

HAND HYGIENE KNOWLEDGE, PERCEPTION, AND SELF-REPORTED PERFORMANCE AMONG NURSES IN A TERTIARY CARE HOSPITAL, LAHORE: A CROSS-SECTIONAL STUDY

Asifa Qasim^{*1}, Ibtisam Tariq², Irshad Ul Haq³, Ibrar Ahmad⁴, Sara Manzoor⁵, Sanyha Khalid⁶

^{*1}Senior Nursing Lecturer Bahria Town School of Nursing Lahore
^{2,3,4,5,6}BSN scholar Bahria Town School of Nursing Lahore

¹asifaqasim1997@gmail.com, ²ibtisamtariq76@gmail.com, ³irshadulhaq015@gmail.com,
⁴ibrahahmadmalik846@gmail.com, ⁵saratbhatti234@gmail.com, ⁶sanyhakhalid2003@gmail.com

Corresponding Author: *

Asifa Qasim

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ABSTRACT

Background: Hand hygiene is considered one of the simplest and most effective measures for preventing healthcare-associated infections (HAIs) and ensuring patient safety. Although clear hand hygiene guidelines are available, compliance among nurses is still inconsistent. Factors such as knowledge, perception, and self-reported performance play an important role in influencing hand hygiene practices in healthcare settings.

Objective: This study aimed to assess the hand hygiene knowledge, perception, and self-reported performance among nurses working in a tertiary care hospital in Lahore and to determine the relationship between these variables.

Methods: A descriptive cross-sectional study was conducted among 150 nurses working at Bahria International Hospital Lahore and Bahria Orchard Hospital Lahore. Data were collected using the WHO Hand Hygiene Knowledge Questionnaire and the WHO Hand Hygiene Perception Questionnaire (2009 revision). Descriptive statistics including frequencies percentages means and standard deviations were used to summarize the data. Since the data were not normally distributed Spearman's rank correlation test was applied using SPSS version 23. A p-value of <0.05 was considered statistically significant.

Results: The findings showed that nurses had a moderately high level of hand hygiene knowledge with a mean score of 16.22 ± 2.33 . The mean perception score was 3.09 ± 0.34 , indicating generally positive perceptions toward hand hygiene, while the mean self-reported performance score was 8.23 ± 1.46 . A moderate positive correlation was found between knowledge and self-reported performance (Spearman's $\rho = 0.429$, $p < 0.001$). Similarly, perception showed a significant positive correlation with self-reported performance (Spearman's $\rho = 0.312$, $p < 0.001$). Knowledge and perception were also positively associated, although the relationship was relatively weak (Spearman's $\rho = 0.213$, $p = 0.009$).

Conclusion: The study concludes that better hand hygiene knowledge and positive perceptions are associated with improved self-reported hand hygiene performance among nurses. These findings highlight the importance of regular educational programs continuous training and supportive infection prevention strategies to strengthen hand hygiene practices and improve patient safety in tertiary care hospitals.

Keywords: Hand hygiene, Knowledge, Perception, Self-reported performance, Healthcare-associated infections, Infection prevention, Tertiary care hospital.

1. INTRODUCTION

1.1. Background of the Study

Healthcare associated infections HAIs remain a major global public health concern and continue to cause significant morbidity mortality and financial burden for healthcare systems worldwide (World Health Organization [WHO], 2009). The situation has become even more critical with rising anti-microbial resistance which makes preventing HAIs a top priority for modern healthcare systems. Among various infection prevention measures hand hygiene (HH) is recognized as the single most effective and economical strategy as the hands of healthcare workers (HCWs) are the most common vehicles for transmitting pathogenic microorganisms between patients (Allegranzi & Pittet, 2009).

Numerous studies consistently conclude that establishing robust HH practices is essential for preventing infections in all healthcare environments (Allegranzi & Pittet, 2009). The World Health Organization introduced the *Five Moments for Hand Hygiene* model to guide clinical staff on exactly when HH is required to prevent infection transmission Hygiene, W. H. (2009). Research reveals that consistent adherence to these five moments significantly reduces HAIs such as central line associated bloodstream infections (CLABSI) and catheter associated urinary tract infections (CAUTI) (Bale et al., 2021).

