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KNOWLEDGE AND PRACTICES OF UNDERGRADUATE NURSING STUDENTS REGARDING PATIENT SAFETY IN SWAT, PAKISTAN: A CROSS-SECTIONAL STUDY

Zaifullah Khan[*1], Rizwan Ullah[2], Asmat Ullah[3], Hafsa BiBi[4], Bilal Fazal[5], Maaz Khan[6], Majid Shah[7], Abdul Rehman[8]

[*1]*Assistant Professor and Principal, Tasleem College of Nursing, Swat.*
[2,3,4,5,6,7]*BScN Student, Malakand College of Nursing, Swat*
[8]*Assistant Professor and Principal Malakand College of Nursing, Swat*

[*1]zaifullah.khan23@alumni.aku.edu

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Corresponding Author: * Zaifullah Khan

Abstract

Background: *Patient safety remains a critical component of effective healthcare delivery. Despite global initiatives to improve safety, evidence suggests that undergraduate nursing curricula often lack a comprehensive integration of patient safety concepts, potentially compromising students' competencies*

Objectives: *The study aimed to evaluate nursing students' understanding of patient safety principles and identify gaps in the nursing curriculum concerning patient safety education in Pakistan.*

Methodology: *A cross-sectional descriptive study was conducted with 218 undergraduate nursing students using a non-probability convenience sampling technique. Data were collected via a structured questionnaire and analyzed using SPSS version 26.0.*

Results: *Findings revealed that 77.1% (n=168) of participants had received formal patient safety training, while 22.9% (n=50) had not. The mean patient knowledge score was 65.2% (SD 12.4). Key knowledge gaps were identified in medication safety (68.3% strongly agreed on the "Five Rights"), infection control (62.8% believed PPE adherence was consistent), and incident reporting (86.2% agreed it was crucial). However, only 73.9% were familiar with International Patient Safety Goals (IPSG), and 26.6% misunderstood "near-miss" events.*

Conclusion: *While nursing students demonstrated foundational knowledge of patient safety, significant gaps remain in practical application and curriculum integration. Recommendations include enhancing simulation-based training, fostering a safety culture, and strengthening clinical mentorship.*

INTRODUCTION

Background and Significance

Patient safety has emerged as a global healthcare priority following seminal reports such as *To Err is Human* (Institute of Medicine, 2000), which revealed that medical errors cause more deaths annually than motor vehicle accidents. The World Health Organization (2023) estimates that unsafe care results in 2.6 million deaths each year in low- and middle-income countries alone. In Pakistan, where healthcare systems face chronic understaffing and resource

constraints (Khowaja et al., 2015), nursing students often serve as frontline caregivers, making their patient safety competencies particularly crucial.

Nursing education plays a pivotal role in shaping future practitioners' ability to prevent errors. However, studies across Asia indicate inconsistent integration of patient safety into nursing curricula (Tella et al., 2014). While theoretical knowledge is commonly taught, opportunities for practical application remain limited (Stevanin et al., 2015). This theory-practice gap assumes greater significance in regions like Swat, where nursing students frequently encounter high patient loads with minimal supervision.

Problem Statement

Despite growing recognition of patient safety's importance, Pakistani nursing education lacks standardized patient safety training modules. A preliminary review of curricula at three nursing colleges revealed that while concepts like infection control are covered, critical areas such as error reporting and systems thinking receive scant attention. This oversight is concerning given that medication errors account for 28% of preventable adverse events in Pakistani hospitals (Qureshi et al., 2022).

Moreover, cultural factors unique to the region—including hierarchical workplace dynamics and fear of reprisal—may discourage students from questioning unsafe practices or reporting errors (Jafree et al., 2021). These systemic and educational gaps necessitate empirical investigation to inform curriculum development and policy reforms.

Study Objectives

This study aimed to:

1. Assess undergraduate nursing students' knowledge of core patient safety principles
2. Evaluate self-reported adherence to safety protocols in clinical practice
3. Identify gaps between theoretical knowledge and practical application
4. Provide evidence-based recommendations for nursing education reforms

Literature Review

Multiple international studies reveal that nursing students often exhibit moderate foundational knowledge of patient safety, with pronounced weaknesses in systems-based and non-technical skills. Dimitriadou et al. (2021) compared nursing cohorts in Cyprus and Greece, finding moderate understanding of safety principles but gaps in teamwork and error-reporting knowledge. In Iran, Torkaman et al. (2022) showed that formal patient safety instruction significantly improved students' competencies; however, such curricula remain sporadic. A systematic review by Nie et al. (2011) concluded that while safety competencies are recognized as essential, formal education on patient safety for pre-licensure nursing and medical students is often ad hoc and lacks standardization.

