and professional characteristics of participants

Characteristic	n (%)	Characteristic	n (%)
Gender		Department	
Male	75 (46.0)	Medical ward	32 (19.6)
Female	86 (52.8)	ICU/HDU	24 (14.7)
Prefer not to say	2 (1.2)	Surgical ward	22 (13.5)
Professional category		Emergency	20 (12.3)
Doctor	37 (22.7)	Operation theatre	14 (8.6)
Nurse	64 (39.3)	OPD	14 (8.6)
Paramedic/Technician	39 (23.9)	Labour room	8 (4.9)
Allied clinical staff	23 (14.1)	Radiology	8 (4.9)
IPC training in last 2 years		Laboratory	6 (3.7)
Yes	87 (53.4)	Other	15 (9.2)
No	66 (40.5)		
Not sure	10 (6.1)		

Table-2: Responses to knowledge items

Statement (correct answer)	Correct, n (%)	Don't know, n (%)
Hand hygiene is the most effective measure against HAIs (T)	105 (64.4)	29 (17.8)
Hand rub instead of soap and water on visibly soiled hands (F)	86 (52.8)	40 (24.5)
Hand hygiene before patient contact and after glove removal (T)	94 (57.7)	37 (22.7)
Same gloves for several patients if they look clean (F)	97 (59.5)	34 (20.9)
PPE chosen by anticipated risk of	94 (57.7)	38 (23.3)

Statement (correct answer)	Correct, n (%)	Don't know, n (%)
exposure (T)		
Two-handed recapping of used needles before disposal (F)	104 (63.8)	31 (19.0)
Standard precautions only for patients with known infection (F)	103 (63.2)	28 (17.2)
Waste segregated at the point of generation (T)	82 (50.3)	39 (23.9)
Transmission-based precautions added to standard precautions (T)	101 (62.0)	30 (18.4)
Needle stick injury reported and PEP considered promptly (T)	102 (62.6)	32 (19.6)

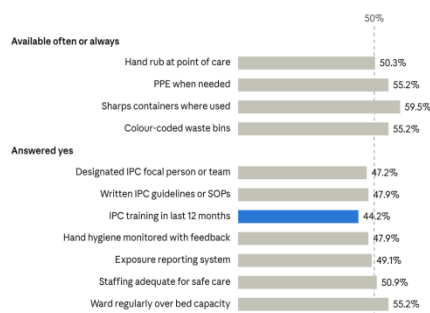
Table-3: Attitude and self-reported practice items (n=163)

Attitude statement	Mean ± SD	Agree, n (%)	Practice	Mean ± SD	Often—Always, n (%)
IPC is part of my professional responsibility	4.01 ± 0.97	127 (77.9)	Hand hygiene before touching a patient	3.87 ± 0.97	110 (67.5)
IPC guidelines protect patients and healthcare workers	4.09 ± 0.90	130 (79.8)	Hand hygiene after touching a patient or surroundings	3.89 ± 1.00	111 (68.1)
Hand hygiene is worth the time, even when busy	4.06 ± 0.97	126 (77.3)	PPE appropriate to the task	4.08 ± 0.94	126 (77.3)
Reporting exposures is important, even minor ones	4.01 ± 0.96	124 (76.1)	Sharps straight into puncture-resistant container	4.02 ± 0.95	124 (76.1)
Heavy workload is an acceptable reason to skip hand hygiene*	2.54 ± 1.22	35 (21.5)	No recapping of used needles	3.92 ± 1.09	117 (71.8)
Regular IPC training improves patient care	3.90 ± 1.07	122 (74.8)	New sterile syringe and needle for each patient	3.91 ± 1.00	118 (72.4)
IPC stays a priority even when short of staff	4.03 ± 0.83	128 (78.5)	Occupational exposures reported when they occur	4.01 ± 1.02	120 (73.6)

Table-4: Knowledge, attitude and practice by professional category and recent IPC training