Studies further show that improving HH compliance can reduce HAIs by as much as 50% demonstrating substantial clinical and economic benefits (Sax et al., 2009). The COVID-19 pandemic brought even more attention to how crucial HH is in healthcare settings. The pandemic revealed enduring deficiencies in fundamental infection control procedures including HH in numerous high- and low-income nations despite advancements in technology and medicine (Cheng et al., 2020).

Patients and healthcare professionals were more vulnerable as a result of these gaps. Despite the pandemic's increased global awareness of HH compliance rates remained uneven especially in

overcrowded facilities with few staff members and resources (Haque et al., 2018). Because they spend a lot of time at the bedside and have constant direct contact with patient's nurses play a crucial role in preventing healthcare associated infections. As frontline careers they are crucial to infection prevention and control (IPC) strategies and help to shape the safety culture of healthcare facilities (Clancy et al., 2021).

Global compliance rates however frequently stay between 30% and 50% despite decades of HH promotion indicating ongoing organizational, behavioral and environmental issues (Clancy et al., 2021). According to research HH is a complex behavioral process influenced by knowledge perceptions workload role modelling and the organizational environment rather than just a technical task (Ahmed et al., 2020). According to recent research a better understanding of HH behavior among nurses can be obtained by assessing the triad of HH knowledge perception and self-reported performance (Abd Rahim & Ibrahim, 2022).

Although knowledge helps raise awareness of evidence-based practice perceptions such as opinions about the significance of HH perceived obstacles and the influence of coworkers often have a greater influence on behavior. Despite occasionally being overestimated self-reported performance provides information about how nurses view their own compliance with HH standards (Oh, 2019).

Due to resource constraints, uneven IPC training high patient to staff ratios and poor infrastructure the burden of HAIs is still very high in developing nations like Pakistan (Ahmed et al., 2020). Due to the high volume of patients and demand for nursing services Lahore A significant urban healthcare center faces particular difficulties in upholding ideal HH standards. There is little local research that looks at nurses HH knowledge perceptions and self-reported performance in tertiary care settings in Lahore despite the significance of effective HH practice. Designing focused interventions that can improve HH compliance and lower HAIs in Pakistani

healthcare facilities requires an understanding of these behavioral and contextual elements (Bari, et al., 2021).

Recent studies continue to highlight critical *deficiencies* in our understanding. In a 2023 study of nursing students in Lesotho it was found that while attitudes were positive knowledge was only moderate with specific deficiencies in understanding when to protect patients and when to wash your hands rather than rub them (Ntaote et al., 2024). Comparable to this study carried out in the Asir region of Saudi Arabia discovered that knowledge is a significant predictor of practice however many nurses were unaware of the exact sequence of the World Health Organization six-step technique and the appropriate amount of time for hand rubbing (Mohaithef, 2020). Despite its undeniable significance HCWs adherence to hand hygiene regulations is still below ideal worldwide resulting in a dangerous and enduring gap between knowledge and practice (Lambe et al., 2019).

1.2. Problem statement

Relating to gaps in the main areas of study are highlighted by an expanding corpus of international literature. Research continuously shows that although everyone agrees that HH is important in theory there are frequently serious knowledge gaps. For example, studies conducted in Lesotho and Zambia revealed that nursing student's knowledge was only moderate with significant gaps in their ability to identify the sources of healthcare-associated infections (HAIs) and the particular Five Moments that are intended to protect patients or healthcare workers (Ntaote et al., 2024). In a similar vein a study conducted in a military hospital in Pakistan found that paramedical staff had the lowest mean knowledge score (64.1%) which is fair at best (Iqbal et al. 2018). Found that even specialized infection control nurses had knowledge gaps about the most common source of germs causing HAIs which supports this. (Oh, 2019).