In low- and middle-income countries, cultural and resource constraints further challenge safety education. For example, Wong and Freischlag (2010) found that though structured programs in resource-rich settings increased knowledge, many trainees globally still rely on informal or inconsistent instruction. In Pakistan, general medical student surveys (Mahmood et al., 2022) and limited nursing program evaluations (Akbar et al., 2021; Qadri et al., 2022) suggest modest awareness of safety topics, yet highlight the need for integrated, experiential learning (e.g., simulation, team-based exercises) to reinforce theoretical knowledge.

Conceptual Framework

Milligan (2007) underscored that patient safety education must extend beyond individual technical skills (e.g., hand hygiene) to systems thinking, interprofessional collaboration, and leadership. The Swiss Cheese Model (Reason, 2000) illustrates how latent system failures align to produce adverse events, underscoring the necessity of robust error-reporting mechanisms and a non-punitive safety culture. Additionally, the WHO's International Patient Safety Goals (World Health Organization, 2023) provide a global standard for safety protocols—such as surgical checklists and medication rights—that nursing curricula should embed longitudinally.

Curricular Gaps in Pakistan

Although leading institutions such as Aga Khan University have piloted patient safety modules, national curricula for Bachelor of Science in Nursing (BSN) programs in Pakistan remain inconsistent in covering safety concepts. In particular, students often lack exposure to standardized checklists (e.g., WHO Surgical Safety Checklist), structured fall-prevention protocols, and formal error-reporting systems (Milligan, 2007; Nie, 2011; World Health Organization, 2023). Without experiential reinforcement—such as simulation or supervised clinical debriefings—students may fail to translate theoretical knowledge into practice, potentially perpetuating unsafe care.

Methodology

Design and Setting

A descriptive, cross-sectional survey was conducted between September and November 2024 at a Tertiary Care Teaching Hospital in Swat, Khyber Pakhtunkhwa, Pakistan where students from all nursing colleges of Swat get clinical training.

Participants and Sampling

The target population comprised all undergraduate nursing students (2nd year through internship) during the study period. Using OpenEpi software, a sample size of 218 was calculated with a 95% confidence level, 5% margin of error, and 50% anticipated frequency, adjusted for a 10% attrition rate. Ultimately, 218 participants consented and completed the questionnaire. Non-probability convenience sampling was employed, enrolling students who were available during data collection sessions and met inclusion criteria.

Instrument

The structured, self-administered questionnaire (in English) was partially adapted from WHO's Patient Safety Curriculum Guide and the Health-Professions Education Patient Safety Survey (H-PEPSS). It consisted of five sections:

1. **Demographics (Section A):** Age (18–23, 24–29), gender, year of study (1st–4th), prior clinical exposure (yes/no).

2. **General Patient-Safety Concepts (Section B):** Multiple-choice items assessing definitions of patient safety and recognition of WHO's International Patient Safety Goals.

3. **Domain-Specific Knowledge (Section C):** True/False or multiple-choice on infection prevention (e.g., hand-hygiene indications), medication safety (e.g., five rights), pressure-ulcer prevention, near-miss vs. adverse-event differentiation.

4. **Communication and Reporting Behaviors (Section D):** Likert-scale items (Always/Often/Sometimes/Never) on confirming patient identity, introducing oneself, explaining procedures, and comfort with error reporting.

5. **Protocol Familiarity (Section E):** Yes/No/Unsure items on awareness of: institutional error-reporting procedure, WHO Surgical Safety Checklist, fall-prevention protocol, and infection-prevention guidelines.

The instrument underwent content validation from experts and a pilot testing with 22 students. Cronbach's α for the 35 knowledge items was .82, indicating acceptable internal consistency.

Procedure

Researchers reached out to students on clinical rotations at the teaching hospital and explained the study purpose, obtained written informed consent, and distributed paper questionnaires. Students completed them anonymously; no personal identifiers were collected. Completed questionnaires were stored securely and entered into SPSS v26.0.

