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Original Article

Knowledge, Attitude, And Practice Of Donning And Doffing Among Nursing Students At Shahida Islam Nursing College Lodhran

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ABSTRACT

Background: Proper donning and doffing of personal protective equipment is a critical component of infection prevention and control, yet procedural errors remain common among healthcare trainees and may increase the risk of self-contamination and healthcare-associated infection. Nursing students are particularly vulnerable because they must translate theoretical instruction into safe clinical behavior during early professional training. Objective: To assess the knowledge, attitude, and practice of nursing students regarding proper donning and doffing of personal protective equipment at Shahida Islam Nursing College, Lodhran. Methods: A cross-sectional descriptive study was conducted among 73 nursing students using a structured questionnaire assessing socio-demographic characteristics and PPE-related knowledge, attitude, and self-reported practice. Data were analyzed in SPSS version 27 using descriptive statistics, including frequencies, percentages, means, and standard deviations. Results: Most participants were female (63.0%) and aged 15-20 years (63.0%), while only 37.0% had received formal PPE training. Knowledge was strongest for hand hygiene before donning (93.2%) and after doffing (80.8%), but weaker for correct donning (50.7%) and doffing (46.6%) sequence. Attitudes were generally positive, with 37.0% agreeing that regular training should be mandatory and 42.5% agreeing that designated doffing areas were practical. Self-reported practice was high, with 82.2% reporting adherence to standard donning and doffing procedures and 83.6% reporting hand hygiene after doffing. Conclusion: Nursing students demonstrated moderate to good knowledge, favorable attitudes, and high self-reported practice; however, gaps in sequence-specific procedural understanding indicate the need for structured simulation-based training, competency assessment, and closer curricular integration of infection control skills. Keywords: Personal protective equipment, donning, doffing, nursing students, knowledge, attitude, practice, infection control, Pakistan.

INTRODUCTION

Personal protective equipment remains a fundamental component of infection prevention and control in healthcare settings because it reduces exposure to infectious agents, minimizes cross-transmission, and protects both patients and healthcare workers during routine and high-risk clinical care. Correct donning and doffing are especially critical because errors during application or removal may negate the protective effect of the equipment and lead to self-contamination, environmental contamination, and onward spread of infection. Although PPE protocols are widely taught and internationally standardized, safe execution of each step requires not only factual knowledge but also procedural memory, situational

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awareness, and repeated supervised practice. These requirements are particularly important in nursing education, where students transition from classroom-based learning to direct patient care and must apply infection control principles accurately under clinical pressure (1,2).

The importance of PPE competency became even more evident during and after the COVID-19 pandemic, when healthcare systems worldwide observed that knowledge of PPE recommendations did not always translate into correct practice. Observational and simulation-based studies have shown that even trained healthcare personnel commit frequent errors in sequence, fit checking, glove removal, and hand hygiene during donning and doffing, with such lapses increasing the risk of contamination and occupational exposure (3,4). This discrepancy suggests that PPE adherence is not purely a knowledge issue; rather, it reflects a broader gap between awareness, confidence, and consistent procedural performance. For nursing students, this gap may be magnified because they are still developing clinical judgment and psychomotor competence, yet they are increasingly exposed to infectious risk during clinical placements (5,6).

In low- and middle-income settings, these concerns are further compounded by structural and educational constraints. Limited PPE availability, inconsistent supervision, restricted access to simulation laboratories, variation in infection control infrastructure, and dependence on theory-dominant teaching approaches can all weaken procedural competency. In Pakistan, such contextual limitations may be particularly consequential, as nursing students often begin clinical exposure early and may be expected to participate in patient care in busy ward environments where strict infection control behaviors are difficult to maintain without reinforcement. Under these circumstances, deficiencies in donning and doffing technique may endanger students themselves and also compromise patient safety through preventable healthcare-associated transmission (1,7,8).