During my clinical rotations in tertiary care settings, I have observed a concerning reality: despite clear protocols and available resources hand hygiene compliance among nursing staff

appears inconsistent in daily practice. These clinical difference between theoretical knowledge and actual implementation represents a significant patient safety issue in our healthcare system. Research indicates that healthcare associated infections remain persistently high in Pakistani hospitals with studies suggesting that suboptimal hand hygiene practices contribute substantially to this burden. In major referral hospitals like those in Lahore where patient acuity is high and exposure risks are multiplied this problem takes on even greater urgency.

1.3. Significance of the study

This research will serve as an essential diagnostic resource for IPC teams and hospital leadership. The results will provide a robust foundation of evidence for developing targeted situation specific interventions by identifying specific knowledge deficiencies (such as misconceptions regarding the Five Moments) and critical perceptual barriers (such as perceived limitations in time or resources). Rather than implementing general training administrators can design programs that specifically address the identified weaknesses such as the risk literacy enhancement or reframing nudge that demonstrated to be effective (Van Roekel et al., 2022).

The results can inform adjustments to training programs in nursing education and curriculum planning. If practicing nurses show areas of limited understanding this signals the need for more effective and continuous professional development potentially incorporating behavioral strategies such as “boosts” which have been shown to produce more sustained effects (van Roekel et al., 2022).

This study is important because it focuses directly on the experiences and perspectives of nurses working in a major tertiary care hospital in Lahore. Nurses spend the most time with patients moving from one bedside to another and their hand hygiene plays a crucial role in preventing the spread of germs. By asking nurses what they know about hand hygiene how they feel about it and how often they believe they follow it correctly the study values their own awareness rather than simply observing them. The findings will help

nursing supervisors and infection control teams identify the exact reasons behind low hand hygiene compliance. Instead of relying on general training the hospital can use this information to create practical solutions such as making hand rubs easier to access offering skin friendly products or encouraging senior staff to model good practices making infection control efforts more effective and directly useful.

For the nursing community this research captures the realities and challenges they face daily such as heavy workloads fatigue and lack of supplies which often make perfect hand hygiene difficult. By bringing these issues to light the study can encourage hospital management to improve staffing ensure availability of supplies and support nurses more consistently. It also helps build a culture where nurses remind and support each other making good hygiene a shared responsibility. Ultimately this work benefits every patient as clean hands are one of the strongest protections during treatment. By understanding and improving what nurses know and do about hand hygiene the study supports safer care reduces infection risks and upholds the core promise of nursing: to protect patients and provide skilled care when they are most vulnerable.

1.4. Research Objectives

1. Is there a correlation between knowledge score and perception of self-performance?
2. Is there a correlation between perception scores and self-performance scores?

3.MATERIAL AND METHODS:

3.1 STUDY DESIGN:

Descriptive cross-Sectional study design is used to identify hand hygiene knowledge, perception and self-reported performance among nurses working in tertiary care hospital, Lahore.

3.2 STUDY VARIABLES:

The variables in this study were chosen in line with the research aims which sought to evaluate the connection between nurses self-reported performance perception and knowledge of hand hygiene.

3.2.1 INDEPENDENT VARIABLES:

Hand Hygiene Knowledge
Hand Hygiene Perception

3.2.2 DEPENDENT VARIABLES:

Hand Hygiene Performance

3.3 CONCEPTUAL DEFINITION:

Hand Hygiene: The process of cleaning one's hands using an alcohol based hand rub (ABHR) or soap and water to remove microorganisms in line with the WHO guidelines (WHO, 2009).

Knowledge: The nurses understanding of hand hygiene principles measured by a structured questionnaire adapted from the WHO tool with scores categorized as good (>75%), moderate (50-75%), or poor (<50%) (Ariyaratne et al., 2015, as cited in Ntaote et al., 2024).

Perception: The nurse beliefs attitudes and opinions regarding the importance effectiveness and feasibility of hand hygiene practices, measured using a Likert scale-based assessment tool (Rahim & Ibrahim, 2022).

