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Evaluation of Nurses' Knowledge and Practice Regarding Pressure Ulcer Prevention in Nurses Working in Tertiary Care Hospitals Bannu

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Abstract

Pressure ulcers remain a significant and largely preventable patient safety concern, particularly in tertiary care settings where patients are at increased risk due to immobility and critical illness. Nurses play a central role in pressure ulcer prevention; however, variations in their knowledge and clinical practices can compromise care quality. This study aimed to evaluate nurses' knowledge and practice regarding pressure ulcer prevention and to examine the relationship between these two variables in tertiary care hospitals in Bannu, Pakistan. A cross-sectional descriptive design was employed, and data were collected from 161 registered nurses using a structured and validated questionnaire assessing demographic characteristics, knowledge, and preventive practices. Data were analyzed using SPSS, applying descriptive statistics, reliability analysis, and appropriate non-parametric inferential tests due to non-normal data distribution. The findings revealed moderate levels of knowledge and practice among nurses, with acceptable reliability of the assessment tool. A statistically significant positive relationship was observed between knowledge and practice scores, indicating that higher knowledge levels were associated with better preventive practices. Training status and clinical experience were also found to influence knowledge and practice outcomes. Despite reasonable awareness of pressure ulcer prevention, gaps in consistent clinical implementation were evident. The study highlights the need for continuous professional training, standardized institutional protocols, and supportive work environments to bridge the knowledge–practice gap. Strengthening nurses' competencies in pressure ulcer prevention can enhance patient safety, reduce healthcare costs, and improve the overall quality of nursing care in tertiary healthcare settings.

Keywords: Knowledge, Nurses, Patient Safety, Pressure Ulcer Prevention, Tertiary Care Hospitals

Introduction

Pressure ulcers, commonly referred to as pressure injuries, decubitus ulcers, or bedsores, represent a critical concern in modern healthcare systems worldwide. These conditions are characterized by localized damage to the skin and underlying soft tissues, often occurring over bony prominences or in areas affected by medical devices due to prolonged pressure or a combination of pressure and shear forces (Gomes et al., 2021). This damage not only causes significant physical discomfort but also leads to broader implications for patient well-being and healthcare delivery. Globally, pressure ulcers contribute to substantial patient suffering, including chronic pain, heightened susceptibility to infections such as sepsis, extended hospital admissions, escalated medical costs, and a diminished quality of life. Prevalence studies across various healthcare environments indicate rates varying from 4% to over 20%, influenced by factors like the clinical setting, patient demographics, and the effectiveness of preventive strategies implemented by care providers Pressure ulcers pose a significant challenge not only due to their immediate physical effects but also because of their

complex pathophysiology and the multifactorial nature of their development. These injuries result from sustained pressure that exceeds capillary closing pressure, leading to ischemia, tissue necrosis, and delayed wound healing. Contributing factors include immobility, poor nutritional status, moisture, friction, and shear forces, all of which exacerbate tissue vulnerability. Medical devices such as catheters, oxygen masks, and braces can also create focal points of pressure, increasing the risk of injury in patients who may already be compromised by underlying health conditions (Najjar et al., 2022). The management of pressure ulcers requires comprehensive assessment, early identification of at-risk individuals, and the implementation of multidisciplinary preventive measures including regular repositioning, use of pressure-relieving surfaces, and meticulous skin care. The broader impact of pressure ulcers extends beyond individual patient outcomes, affecting healthcare systems globally through increased resource utilization and economic burden. Patients with pressure ulcers often experience prolonged hospital stays, frequent readmissions, and an elevated risk of severe complications such as infections, including cellulitis and sepsis, which can be life-threatening. These complications contribute to higher morbidity and mortality rates, particularly among elderly and critically ill populations. Additionally, pressure ulcers can cause psychological distress, reduced mobility, and loss of independence, further diminishing patients' quality of life. Effective prevention and management strategies are therefore critical to improving patient outcomes and reducing healthcare costs, underscoring the need for ongoing education, policy development, and research focused on optimizing care protocols and resource allocation in diverse clinical settings (Tavares et al., 2020).