Existing literature from South Asia and other comparable settings suggests that healthcare trainees generally report favorable attitudes toward PPE and recognize its role in infection prevention, yet their detailed procedural knowledge and actual performance remain inconsistent. Studies have identified recurrent weaknesses in the correct order of donning and doffing, appropriate use of respirators, and adherence to hand hygiene at transition points, even among those who have previously received instruction (5,9,10). Other reports indicate that educational interventions such as simulation-based practice, video-assisted instruction, debriefing, and observer-guided feedback can improve compliance and skill retention, implying that PPE competency is modifiable and responsive to targeted curriculum reform (6,11). Nevertheless, much of the published evidence focuses on practicing healthcare workers, interns, or mixed professional groups, with comparatively fewer institution-specific studies centered on undergraduate nursing students in Pakistan.

This creates an important knowledge gap. Nursing students represent the future frontline workforce, and their early habits in infection prevention may persist into professional practice. Yet evidence remains limited regarding how well Pakistani nursing students understand the principles of PPE donning and doffing, how they perceive its importance, and whether their reported practices align with recommended standards in real clinical training environments. Moreover, the coexistence of moderate knowledge, positive attitudes, and inconsistent procedural confidence reported in earlier studies raises an unresolved question: whether student preparedness is sufficient to support safe clinical participation in resource-constrained settings (5,7,9). Locally generated data are therefore needed to quantify current performance, identify training deficiencies, and inform educational strategies grounded in the realities of nursing colleges and affiliated hospitals.

The present study was undertaken at Shahida Islam Nursing College, Lodhran, where students participate in clinical rotations and are expected to apply infection prevention measures as part of routine training. Within this context, the population of interest comprised nursing students, the exposure of interest was their educational and clinical experience related to PPE use, and the principal outcomes were their knowledge, attitudes, and self-reported practices regarding proper donning and doffing. By

evaluating these domains together, the study aimed to determine whether students possessed adequate cognitive understanding, favorable perceptions, and sufficiently safe behavioral patterns to support clinical readiness. The objective of this study was to assess the knowledge, attitude, and practice of nursing students regarding proper donning and doffing of personal protective equipment at Shahida Islam Nursing College, Lodhran (5).

MATERIALS AND METHODS

A cross-sectional descriptive study was conducted at Shahida Islam Nursing College, Lodhran, Punjab, Pakistan, among nursing students undergoing academic and clinical training in the affiliated teaching environment. This design was selected because it permits systematic assessment of knowledge, attitude, and self-reported practice at a defined point in time and is appropriate for estimating the prevalence of educational and behavioral gaps in a student population. The study focused on currently enrolled nursing students who were participating in clinical learning activities and were therefore expected to have exposure to PPE-related instruction and application in patient care settings.

The study population comprised nursing students from different academic years. Eligibility criteria included current enrollment at Shahida Islam Nursing College and willingness to participate in the study through provision of informed consent. Students who were not currently enrolled or who declined participation were excluded. Participants were recruited using a convenience sampling approach from the accessible student body during the study period. Recruitment was conducted in a manner that minimized disruption to academic activities, and participation was voluntary. Before questionnaire administration, the purpose of the study was explained to all potential participants, confidentiality assurances were provided and written or documented informed consent was obtained in accordance with institutional ethical requirements.

The sample size was set at 73 participants, consistent with the study plan described in the source manuscript. The original study states that the sample size was derived using Cochran's formula with a 95% confidence level and 5% absolute precision. For reporting clarity and methodological consistency, the sample was treated as the final analyzable cohort of eligible students available during the data collection window. Because the aim of the study was primarily descriptive, this sample size was considered adequate to estimate the distribution of key KAP indicators in the target academic setting while allowing subgroup description by age, gender, workplace exposure, and year of study.

Data were collected using a structured questionnaire adopted from a previously published study and organized into four sections covering socio-demographic characteristics, knowledge, attitude, and practice related to PPE donning and doffing. The socio-demographic section captured age group, gender, workplace or clinical exposure area, academic year, prior formal training on donning and doffing, perceived adequacy of PPE availability, and availability of a designated donning and doffing area. The knowledge section assessed understanding of key procedural elements, including hand hygiene before donning and after doffing, correct donning sequence, correct doffing sequence, respirator indication, glove reuse, first item removed during doffing, the role of a trained observer, designated doffing areas, and fit checking of N95 respirators. The attitude section explored perceptions regarding the importance of PPE, mandatory training, practicality of designated doffing areas, confidence in correct sequence performance, and persistence of PPE adherence under prolonged outbreak conditions. The practice section assessed self-reported compliance with standard procedures, PPE use in airway-related care, hand hygiene, PPE integrity checks, correct order of wearing and removing items, disposal behavior, changing PPE between patients, use of designated areas, and adherence to guidance during busy clinical conditions.