Self-Reported Performance: The frequency of hand hygiene practice as reported by the nurses themselves reflecting their own perceived compliance with established guidelines on a scale from 0 to 100% (Oh, 2019).

Operational Definition:

Knowledge: Hand hygiene knowledge refers to the nurse's evidence-based understanding of the WHO (5 Moments of hand hygiene) the standard techniques for hand decontamination, and the underlying rationale for hand washing in a clinical setting.

Perception: The perception of hand hygiene is defined as the nurse's internal evaluation of how hand-cleansing practices impact patient outcomes and the extent to which these procedures are realistic to perform given their current workload.

Self-reported hand hygiene performance: Refers to a nurse's subjective evaluation of their own compliance regarding the timing and accuracy of

hand cleansing. This variable is quantified through data collected from self-administered instruments, such as questionnaires or Likert scales, rather than through external observation

Hand hygiene: Refers to the practice of cleaning one's hands using either soap and water or an alcohol-based sanitizer. This process is designed to eliminate physical debris and organic matter while neutralizing temporary germs to prevent cross-contamination.

3.4 Study Setting: Tertiary care hospital Lahore Pakistan

3.5 Study Population: Registered nurses working in different departments of tertiary care hospital, Lahore.

3.6 Sampling technique: Stratified random or Convenience sampling technique is used to identify hand hygiene knowledge, perception and self-reported performance among nurses working in tertiary care hospital, Lahore.

3.7 Sample size:

$$n = N / (1 + N * e^2)$$

Total population (N=150)

Margin of error (e=0.05),
the calculation would be:

$$n = 150 / (1 + 150 * (0.05)^2)$$

$$n = 109.09$$

"Slovin's Formula Calculator."

<https://www.calculatorultra.com/en/tool/slovin-formula-calculator.html>.

3.8 DURATION OF STUDY:

The study was conducted over a period of three months, from January 2026 to March 2026.

3.9 Eligibility Criteria:

3.9.1 Inclusion Criteria:

- I. Registered nurses (diploma/BSN/MSN) employed at the tertiary care hospital.
- II. Currently working in clinical areas with direct patient contact (wards, ICU, emergency, operating theatre, outpatient clinics).

- III. Employed for ≥ 3 months at the hospital.
- IV. Full-time or regular part-time nursing staff on duty roster (not temporary/occasional).
- V. Provide informed consent to participate.

3.9.2 Exclusion criteria:

- I. Nurses in purely administrative/non-clinical roles (HR, payroll, academic-only posts).
- II. Student nurses, interns, or recent graduates on short clinical attachment.
- III. Nurses currently on long-term leave (medical, maternity, study leave) or on duty offsite during data collection.
- IV. Those who decline or withdraw consent.
- V. Nurses who participated in a very similar hand-hygiene intervention study within the last 3 months

3.10 Research Tool:

The WHO hand hygiene knowledge questionnaire for healthcare workers (revised in 2009).

WHO hand hygiene perception questionnaire for health care workers (revised in 2009).

- I. Part I Demographics
- II. Part II Knowledge
- III. Part III Perception

3.11 VALIDITY AND RELIABILITY:

The WHO hand hygiene knowledge questionnaire for healthcare workers is considered a valid and reliable tool, with studies reporting good internal consistency (reliability) and evidence of content validity, construct validity, and convergent validity. Reliability is supported by measures like Guttman's Lambda-6 (e.g., (0.7)) and Cronbach's alpha (e.g., (0.80) for related scales), while validity is established through expert review for content and factor analysis for construct validity. (Sinopidis et al., 2022).

DATA COLLECTION PROCEDURE:

After obtaining approval from the Principal of Bahria Town School of Nursing Lahore an official

permission letter was submitted to the administration of Bahria International Hospital Lahore and Bahria Orchard Hospital Lahore to conduct the study. Following institutional approval, eligible participants who met the inclusion criteria were approached during their duty hours. The purpose of the study was explained to the participants, and the questionnaire was administered to 150 eligible nursing professionals selected for the study. Participants completed the self-administered questionnaire during their available time, and the completed questionnaires were collected on the same day. The collected data were checked for completeness, coded, and entered into SPSS version 23 for statistical analysis while maintaining the confidentiality and anonymity of all participants.