Data Analysis

SPSS version 26.0 was used for:

- Descriptive statistics (frequencies, percentages etc)
- Chi-square tests to examine associations between training and knowledge scores

Results

Demographic Data:

The study included a total of 218 undergraduate nursing students, predominantly male (92.2%, n =

201), with a smaller proportion of female students (7.8%, n = 17). Participants ranged in age from 18 to 29 years, with 56.0% (n = 122) between 18 and 23 years and 44.0% (n = 96) between 24 and 29 years. Regarding their academic progression, most respondents were in their 2nd year (39.4%, n = 86), followed by interns (27.5%, n = 60), 4th-year students (18.8%, n = 41), and 3rd-year students (14.2%, n = 31). Additionally, a substantial proportion (77.1%, n = 168) reported having received formal patient safety training, whereas 22.9% (n = 50) indicated they had not.

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–23	122	56.0
	24–29	96	44.0
Gender	Male	201	92.2
	Female	17	7.8
Year of Study	2nd Year	86	39.4
	3rd Year	31	14.2
	4th Year	41	18.8
	Intern	60	27.5
Formal Training	Yes	168	77.1
	No	50	22.9

Table 1. Demographic Data of the Participants

Patient Safety Knowledge: The mean overall knowledge score was 65.2% (SD 12.4). Scores improved with year: 2nd-year mean 55%, 3rd-year 62%, 4th-year 70%, internship-year 78%. As in prior studies, final-year students outperformed juniors

Academic Year	M (%)	SD
Second Year	55.0	—
Third Year	62.0	—
Fourth Year	70.0	—
Internship Year	78.0	—
Overall	**65.2**	**12.4**

Table 2. Patient Safety Knowledge Scores by Academic Year and Overall

Knowledge of Core Patient Safety Concepts
Understanding of Patient Safety Definition
When presented with the statement "Patient safety is defined as the prevention of errors and adverse effects to patients associated with healthcare," 91.7% (n = 200) of participants correctly identified it as true, while 8.3% (n = 18) marked it incorrectly as false.

Response	n	%
True	200	91.7
False	18	8.3

Table 3: Recognition of Patient Safety Definition (N = 218)

Medication Safety Knowledge
Regarding the "Five Rights" of medication administration (right patient, right drug, right dose, right route, right time), 68.3% (n = 149) strongly agreed they were essential, 24.8% (n = 54) agreed, 3.7% (n = 8) were neutral, 2.3% (n = 5) disagreed, and 0.9% (n = 2) strongly disagreed.

Level of Agreement	n	%
Strongly Agree	149	68.3
Agree	54	24.8
Neutral	8	3.7
Disagree	5	2.3
Strongly Disagree	2	0.9

Table 4. Levels of Agreement with "Five Rights" of Medication

IPSG Awareness

Familiarity with the six International Patient Safety Goals (IPSG) was reported by 73.9% (n = 161) of students, whereas 26.1% (n = 57) were unfamiliar. Of those familiar, only 41% (n = 66) could name at least four of the six goals when probed further.

IPSG Familiarity	n	%
Familiar	161	73.9
Unfamiliar	57	26.1

Table 5. Awareness and Recall of IPSG (N = 218)

Note. Among the 161 students familiar with IPSG, 66 (41.0%) could correctly name at least four of the six goals upon further probing.

Self-Reported Safety Practices

Hand Hygiene Compliance

Regarding frequency of hand hygiene before and after patient contact, 54.1% (n = 118) always complied, 15.6% (n = 34) frequently complied, 21.1% (n = 46) sometimes complied, 7.8% (n = 17) rarely complied, and 1.4% (n = 3) never complied.

Frequency	n	%
Always	118	54.1
Frequently	34	15.6
Sometimes	46	21.1
Rarely	17	7.8
Never	3	1.4

Table 6: Frequency of Self-Reported Hand Hygiene (N = 218)

Use of Structured Communication Tools (SBAR)

Implementation of SBAR (Situation-Background-Assessment-Recommendation) during shift changes was reported as follows: 39.4% (n = 86) always used SBAR, 19.7% (n = 43) frequently used it, 29.4% (n = 64) sometimes used it, and 11.5% (n = 25) rarely used it. No participants reported never using SBAR.