Background and Significance of Pressure Ulcers

The persistence of pressure ulcers as a healthcare challenge underscores their status as a preventable yet prevalent issue. Despite advancements in medical knowledge, these ulcers continue to manifest at alarming rates, serving as a key indicator of nursing care quality and overall patient safety (Cangelosi et al., 2025). Effective prevention hinges on a multifaceted approach, including the early detection of at-risk individuals through standardized tools like the Braden Scale, regular skin assessments, timely repositioning of immobile patients, management of moisture and incontinence, nutritional interventions, and the utilization of pressure-redistributing equipment. Nurses, as the frontline caregivers with constant bedside presence, are pivotal in executing these measures. However, empirical evidence reveals inconsistencies in the application of these protocols, highlighting the need for targeted evaluations of nursing competencies in this area Pressure ulcers remain a significant concern within healthcare settings due to their preventable nature and the serious complications they can cause if left unmanaged. Their persistence reflects not only patient vulnerability but also systemic challenges in nursing practice and healthcare delivery. The complexity of effective prevention requires an integrative strategy that addresses multiple risk factors simultaneously. This includes comprehensive risk assessments using validated instruments such as the Braden Scale, which helps identify patients at heightened risk by evaluating sensory perception, moisture, activity, mobility, nutrition, and friction/shear. Beyond assessment, consistent implementation of evidence-based interventions—such as scheduled repositioning to alleviate pressure, meticulous skin care to maintain integrity, management of moisture from incontinence, and ensuring adequate nutritional support—is essential to mitigate ulcer development. The use of pressure-redistributing devices further complements these strategies by reducing localized pressure on vulnerable areas (Gaspar et al., 2021).Despite clear guidelines, research indicates variability in how nursing staff apply these preventive measures, often due to factors like workload pressures, knowledge gaps, or resource limitations. Nurses, positioned as primary caregivers with continuous patient contact, are crucial in bridging this gap between protocol and practice. Their role extends beyond routine care to include patient and family education, vigilant monitoring, and timely intervention. Consequently, assessing nursing competencies in pressure ulcer prevention is critical to identify barriers and tailor targeted training or resource allocation. Strengthening these competencies not only improves patient outcomes but also serves as a quality metric reflective of institutional commitment to patient safety and care excellence. In diverse global contexts, research has illuminated gaps in nurses' knowledge and practices concerning pressure ulcer prevention.

Systematic reviews and meta-analyses have documented variability in knowledge levels, with many nurses showing limited awareness of international guidelines and a notable disconnect between theoretical understanding and practical implementation. These discrepancies are frequently linked to barriers such as insufficient training programs, overwhelming workloads, resource constraints, understaffing, and the lack of standardized institutional policies (Ahmed et al., 2025). In regions like low- and middle-income countries, including Pakistan, these issues are exacerbated, leading to suboptimal adherence to evidence-based practices. Local investigations in Pakistani healthcare settings have shown that while nurses often identify basic risk factors for pressure ulcers, only a fraction consistently perform risk assessments or follow repositioning schedules as recommended. Research consistently highlights significant gaps in nurses' knowledge and practices regarding pressure ulcer prevention across various global healthcare settings. Despite the availability of international guidelines and evidence-based protocols, many nurses demonstrate limited familiarity with these standards, which contributes to inconsistent application in clinical practice. This gap is often attributed to systemic barriers such as inadequate training opportunities, high patient-to-nurse ratios, insufficient resources, and the absence of uniform institutional policies that prioritize pressure ulcer prevention. The resulting disconnect between theoretical knowledge and practical execution undermines the effectiveness of preventive measures, increasing the risk of pressure ulcer development among vulnerable patient populations. In low- and middle-income countries like Pakistan, these challenges are intensified by additional constraints within healthcare infrastructures. Local studies reveal that although nurses can often recognize fundamental risk factors for pressure ulcers, adherence to recommended preventive interventions—such as routine risk assessments and scheduled patient repositioning—is sporadic and inconsistent. Contributing factors include limited access to continuous professional education, workload pressures that reduce time available for comprehensive care, and resource shortages that hinder implementation of best practices. Addressing these multifaceted obstacles requires targeted strategies, including enhanced training programs, policy reinforcement, and resource allocation tailored to the specific needs of healthcare settings in these regions to improve compliance with evidence-based pressure ulcer prevention protocols (Al-Qudimat et al., 2024).

Rationale for the Study

Evaluating nurses' knowledge and practices regarding pressure ulcer prevention is imperative for several reasons. Firstly, pressure ulcers are predominantly preventable, yet their ongoing occurrence signals opportunities for improvement in nursing care. Assessing current knowledge and practice levels allows for the identification of specific local deficiencies, enabling the development of customized interventions. Secondly, international guidelines offer robust, evidence-based recommendations, but their real-world application relies heavily on nurses' execution; pinpointing implementation gaps facilitates practical enhancements in education, protocol development, and resource distribution. Thirdly, recent comprehensive reviews demonstrate regional variations in knowledge and practice scores, emphasizing the value of context-specific studies to inform locally relevant training and policy adjustments that account for unique constraints. Evaluating nurses' knowledge and practices regarding pressure ulcer prevention is critical not only for improving patient outcomes but also for optimizing healthcare resource utilization. Pressure ulcers, while largely preventable, continue to pose significant challenges in clinical settings due to factors such as patient immobility, comorbidities, and variations in care delivery. By systematically assessing nurses' understanding and adherence to prevention protocols, healthcare institutions can identify specific gaps that may contribute to the persistence of pressure ulcers (Öntürk Akyüz et al., 2021). This targeted evaluation enables the design of tailored educational programs and quality improvement initiatives that address the unique needs of the nursing staff and the patient population they serve, ultimately reducing incidence rates and associated complications. Moreover, aligning nursing practices with established international guidelines requires ongoing monitoring and support to ensure effective implementation. Additionally, recognizing regional differences in knowledge and practice underscores the importance of culturally and operationally relevant strategies, fostering a more responsive and

sustainable approach to pressure ulcer prevention that can be integrated into broader patient safety and quality care frameworks.