3.13 DATA ANALYSIS PLAN: Descriptive statistics (mean, SD, frequency, percentage) and inferential statistics (Chi-Square, Co-relation etc.) by using SPSS 23

3.14 ETHICAL CONSIDERATIONS

The rules and regulations set by the ethical committee of Bahria Town School of Nursing Lahore will be followed while conducting the research and the rights of the research participants will be respected.

Written informed consent will be taken from all the participants.

All information and data collection will be kept confidential.

Participants' identity will be kept confidential throughout the study.

The subjects will be informed that there are no disadvantages or risks on the procedure of the study.

They will also be informed that they will be free to withdraw at any time during the process of the study.

There is no known risk associated with this research.

Participants' privacy will be protected. And their identity will not be revealed in any publication resulting from this study.

The participation in this research study is voluntary. You may choose not to participate and you may withdraw your consent to participate any time. You will not be penalized in any way should you decide not you participate or to withdraw from this study.

4. RESULTS

The sample population of 150 nurses was chosen for the study from Bahria International Hospital (BIH) and Bahria orchard hospital Lahore. This chapter consists of three sections. This Section I deals with demographic characteristics, section II deals with knowledge scores, section III deals with Perception scores.

Table 4.1: Demographic Characteristics of Participants (N=150)

Variables	Categories	Frequency (n)	Percentage (%)
Age	20-24 years	96	64.0
	25-29 years	43	28.7
	30-34 years	11	7.3
	Total	150	100.0
Gender	Male	57	38.0
	Female	93	62.0
	Total	150	100.0
Marital Status	Single	111	74.0
	Married	36	24.0
	Other	3	2.0
	Total	150	100.0
Educational Level	BSN	109	72.7

	CAN	20	13.3
	Diploma	21	14.0
	Total	150	100.0
Job Title	Registered Nurse	83	55.3
	Assistant	22	14.7
	Other	45	30.0
	Total	150	100.0
Years of Experience	0-1 year	70	46.7
	1-2 years	45	30.0
	2-3 years	35	23.3
	Total	150	100.0
Ward	Medicine	51	34.0
	Surgery	28	18.7
	Critical Area	71	47.3
	Total	150	100.0

4.1 Demographic Characteristics of Participant

A total of 150 nurses participated in this study. The majority of participants (64.0%) were between 20-24 years of age while (28.7%) were aged 25-29 years and only (7.3%) were aged 30-34 years. Female nurses constituted 93 (62.0%) of the respondents whereas (38.0%) were male. With regard to marital status the majority of the participants were single (74.0%) while 24.0% were married and 2.0% belonged to other marital status categories. Concerning educational qualifications most participants (72.7%) had a BSN degree whereas 14.0% possessed diploma qualifications

and 13.3% were certified nursing assistants (CNA).

Among the respondents (55.3%) were registered nurses (14.7%) were assistants and 45 (30.0%) belonged to other nursing categories. Concerning years of experience (46.7%) nurses had 0-1 year of experience (30.0%) had 1-2 years and (23.3%) had 2-3 years of experience.

Regarding working departments (47.3%) participants were working in critical care areas (34.0%) in medical wards and (18.7%) in surgical wards.

4.2 Descriptive Statistics of Main Variables

Table 4.2 Descriptive Statistics of Study Variables (N = 150)

Variable	N	Mean (SD)
Knowledge Score	150	16.22 (+2.33)
Perception Score	150	3.09 (+0.34)
Self-Performance Score	150	8.23 (+1.46)

The mean knowledge score was 16.22 out of 25 (SD = 2.33), indicating a moderately high level of hand hygiene knowledge. The perception score averaged 3.09 on a 4-point scale (SD = 0.43), reflecting predominantly positive perceptions of hand hygiene practices. The self-performance composite score averaged 8.23 out of 12 (SD = 1.46).