Frequency	n	%
Always	86	39.4
Frequently	43	19.7
Sometimes	64	29.4
Rarely	25	11.5
Never	0	0.0

Table 7. Frequency of SBAR Usage During Shift Changes (N = 218)

Attitudes Toward Error Reporting

Comfort with Error Reporting

When asked about comfort in reporting errors or near misses, 63.3% (n = 138) felt comfortable, 26.6% (n = 58) were uncomfortable, and 10.1% (n = 22) were unsure. Among the 58 participants who reported being uncomfortable, qualitative comments indicated fear of punishment (62.0% of comments), belief that minor errors need not be reported (28.0%), and lack of clear reporting procedures (10.0%).

Comfort Level	n	%
Comfortable	138	63.3
Uncomfortable	58	26.6
Unsure	22	10.1

Table 8. Comfort Level in Reporting Errors or Near Misses (N = 218)

Perceived Importance of Incident Reporting

Responses to the statement "Incident reporting is crucial in healthcare to improve patient safety by learning from mistakes" were as follows: 37.2% (n = 81) strongly agreed, 49.1% (n = 107) agreed, 10.6% (n = 23) were neutral, 1.8% (n = 4) disagreed, and 1.4% (n = 3) strongly disagreed.

Clinical Safety Protocol Familiarity

Patient Fall Management

Familiarity with institutional protocols for managing patient falls was reported as: very familiar (28.4%, n = 62), familiar (49.5%, n = 108), neutral (13.8%, n = 30), unfamiliar (7.8%, n = 17), and very unfamiliar (0.5%, n = 1).

Level of Familiarity	n	%
Very Familiar	62	28.4
Familiar	108	49.5
Neutral	30	13.8
Unfamiliar	17	7.8
Very Unfamiliar	1	0.5

Table 9. Familiarity with Patient Fall Management Protocols (N = 218)

Surgical Safety Checklists

Perceptions of the effectiveness of surgical safety checklists showed: strongly agree (39.0%, n = 85), agree (47.7%, n = 104), neutral (9.2%, n = 20), disagree (3.7%, n = 8), and strongly disagree (0.5%, n = 1).

Level of Agreement	n	%
Strongly Agree	85	39.0
Agree	104	47.7
Neutral	20	9.2
Disagree	8	3.7
Strongly Disagree	1	0.5

Table 10. Perceived Effectiveness of Surgical Safety Checklists (N = 218)

Comparative Analysis by Training Status

Participants who had received formal patient safety training (n = 168) demonstrated significantly higher correct responses and self-reported practices compared to those without training (n = 50) across multiple measures (all $p < .05$). Specifically:

- **Correct patient safety definition**: 96.4% of trained versus 76.0% of untrained ($p = .001$).
- **Strong agreement on "Five Rights"**: 74.4% of trained versus 48.0% of untrained ($p = .003$).
- **IPSG familiarity**: 82.1% of trained versus 46.0% of untrained ($p < .001$).
- **Always practice hand hygiene**: 61.9% of trained versus 28.0% of untrained ($p < .001$).
- **Comfortable reporting errors**: 71.4% of trained versus 38.0% of untrained ($p < .001$).

Measure	Trained (n = 168)	Untrained (n = 50)	p-value
Correct patient safety definition (%)	96.4	76.0	.001
Strong agreement on "Five Rights" (%)	74.4	48.0	.003
IPSG familiarity (%)	82.1	46.0	< .001
Always practice hand hygiene (%)	61.9	28.0	< .001
Comfortable reporting errors (%)	71.4	38.0	< .001

Table 11. Comparison of Key Measures by Training Status (N = 218)

Year-Wise Competency Progression

Analysis by academic year showed progressive improvement in patient safety knowledge and practices:

- **Correct safety definition**: 84.9% (second year), 87.1% (third year), 95.1% (fourth year), and 98.3% (interns).
- **"Five Rights" strong agreement**: 59.3% (second year), 64.5% (third year), 73.2% (fourth year), and 81.7% (interns).
- **Always practice hand hygiene**: 43.0% (second year), 51.6% (third year), 63.4% (fourth year), and 73.3% (interns).
- **Comfortable reporting errors**: 52.3% (second year), 58.1% (third year), 70.7% (fourth year), and 78.3% (interns).

Despite overall improvements, even interns showed gaps: 18.3% of interns did not strongly agree about the "Five Rights," and 21.7% were uncomfortable reporting errors.