Group	Knowledge: mean ± SD; adequate, n (%)	Attitude: mean ± SD; positive, n (%)	Practice: mean ± SD; satisfactory, n (%)
All participants (n=163)	5.94 ± 1.68; 58 (35.6)	27.56 ± 2.44; 149 (91.4)	27.71 ± 2.55; 147 (90.2)
Doctor (n=37)	5.92 ± 1.52; 13 (35.1)	27.54 ± 2.63; 32 (86.5)	27.59 ± 2.95; 33 (89.2)
Nurse (n=64)	5.84 ± 1.77; 21 (32.8)	27.58 ± 2.21; 59 (92.2)	27.56 ± 2.34; 57 (89.1)
Paramedic/Technician (n=39)	5.72 ± 1.72; 12 (30.8)	27.82 ± 2.49; 37 (94.9)	27.74 ± 2.63; 35 (89.7)
Allied clinical staff (n=23)	6.61 ± 1.53; 12 (52.2)	27.13 ± 2.74; 21 (91.3)	28.26 ± 2.40; 22 (95.7)
p-value (profession)	0.208; 0.338*	0.765; 0.618*	0.717; 0.821*
IPC training: Yes (n=87)	6.45 ± 1.60; 44 (50.6)	27.57 ± 2.60; 78 (89.7)	27.66 ± 2.74; 78 (89.7)
IPC training: No (n=66)	5.27 ± 1.54; 9 (13.6)	27.67 ± 2.06; 64 (97.0)	27.82 ± 2.33; 61 (92.4)
IPC training: Not sure (n=10)	5.90 ± 1.79; 5 (50.0)	26.80 ± 3.33; 7 (70.0)	27.50 ± 2.55; 8 (80.0)
p-value (training)	<0.001; <0.001*	0.813; 0.012*	0.698; 0.455*

Figure 1. Organizational IPC support reported by participants
Percentage of 163 healthcare workers



4. DISCUSSION

The clearest finding of this study was the distance between what healthcare workers knew and how they felt and acted. Only about one in three had adequate knowledge, yet nine in ten held a positive attitude and reported satisfactory practice. Knowledge here was well below the 71.9% reported from southwest Ethiopia¹⁵ and the pooled 74.5% from Ethiopian studies¹⁶, and close to the 37.5% seen in tertiary hospitals of Punjab¹⁰. In Bangladeshi tertiary hospitals the pattern was reversed, with 76.8% adequate knowledge but safe practice in only 54.6%¹⁷. Self-reported practice of 90.2% sits uneasily beside knowledge of 35.6%. Healthcare professionals in South India also described good practices alongside high awareness¹⁸, but staff nurses in Rawalpindi with 77% adequate knowledge showed satisfactory practice in only 53%, and 68.5% still recapped needles¹⁹. Our practice data were self-reported, and staff tends to describe what they ought to do rather than what happens on a busy shift. Direct observation would give a truer picture and should be built into future audits.

The weakest knowledge items were practical ones. Half the participants did not know that infectious and general waste must be separated at the point of generation, and nearly half believed that hand rub was suitable for visibly soiled hands. A survey from an Italian university hospital found similar confusion about when hand rub works and when soap and water are needed, even among staff who used hand rub every day²⁰. Such points are

easily taught at the bedside and should not be left to chance.

Recent IPC training was the one factor clearly linked with knowledge. Trained staff scored more than a point higher, and half of them reached the adequate level compared with about one in seven of the untrained. Training workshops in Islamabad hospitals improved knowledge significantly on pre- and post-testing²¹, a three-hour program for auxiliary staff in Rawalpindi raised both knowledge and practice scores²², and a short session for laboratory staff raised good practice from 7.5% to 57.9%²³. Yet training had reached only about half of our participants, and fewer than half reported any orientation in the previous year. The association between training and attitude was driven largely by the small group unsure of their training status and should be read with caution.

Profession made no difference to any score, which suggests that the gap lies with the institution rather than with one cadre. Participants named shortages of hand hygiene supplies and PPE, the need for refresher training and heavy workload as their main barriers. Hand hygiene compliance is known to fall once opportunities exceed about 30 per hour²⁴, and PPE availability and prior training was independent predictors of IPC compliance in Saudi Arabia²⁵. More than half of our participants reported that their ward regularly held more patients than beds, and only half considered staffing adequate.

5. CONCLUSION

Healthcare workers at CDA Hospital, Islamabad, were well-disposed towards infection prevention and control and reported good practice, but only about a third had adequate knowledge. The gaps were greatest in waste segregation and hand hygiene technique, and recent training was the only factor linked with better knowledge. Regular, practical IPC training for every cadre, supported by a steady supply of hand rub and PPE, an active IPC team and routine

observation of practice, would help close the gap between attitude and knowledge.

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