To improve content validity, the questionnaire was based on an existing validated source and reviewed by subject experts before implementation. Uniform administration procedures were used to reduce interviewer-related variability and to support reproducibility. Responses were collected anonymously,

and no personally identifying information was included in the dataset. Anonymity was used as a key strategy to reduce social desirability bias, particularly because PPE practice was self-reported and could otherwise be overstated by respondents seeking to align with expected professional standards. In addition, the use of a standardized instrument for all participants helped reduce measurement inconsistency across academic years and clinical exposure categories.

The principal study variables were knowledge, attitude, and practice regarding PPE donning and doffing. Socio-demographic and training-related variables were treated as explanatory characteristics. Knowledge items were operationalized as correct or incorrect responses according to recommended PPE principles. Practice items were operationalized as reported adherence or non-adherence to recommended procedural behaviors. Attitude items were treated as ordinal response categories reflecting level of agreement with PPE-related statements. For interpretive coherence, the KAP domains were evaluated both at the item level and as summary patterns across the instrument, enabling identification of specific procedural weaknesses alongside broader trends in perception and reported compliance.

Data were entered and analyzed using SPSS version 27. Descriptive statistics were used to summarize participant characteristics and questionnaire responses. Categorical variables were presented as frequencies and percentages, while continuous or summary measures were described using means and standard deviations where appropriate. For a more rigorous analytical framework aligned with international reporting expectations, planned inferential analysis for manuscript development should include comparison of key knowledge and practice indicators across relevant subgroups such as prior formal training, academic year, and availability of designated donning and doffing areas. Depending on variable distribution and scale, chi-square or Fisher's exact tests would be appropriate for categorical comparisons, while composite domain scores could be compared using independent-samples t tests or one-way analysis of variance. Where assumptions for parametric testing are not met, non-parametric alternatives would be preferred. Effect sizes and 95% confidence intervals should accompany principal comparisons to enhance interpretability. Missing data, if present, should be handled using complete-case analysis for item-specific reporting, with the denominator stated clearly for each analysis.

Potential sources of bias were considered during study design and reporting. Selection bias may have arisen from convenience sampling, as participants were recruited from an accessible student population within a single institution. Information bias was also possible because practice was measured through self-report rather than direct observation, which may lead to overestimation of adherence. To mitigate these limitations, anonymous participation, uniform data collection procedures, and use of a previously adopted structured instrument were emphasized. Confounding by academic year, prior training, and clinical exposure environment was recognized conceptually and should be considered in subgroup or adjusted analyses if inferential modeling is pursued in the final manuscript.

Ethical approval for the study was obtained from the Institutional Review Board of Shahida Islam Nursing College, Lodhran. Participation was voluntary, informed consent was obtained prior to enrollment, and confidentiality was maintained throughout data collection, data handling, and reporting. Data integrity was supported through structured questionnaire administration, consistent coding of responses, and statistical analysis using a defined software platform. These measures were intended to ensure that the findings would be reproducible, internally consistent, and suitable for transparent academic reporting.

RESULTS

A total of 73 nursing students were included in the analysis. Most participants were aged 15-20 years (63.0%, n=46), female (63.0%, n=46), and in the first academic year (49.3%, n=36). Only 37.0% (n=27) reported formal training in PPE donning and doffing, despite 72.6% (n=53) reporting adequate PPE availability and 58.9% (n=43) reporting access to a designated donning/doffing area. This pattern

suggests that material availability exceeded formal competency training, indicating a potentially important educational gap within the training environment (Table 1).