Measure	2nd Year	3rd Year	4th Year	Interns
Correct safety definition	84.9	87.1	95.1	98.3
"Five Rights" strong agreement	59.3	64.5	73.2	81.7
Always practice hand hygiene	43.0	51.6	63.4	73.3
Comfortable reporting errors (%)	52.3	58.1	70.7	78.3

Table 12. Patient Safety Knowledge and Practices by Academic Year (%)

Discussion

This study evaluated undergraduate nursing students' knowledge of patient safety at a tertiary care teaching hospital in Swat, Pakistan, revealing both strengths and gaps. Overall, most participants demonstrated foundational understanding of core safety concepts but varied in specific application and procedural adherence.

Knowledge of Core Patient Safety Concepts

A substantial majority (91.7%) correctly identified patient safety as the prevention of errors and adverse effects, aligning with global definitions (WHO, 2023). Similar findings were reported by Tella et al. (2014), who noted high awareness but limited depth of understanding among nursing students. In our sample, 93.1% agreed that the "Five Rights" of medication administration are essential, paralleling results from Pintor-Mármol et al. (2012), who emphasized medication safety as a rudimentary competency. Stevanin et al. (2015) similarly found >90% of Italian nursing students recognized medication administration priorities, though actual practice adherence lagged.

Confidence in identifying potential safety issues was reported by 90.3%. This self-reported confidence contrasts with studies indicating that confidence often overestimates actual competence (Lee & Dahinten, 2023). Simulation-based assessments by Lee and Scott (2018) revealed discrepancies between perceived and demonstrated skills, underscoring the need for objective evaluations.

Familiarity with International Patient Safety Goals (IPSG)

Seventy-three percent (73.9%) of participants reported familiarity with the six IPSG . While this indicates reasonable exposure, nearly one-quarter (26.1%) remained unaware, Such a gap was similarly observed by Dimitriadou et al. (2021). The IPSG framework, promulgated by WHO (2023), offers standardized safety benchmarks; integrating IPSG-focused modules early in curricula could ensure comprehensive dissemination. Ji et al. (n.d.)

advocated explicit incorporation of IPSG to develop students' competency in systemic safety measures.

Recognition of Near Misses and IPC Practices

Correct identification of a near miss was demonstrated by 73.4%. This rate, albeit encouraging, implies that over one-quarter of students could not distinguish near misses from actual errors—significant because near-miss detection is a sentinel indicator for system vulnerabilities (Pronovost et al., 2005). Pronovost et al. (2010) and Pronovost and Freischlag (2010) highlighted that underreporting of near misses undermines safety improvement efforts.

Perception that all healthcare workers adhere to IPC/PPE guidelines was affirmed by 62.8% , yet 37.2% either disagreed or were unsure. This ambivalence points to inconsistent training or observational experiences. Lee & Scott (2018) reported that while theoretical IPC knowledge may be high, actual compliance remains suboptimal due to resource constraints or workflow pressures. Torkaman et al. (2022) found targeted IPC-based training significantly improved students' competencies, suggesting simulation-based IPC modules could bolster adherence.

Hand Hygiene and Communication

Hand hygiene practice is a fundamental IPC measure; 69.7% reported "always" or "frequently" performing hand hygiene. Although majority adherence is positive, nearly one-third indicated suboptimal or inconsistent practice. Stevanin et al. (2015) similarly documented gaps in compliance, attributing lapses to inadequate emphasis during clinical rotations. Milligan (2007) advocated embedding human factors theory early in nursing education to reinforce habitual hand hygiene.

The importance of effective communication in reducing medical errors was recognized by 92.6%, reflecting consensus in literature that communication lapses constitute a leading cause of adverse events (Hor et al., 2013; Künzle et al., 2010). However, comfort with error/near-miss reporting was reported by only 63.3%, suggesting a culture of blame or fear of repercussions, as described by Davis et al. (2007). Creating a non-punitive reporting environment is essential to encourage transparency. Dimitriadou et al. (2021) reported that nursing students often hesitate to report errors due to uncertainty about protocols and fear of judgment.

Structured Handover Tools and Incident Reporting

Using a structured handover tool (e.g., SBAR) was "always" or "frequently" practiced by 59.1%. Standardized handover frameworks reduce information loss and miscommunication (Milligan, 2007; Wong et al., 2010). Nonetheless, 40.9% reported inconsistent use, echoing findings by Lee & Dahinten (2023) that institutional implementation of SBAR remains fragmented. Embedding SBAR training within clinical practicums may improve adoption.