4.3 Normality Testing

Shapiro-Wilk tests were conducted to assess the normality of the three study variables given the sample size of 150

Table 4.3 Shapiro-Wilk Normality Tests

variable	W Statistic	p-value
Knowledge Score	0.9642	0.0006
Perception Score	0.9753	0.0085
Self-Performance Score	0.9523	0.0001

All three variables significantly deviated from normality ($p < 0.05$). Therefore, Spearman's rank-order correlation coefficient is the primary test statistic reported in line with non-parametric assumptions. Pearson's r is also reported for comparative purposes.

Both Pearson's r and Spearman's ρ were computed for each study objective. Given the violation of normality Spearman's ρ is the definitive measure

4.4 Correlation Analysis Results

4.4.1 Objective 1: Knowledge Score vs. Self-Performance Score

Hypothesis: There is a statistically significant positive correlation between hand hygiene knowledge and self-reported performance.

Table 4.4.1 Correlation: Knowledge Score and Self-Performance Score (N = 150)

Test	Coefficient	p-value
Pearson r	0.459	< 0.001
Spearman ρ	0.429	< 0.001

A statistically significant moderate positive correlation was found between knowledge scores and self-performance scores (Spearman $\rho = 0.429$, $p < 0.001$). This indicates that nurses with higher hand hygiene knowledge tended to report better self-performance. The null hypothesis is rejected.

4.4.2. Objective 2: Perception Score vs. Self-Performance Score

Hypothesis: There is a statistically significant positive correlation between perception of hand hygiene effectiveness and self-reported performance

Table 4.4.2 Correlation: Perception Score and Self-Performance Score (N = 150)

Test	Coefficient	p-value
Pearson	0.322	< 0.001
Spearman	0.312	< 0.001

Result: A statistically significant positive correlation was found between perception scores and self-performance scores (Spearman $\rho = 0.312$, $p < 0.001$). Nurses with more positive

perceptions of hand hygiene interventions reported better self-performance though the effect size was weaker than for knowledge. The null hypothesis is rejected.

4.4.3 Additional Analysis: Knowledge Score vs. Perception Score

Table 4.4.3. Correlation: Knowledge Score and Perception Score (N = 150)

Test	Coefficient	p-value
Pearson	0.212	0.009
Spearman	0.213	0.009

A weak but significant positive correlation exists between knowledge and perception scores (Spearman rho = 0.213, p = 0.009), suggesting that

greater knowledge is associated with more positive perceptions of hand hygiene practices.

4.5 Correlation Strength Reference

Coefficient Range	Interpretation
0.00 – 0.10	Negligible
0.10 – 0.29	Weak
0.30 – 0.49	Moderate
0.50 – 0.69	Strong
0.70 – 1.00	Very Strong

(Adapted from Cohen, 1988)

4.6 Item-Level Knowledge Analysis

Table 7 presents the percentage of nurses who correctly answered each knowledge item, organized by domain.

Table 4.6. Correct Response Rates for Knowledge Items (N = 150)

Item	Description	% Correct	Performance
Domain 1: Conceptual Knowledge (Routes, Sources, Timing)			
HHK1	Main route of cross-transmission of germs	52.7%	Moderate
HHK2	Most frequent source of healthcare-associated infections	44.7%	Low
HHK3	Minimal time for handrub to kill germs	42.7%	Low
Domain 2: Five Moments – Transmission to Patient (HHK6a–d)			
HHK6a	Before touching a patient	90.7%	High
HHK6b	After body fluid exposure risk	92.0%	High
HHK6c	After exposure to patient surroundings	90.7%	High
HHK6d	Before clean/aseptic procedure	86.7%	High
Domain 3: Five Moments – Transmission to HCW (HHK7a–d)			
HHK7a	After touching a patient	89.3%	High
HHK7b	After body fluid exposure risk	81.3%	High
HHK7c	After body fluid exposure (repeated)	84.7%	High
HHK7d	After patient surroundings exposure	88.0%	High
Domain 4: Handrub vs. Handwashing Properties (HHK8a–d)			
HHK8a	Handrub is more rapid than handwashing	86.0%	High
HHK8b	Handrub causes more skin dryness (False)	27.3%	Low