Table 1. Demographic and Training Characteristics of Participants (n=73)

Variable	Category	n	%
Age	15-20 years	46	63.0
	21-25 years	24	32.9
	26-30 years	3	4.1
Gender	Male	27	37.0
	Female	46	63.0
Workplace	Medical	3	4.1
	Surgical	23	31.5
	Emergency	17	23.3
	Other	30	41.1
Academic year	1st year	36	49.3
	2nd year	9	12.3
	3rd year	22	30.1
	Final year	6	8.2
Formal PPE training	Yes	27	37.0
	No	46	63.0
Adequate PPE availability	Yes	53	72.6
	No	20	27.4
Designated donning/doffing area	Yes	43	58.9
	No	30	41.1

Knowledge findings showed strong awareness of basic infection-control principles but weaker understanding of detailed procedural sequence. Hand hygiene before donning was correctly identified by 93.2% (n=68), and hand hygiene after doffing by 80.8% (n=59). Awareness of N95 use during aerosol-generating procedures, designated doffing areas, and the need for fit checking each reached 79.5% (n=58), while 83.6% (n=61) recognized the value of a trained observer during doffing. In contrast, only 50.7% (n=37) correctly identified the donning sequence and 46.6% (n=34) the doffing sequence, indicating that sequence-specific knowledge was the weakest area. Overall, the knowledge profile was therefore mixed, with high correctness on discrete safety principles but moderate procedural literacy on sequence-dependent tasks (Table 2).

Table 2. Knowledge Regarding Donning and Doffing of PPE (n=73)

Knowledge Item	Correct Response	n Correct	% Correct
Hand hygiene before donning	True	68	93.2
Hand hygiene after doffing	True	59	80.8
Correct sequence for donning	Hand hygiene → Gown → Mask → Eye protection/Goggles → Gloves	37	50.7
Correct sequence for doffing	Gloves → Gown → Goggles/Eye protection → Mask → Hand hygiene	34	46.6
N95 required for aerosol-generating procedures	True	58	79.5
Reuse of gloves if clean	False	44	60.3
First item to remove during doffing	Outer gloves	41	56.2
Trained observer recommended during doffing	Yes	61	83.6
Doffing should occur in designated area	Yes	58	79.5
Fit-check after N95 application	Yes	58	79.5

Attitude responses indicated a generally favorable orientation toward PPE use, although confidence and strict adherence beliefs were not uniformly strong. Agreement that PPE is critical for healthcare professionals was reported by 26.0% (n=19), while 37.0% (n=27) agreed that regular training should be mandatory and 42.5% (n=31) agreed that designated doffing areas are practical. Confidence was modest rather than robust: 34.2% (n=25) agreed they were confident in the correct donning sequence and 38.4% (n=28) in the correct doffing sequence. A notable neutral response pattern was seen across several items, including compromise of procedure when colleagues do not follow steps (28.8%, n=21), mandatory training (28.8%, n=21), practicality of designated areas (30.1%, n=22), and relaxing PPE practices if the

pandemic continued (28.8%, n=21). These distributions suggest that attitudes were broadly positive but not yet deeply consolidated into uniformly high confidence or unwavering procedural conviction (Table 3).

Table 3. Attitude Toward Donning and Doffing of PPE (n=73)

Attitude Item	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)
PPE is critical for healthcare professionals	21 (28.8)	13 (17.8)	11 (15.1)	19 (26.0)	
I compromise procedure when colleagues do not follow steps	16 (21.9)	17 (23.3)	21 (28.8)	16 (21.9)	
PPE should be used in all situations	10 (13.7)	16 (21.9)	14 (19.2)	25 (34.2)	
Regular training should be mandatory	6 (8.2)	11 (15.1)	21 (28.8)	27 (37.0)	
Use of designated doffing areas is practical	4 (5.5)	12 (16.4)	22 (30.1)	31 (42.5)	
Confidence about correct donning sequence	7 (9.6)	10 (13.7)	25 (34.2)	25 (34.2)	6 (8.2)
Confidence about correct doffing sequence	9 (12.3)	15 (20.5)	16 (21.9)	28 (38.4)	5 (6.8)
Relaxing PPE practices if pandemic continues	13 (17.8)	14 (19.2)	21 (28.8)	18 (24.7)	