Incident reporting's perceived importance was high, yet literature indicates that reporting systems often focus on event logging rather than hazard analysis (Pronovost et al., 2005; Parand et al., 2014). The current study did not assess actual reporting rates; future research should examine barriers to reporting and effectiveness of existing Patient Safety Reporting Systems (PSRS).

Surgical Safety Checklist and Fall Management

Belief in the surgical safety checklist's utility was endorsed by 86.7%),consistent with global evidence that checklists reduce complications (Pronovost et al., 2010; Wachter et al., 2013). However, actual implementation in Pakistani tertiary hospitals is variable (Ali et al., 2022). Very Familiar/Familiar with institutional fall-management protocols comprised 77.9%, echoing findings by Stevanin et al. (2015) that awareness of fall guidelines is moderate, yet reinforcement during clinical rotations is required.

Implications for Curriculum and Practice

1. Curriculum Enrichment: Although fundamental knowledge is strong, gaps in IPC, near-miss identification, and structured communication indicate curricular inadequacies. Integrating explicit patient safety modules—covering IPSG, incident reporting, and human factors—into both theoretical coursework and clinical practicums is imperative (Tella et al., 2014; Lee & Dahinten, 2023). Ji et al. (n.d.) recommended an "integrated curriculum" linking patient safety theory to hands-on practice.

2. Simulation-Based Learning: Simulation offers safe, controlled environments for students to practice error detection, communication, and IPC protocols (Lee et al., 2023; Wong et al., 2010). Implementing scenario-based simulations (e.g., medication administration exercises, mock code drills, SBAR handovers) can bridge the theory–practice gap. Künzle et al. (2010) found that simulation enhanced leadership and team performance, thereby improving safety.

3. Cultivating Safety Culture: Only 63.3% felt comfortable reporting errors, highlighting fear of blame. Establishing a **non-punitive reporting culture**, endorsed by leadership and integrated across all levels, is critical (Pronovost & Freischlag, 2010; Davis et al., 2007). Workshops on "Just Culture" principles and open forums for discussing near misses may foster psychological safety and transparency.

4. Strengthening Clinical Mentorship: Mentors and clinical instructors must model best practices in IPC, hand hygiene, and SBAR usage. Providing **real-time feedback** and positive reinforcement when students adhere to protocols can reinforce behavioral change (Milligan, 2007). Parand et al. (2014) emphasized the role of nursing leaders in championing quality and safety, suggesting mentorship models that pair novices with safety-focused preceptors.

5. Interprofessional Education: Collaborative learning with medical, pharmacy, and allied health students can promote "team-based" patient safety understanding (Lee & Dahinten, 2023; Hor et al., 2013). Joint simulation sessions centered on code blue scenarios or multidisciplinary rounds encourage shared responsibility and mutual respect.

Conclusion

This study provides a comprehensive snapshot of patient safety knowledge among undergraduate nursing students at a tertiary care teaching hospital in Swat, Pakistan. While foundational understanding of safety principles—such as medication "Five Rights," hand hygiene, and communication—was generally robust, critical gaps persisted in areas such as structured handover tool utilization, near-miss reporting, and consistent IPC adherence. These shortcomings reflect curricular deficiencies and underscore the need for a comprehensive educational strategy to improve the understanding and practice of Patient safety among nursing students.

Ensuring patient safety is both a moral responsibility and a professional imperative for nursing students, who will serve as frontline advocates for vulnerable patients. Investing in their education and training is essential to build a healthcare workforce capable of reducing preventable harm, improving quality, and upholding the trust patients place in nursing care.

Strengths of the Study: This study included a substantial and diverse sample of 218 undergraduate nursing students across all years from more than a dozen Nursing Colleges at a tertiary care teaching hospital in Swat, providing locally relevant insights. The use of a structured and validated questionnaire enhanced the reliability of measures across various patient safety areas. Strict ethical procedures and minimal missing data further support the study's validity.

Limitations of the Study: As a single-center study using convenience sampling, the findings may not be generalizable to other nursing programs in Pakistan. Dependence on self-reported responses introduces the possibility of social desirability bias, and the cross-sectional design prevents any conclusions about cause-and-effect or changes in knowledge and practice over time.

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