HHK8c	Handrub is more effective against germs	72.0%	Moderate
HHK8d	Both methods used in sequence (False)	22.0%	Low
Domain 5: Hand Colonization Risk Factors (HHK9a–d)			
HHK9a	Wearing jewelers increases colonization	81.3%	High
HHK9b	Damaged skin increases colonization	74.7%	Moderate
HHK9c	Artificial nails increase colonization	67.3%	Moderate
HHK9d	Regular hand cream is NOT harmful (False)	36.0%	Low
Domain 6: Situational Technique Selection (HHK10a–f)			
HHK10a	Before palpation of abdomen → Rubbing	62.7%	Moderate
HHK10b	Before injection → Rubbing	40.0%	Low
HHK10c	After emptying bedpan → Washing	74.7%	Moderate
HHK10d	After removing gloves → Rubbing	31.3%	Low
HHK10e	After making patient's bed → Rubbing	34.7%	Low
HHK10f	After visible blood exposure → Washing	68.7%	Moderate

4.7 Summary of Correlation Results

Objective	Pearson r	Spearman rho	p-value	Conclusion
Obj 1: Knowledge ↔ Self-Performance	0.459	0.429	< 0.001	Significant moderate positive correlation
Obj 2: Perception ↔ Self-Performance	0.322	0.312	< 0.001	Significant weak-moderate positive correlation
Additional: Knowledge ↔ Perception	0.212	0.213	0.009	Significant weak positive correlation

DISCUSSION

This chapter focused on discussion of the current study with relevance to the literature. The basic aim of the study was to evaluate Hand Hygiene Knowledge, Perception, and Self-Reported Performance Among Nurses in a Tertiary Care Hospital, Lahore.

The present study found that nurses had a moderately high level of hand hygiene knowledge (Mean = 16.22 ± 2.33), positive perceptions regarding hand hygiene practices (Mean = 3.09 ± 0.34), and moderate self-performance scores (Mean = 8.23 ± 1.46). Similar findings were

reported by (Erasmus, Daha et al. 2010, Asadollahi, Bostanabad et al. 2015)

who observed that healthcare workers with better hand hygiene knowledge demonstrated more positive attitudes and higher compliance with infection prevention practices. Their study highlighted that education and awareness significantly improved hand hygiene behavior among healthcare professionals.

The current study also demonstrated a statistically significant moderate positive correlation between knowledge and self-performance (Spearman rho = 0.429, $p < 0.001$). These findings are consistent

with the study conducted by (Nair, Hanumantappa et al. 2014)

who found that nurses possessing greater knowledge regarding WHO hand hygiene guidelines showed significantly better compliance with hand hygiene practices. The researchers concluded that increased educational exposure positively influences nursing performance related to infection control.

Similarly, the present study identified a significant positive relationship between perception and self-performance (Spearman rho = 0.312, $p < 0.001$). Comparable results were reported by (Sax, Allegranzi et al. 2007)

who stated that healthcare workers with positive perceptions regarding the effectiveness of hand hygiene interventions were more likely to adhere to recommended hand hygiene practices. Their findings emphasized that positive attitudes and institutional support improve practical compliance.

Other than this the weak but significant correlation between knowledge and perception observed in this study (Spearman rho = 0.213, $p = 0.009$) aligns with the findings of (Allegranzi and Pittet 2009)

who reported that improved knowledge regarding infection prevention strategies contributes to more favorable perceptions and attitudes toward hand hygiene among healthcare workers.