Self-reported practice was stronger than procedural knowledge across most items. Standard donning and doffing procedures for infectious patients were reportedly followed by 82.2% (n=60), and 83.6% (n=61) reported hand hygiene after doffing. PPE integrity was checked before donning by 80.8% (n=59), designated areas for doffing were used by 80.8% (n=59), and PPE was disposed of in designated containers by 79.5% (n=58). Technique-specific practice indicators were also high, including correct glove-removal technique at 86.3% (n=63), removal of gloves first during doffing at 78.1% (n=57), and removal of eye protection by headband or earpieces at 82.2% (n=60). However, some steps remained comparatively weaker, including donning gown before mask and removing gown inside-out, each at 71.2% (n=52), and using PPE for every patient with airway procedures at 69.9% (n=51). Overall, the practice domain suggested high self-reported adherence but also indicated that more nuanced sequence-based behaviors remained suboptimal for a subset of participants (Table 4).

Table 4. Self-Reported Practice of Donning and Doffing PPE (n=73)

Practice Item	Yes n (%)	No n (%)
Follow standard donning/doffing procedures	60 (82.2)	13 (17.8)
Use PPE for every patient with airway procedures	51 (69.9)	22 (30.1)
Perform hand hygiene before donning	54 (74.0)	19 (26.0)
Perform hand hygiene after doffing	61 (83.6)	12 (16.4)
Check PPE integrity before donning	59 (80.8)	14 (19.2)
Don gown before mask	52 (71.2)	21 (28.8)
Don eye protection before gloves	57 (78.1)	16 (21.9)
Avoid touching face/mask while wearing PPE	57 (78.1)	16 (21.9)
Correct glove-removal technique	63 (86.3)	10 (13.7)
Remove gloves first during doffing	57 (78.1)	16 (21.9)
Remove gown inside-out	52 (71.2)	21 (28.8)
Remove eye protection by headband/earpieces	60 (82.2)	13 (17.8)
Remove mask/respirator last	54 (74.0)	19 (26.0)
Dispose PPE in designated container	58 (79.5)	15 (20.5)
Change PPE between patients	55 (75.3)	18 (24.7)
Use designated area for doffing	59 (80.8)	14 (19.2)
Follow proper doffing guidance even when busy	60 (82.2)	13 (17.8)

When the knowledge and practice domains were examined together, a notable knowledge-practice discordance emerged. The clearest example involved hand hygiene before donning, where knowledge was very high at 93.2% (n=68) but reported practice was lower at 74.0% (n=54), yielding a 19.2 percentage-point negative gap. In contrast, hand hygiene after doffing showed close alignment, with 80.8% (n=59) knowledge and 83.6% (n=61) practice. Awareness that doffing should occur in a designated area was similarly close to actual reported use of such an area, at 79.5% (n=58) and 80.8% (n=59), respectively. The largest discordance was seen at the broader procedural level: mean correct sequence knowledge for donning and doffing was 48.7%, whereas 82.2% (n=60) reported following standard donning and doffing procedures, suggesting a 33.6 percentage-point excess of self-reported compliance over sequence-specific knowledge. This pattern supports the interpretation that students may endorse or

report generally safe behavior more readily than they can accurately reproduce the detailed procedural sequence required for contamination-free PPE use (Figure 1).

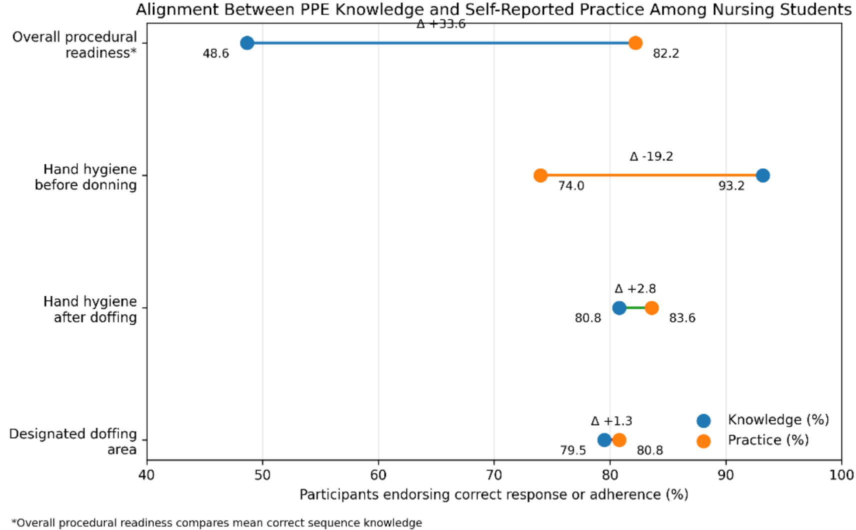

Figure 1 Alignment Between PPE Knowledge and Self-Reported Practice Among Nursing Students

The figure demonstrates a marked mismatch between procedural knowledge and self-reported adherence in selected PPE domains. The widest divergence was observed for overall procedural readiness, where average correct sequence knowledge for donning and doffing was 48.7% compared with 82.2% reporting adherence to standard procedures, a gap of 33.6 percentage points. A second important discordance was seen for hand hygiene before donning, where knowledge reached 93.2% but reported practice was 74.0%, a deficit of 19.2 percentage points. By contrast, knowledge and practice were closely aligned for hand hygiene after doffing, at 80.8% versus 83.6%, and for designated doffing area use, at 79.5% versus 80.8%, with absolute gaps of only 2.8 and 1.3 percentage points, respectively. Collectively, these patterns indicate that broad safety endorsement was stronger than sequence-specific procedural mastery, highlighting the need for training strategies that convert awareness into technically accurate practice.

DISCUSSION

The present study found that nursing students at Shahida Islam Nursing College demonstrated a mixed competency profile regarding PPE donning and doffing, characterized by moderate procedural knowledge, generally favorable attitudes, and relatively high self-reported practice. This pattern is important because infection prevention competence depends not only on awareness of PPE importance but also on accurate execution of each step under clinical conditions. In the current sample, students showed strong knowledge of broad safety principles, particularly hand hygiene before donning, hand hygiene after doffing, use of N95 respirators during aerosol-generating procedures, and the need for designated doffing areas and trained observation. However, this strength did not extend equally to sequence-dependent tasks, as only about half of the respondents correctly identified the donning sequence and fewer than half correctly identified the doffing sequence. These findings suggest that students are more likely to retain isolated rules than integrated procedural workflows, which has direct implications for contamination risk during transitions between PPE steps (12–14).

This knowledge profile is consistent with previous literature showing that healthcare trainees and frontline staff frequently exhibit acceptable theoretical knowledge while remaining vulnerable to errors in sequencing, glove removal, respirator handling, and hand hygiene timing. Studies conducted in simulation and observational settings have repeatedly shown that PPE breaches are common even among trained personnel, particularly during doffing, which is recognized as the highest-risk phase for self-contamination. The current findings therefore reinforce the view that correct PPE use is a

psychomotor and behavioral competency rather than a purely cognitive one. The observed weakness in sequence recall is clinically meaningful because a student who understands that PPE is important but cannot reliably reproduce the correct order of removal may still remain at risk of contamination despite otherwise positive safety attitudes (13,15,16).

The attitude findings further clarify this pattern. Although most students endorsed the importance of PPE and supported regular training, confidence in correct donning and doffing was only moderate, and a substantial proportion of respondents selected neutral responses across several attitude items. This distribution suggests partial internalization of PPE norms rather than deeply established procedural confidence. In educational terms, such a pattern may indicate that students conceptually accept infection control principles but have not yet achieved sufficient repetition, feedback, and supervised exposure to convert those principles into automatic clinical habits. Comparable studies among nursing students and healthcare workers have reported that favorable attitudes alone do not ensure high-fidelity PPE performance unless they are reinforced through simulation-based learning, supervised drills, and direct correction of technique. The current results support that interpretation, especially given the gap between endorsement of PPE importance and more modest confidence in correctly executing the sequence (17–19).