The item-level analysis of the current study showed high correct responses regarding WHO "Five Moments of Hand Hygiene," while lower scores were observed in conceptual knowledge and technique selection items. Similar patterns were identified by (Ariyaratne, Gunasekara et al. 2015) who reported that nurses were generally familiar with routine hand hygiene indications but lacked detailed conceptual understanding regarding hand rub effectiveness, duration, and appropriate technique selection.

Demographically, the majority of participants in the current study were young female nurses with limited years of experience. Similar findings were reported by (Asadollahi, Bostanabad et al. 2015) where most participants were female nurses and nurses with higher educational levels demonstrated better knowledge regarding hand

hygiene practices. The study further emphasized that education and institutional support positively influence infection prevention behaviors among nurses.

Overall, the findings of the current study are supported by previous international literature indicating that improved knowledge and positive perceptions are associated with better hand hygiene performance among nurses. These findings reinforce the importance of continuous educational interventions, practical training sessions, and institutional infection control policies to improve compliance with hand hygiene standards in healthcare settings.

The moderate positive correlation between knowledge and self-performance (Spearman rho = 0.429, $p < 0.001$) indicates that higher levels of hand hygiene knowledge are associated with better self-reported compliance. This is consistent with findings in the literature which suggest that targeted educational interventions can improve both knowledge and practice. However the relationship is not deterministic knowledge alone is insufficient to ensure optimal performance as behavioral environmental and organizational factors also play key roles.

The weaker but still significant correlation between perception and self-performance (Spearman rho = 0.312, $p < 0.001$) suggests that positive attitudes toward hand hygiene interventions (such as leadership support reminders and feedback mechanisms) are associated with better self-reported practice. This finding highlights the importance of creating an institutional culture that values and promotes hand hygiene.

Item-level analysis revealed specific gaps: correct response rates were notably low for items on skin colonization misconceptions (HHK8b: 27.3%; HHK8d: 22.0%) appropriate use of rubbing vs. washing technique in specific scenarios (HHK10d: 31.3%; HHK10e: 34.7%) and foundational conceptual knowledge (HHK3: 42.7%). These areas should be prioritized in future training programs.

5. CONCLUSION, RECOMMENDATION, LIMITATION

5.1 Conclusion:

Both study objectives yielded statistically significant findings:

1. Objective 1 confirmed: A significant moderate positive correlation exists between knowledge scores and self-performance scores (Spearman rho = 0.429, $p < 0.001$).
2. Objective 2 confirmed: A significant positive correlation exists between perception scores and self-performance scores (Spearman rho = 0.312, $p < 0.001$).

These findings support the development of multi-component hand hygiene improvement programs that combine knowledge building with strategies that address perception institutional culture and behavioral reinforcement.

5.2 Recommendations

1. Regular educational and refresher training programs should be conducted to improve nurses knowledge of hand hygiene particularly regarding the WHO Five Moments of Hand Hygiene appropriate hand hygiene techniques and the correct use of alcohol-based hand rubs.
2. Infection Prevention and Control (IPC) teams should conduct regular monitoring hand hygiene audits, and constructive feedback sessions to strengthen nurses compliance with recommended hand hygiene practices.
3. Hospital management should ensure the continuous availability of hand hygiene resources, including alcohol-based hand rubs, soap handwashing facilities and educational materials to facilitate proper hand hygiene practices in all clinical areas.
4. Nursing supervisors and hospital administrators should promote a positive hand hygiene culture by providing leadership support encouraging compliance, and serving as role models for infection prevention practices.
5. Future educational interventions should focus on the specific knowledge gaps identified in this study particularly the correct duration of hand rubbing the appropriate selection of hand rubbing versus hand washing in different clinical situations

and misconceptions related to hand hygiene practices.

5.3 Limitations

1. The self-performance percentage variable (HHK25) was entirely missing from the dataset and could not be included in the analysis. A composite proxy score was constructed instead.
2. Self-reported performance data are susceptible to social desirability bias; observed compliance rates may differ.
3. The cross-sectional design limits causal inferences between knowledge perception, and performance.
4. The sample was drawn from a single tertiary care hospital in Lahore which may limit generalizability.

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