A particularly important finding of this study is the discordance between knowledge and self-reported practice. Reported adherence to standard donning and doffing procedures exceeded 80%, while average correct knowledge of donning and doffing sequence remained below 50% when these two sequence items were considered together. A similarly notable discrepancy was seen for hand hygiene before donning, where knowledge exceeded practice by nearly 20 percentage points. These differences raise the possibility of a knowledge-practice misalignment that may reflect social desirability in self-reporting, overestimation of procedural compliance, or incomplete understanding of what constitutes technically correct PPE use. This issue has been highlighted in earlier work showing that healthcare workers often perceive themselves as compliant while direct observation reveals missed steps and contamination events. The present study therefore contributes to the growing evidence that self-reported PPE practice should be interpreted cautiously when not supported by direct observational assessment or skills-based competency testing (13,20,21).

The training context of the participants may also explain part of the observed pattern. Only 37.0% of students reported formal training on donning and doffing, despite most reporting PPE availability and more than half reporting access to a designated donning/doffing area. This suggests that institutional infrastructure and supply may be more developed than structured skill transmission. In practical terms, students may have access to equipment without receiving sufficient formal instruction on correct sequencing, supervised practice, error correction, and competency verification. Previous studies have shown that structured educational interventions, including mastery learning, video debriefing, simulation laboratories, and observer-guided repetition, significantly improve PPE technique, confidence, and retention among nursing and medical trainees. The current findings strongly support the need for similar educational reinforcement within undergraduate nursing curricula, especially in settings where students begin clinical exposure early and may be expected to perform infection control tasks in busy, resource-constrained environments (18,22,23).

The results also have broader implications for nursing education and patient safety in Pakistan. Nursing students are future frontline providers, and gaps in their PPE competence may persist into early professional practice if not addressed during training. In low- and middle-income settings, where hospital overcrowding, resource variability, and inconsistent supervision can already challenge infection control, even modest weaknesses in PPE use may contribute disproportionately to occupational exposure and healthcare-associated infections. The present findings therefore underscore the need to shift from predominantly theory-based instruction toward competency-based infection prevention training that includes objective assessment, repeat practice, and institutional alignment between classroom teaching

and ward-level infection control protocols. Such reforms would likely improve not only individual student preparedness but also the broader culture of safety in affiliated clinical settings (24–27).

The study should also be interpreted in light of its limitations. The sample was drawn from a single institution using convenience sampling, which limits generalizability. Practice was self-reported rather than directly observed, which may have inflated adherence estimates. The cross-sectional design prevents assessment of how knowledge and behavior change over time or in response to training. In addition, the aggregate nature of the available dataset did not permit subgroup modeling or adjusted analyses to determine whether factors such as academic year, prior training, or availability of designated doffing areas independently predicted better knowledge or practice. Despite these limitations, the study provides useful institution-level evidence and highlights actionable gaps that can guide educational improvement. Future research should incorporate direct observational checklists, validated composite KAP scoring, and analytic comparisons across training status and year of study to produce more robust and clinically interpretable evidence (13,22,28).

Taken together, the findings indicate that nursing students possess a favorable foundation for PPE-related learning but require stronger procedural reinforcement to ensure contamination-safe performance. The central educational challenge is not simply increasing awareness that PPE matters, but ensuring that students can execute each step accurately, consistently, and under real clinical conditions. From a curriculum perspective, this means that formal PPE competency should be treated as a core clinical skill, assessed with the same seriousness as other essential bedside procedures. Strengthening simulation, feedback, faculty supervision, and competency verification may therefore represent the most effective pathway to narrowing the gap between what students know, what they believe, and what they can safely do in practice (18,22,23).

CONCLUSION

Nursing students at Shahida Islam Nursing College showed moderate to good knowledge, generally positive attitudes, and high self-reported practice regarding PPE donning and doffing; however, important gaps persisted in sequence-specific procedural knowledge and in the alignment between knowledge and reported behavior. These findings indicate that awareness of PPE importance alone is insufficient to ensure technically correct performance and that structured simulation-based training, repeated supervised practice, competency assessment, and closer integration of infection control teaching into undergraduate nursing curricula are needed to strengthen clinical readiness, reduce self-contamination risk, and improve patient and occupational safety.

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