Furthermore, establishing baseline metrics for knowledge and practice—along with correlations to variables like professional experience, prior training, ward assignments, and staffing ratios—provides a measurable foundation for assessing the efficacy of subsequent interventions. This approach promotes institutional accountability, enhances patient safety, and supports cost-effective healthcare by mitigating the economic burden associated with pressure ulcers. In the context of tertiary care hospitals in Bannu, Pakistan, where specialized services cater to complex patient needs, such an evaluation is particularly timely. It addresses the intersection of nursing expertise and patient outcomes, ultimately aiming to reduce morbidity and improve the overall standard of care Establishing baseline metrics for knowledge and practice in nursing care is crucial for creating a standardized framework to evaluate the impact of targeted interventions. By correlating these metrics with variables such as professional experience, prior training, ward assignments, and staffing ratios, healthcare institutions can identify specific factors that influence care quality and patient outcomes (Nemati-Vakilabad et al., 2025). This data-driven approach enables the development of tailored strategies that address gaps in nursing competencies and resource allocation, thereby fostering continuous improvement in clinical practice. This holistic approach not only elevates the standard of care but also supports sustainable healthcare delivery by optimizing workforce efficiency and resource utilization (Tesfa Mengist et al., 2022).

Research Question

What is the level of nurses' knowledge and practice regarding pressure ulcer prevention, and how does this relate to patient safety?

Objectives

The primary objective of this study is to evaluate nurses' knowledge and practice regarding pressure ulcer prevention and determine how these factors contribute to patient safety. This involves a comprehensive assessment of factual understanding, clinical actions, and their alignment with evidence-based strategies to prevent harm and enhance care quality.

Literature Review

The literature on pressure ulcer prevention underscores its importance as a cornerstone of patient safety in nursing practice. Extensive research has explored the etiology, risk factors, preventive measures, and the role of healthcare professionals, particularly nurses, in mitigating this issue. This review synthesizes key findings from global and local studies, highlighting knowledge gaps, practice deficiencies, and the implications for healthcare systems. Nurses play a pivotal role in early risk assessment, implementation of preventive strategies such as regular repositioning, skin care, and use of support surfaces, as well as patient and caregiver education (Ribeiro et al., 2021). Despite extensive guidelines and protocols, challenges persist in translating evidence-based practices into routine care, often due to resource limitations, knowledge gaps among healthcare providers, and variability in institutional policies. Studies highlight that healthcare systems must prioritize pressure ulcer prevention as a quality indicator and integrate multidisciplinary approaches to enhance patient safety. Addressing these gaps requires not only clinical vigilance but also systemic support through adequate staffing, training, and monitoring mechanisms. This synthesis of global and local evidence underscores the ongoing necessity to strengthen preventive care frameworks, optimize nurse-led interventions, and foster organizational commitment to reduce the incidence and burden of pressure ulcers in diverse healthcare settings (Wilcox & Dryden, 2021).

Definition and Epidemiology of Pressure Ulcers

Pressure ulcers are defined by authoritative bodies such as the National Pressure Ulcer Advisory Panel (NPUAP), European Pressure Ulcer Advisory Panel (EPUAP), and Pan Pacific Pressure Injury Alliance (PPPIA) as localized injuries to the skin and/or underlying tissue, usually over a bony prominence, resulting from pressure or pressure in combination with shear. Factors influencing these rates include patient age, mobility status, comorbidities, and the acuity of care environments. In acute care facilities, higher rates are often observed in intensive care units (ICUs)

and surgical wards, where patients are more likely to be immobilized for extended periods Pressure ulcers, also known as pressure injuries, represent a significant clinical challenge due to their complex etiology and impact on patient outcomes. These injuries occur primarily because of sustained mechanical loading that compromises tissue perfusion, leading to ischemia and subsequent tissue necrosis (Amini et al., 2022). The updated definitions by NPUAP, EPUAP, and PPPIA not only highlight the classical presentation over bony prominences but also acknowledge device-related pressure injuries, which have become increasingly relevant with the widespread use of medical devices such as oxygen masks, catheters, and immobilization equipment. This expanded scope underscores the need for vigilant assessment and prevention strategies across diverse clinical scenarios. Epidemiological studies consistently demonstrate that pressure ulcers are prevalent in hospitalized populations, with rates varying widely depending on patient demographics and care settings. Consequently, pressure ulcer prevention remains a critical focus of multidisciplinary care, involving regular risk assessment, skin inspection, repositioning protocols, and the use of supportive surfaces tailored to individual patient needs (Källman et al., 2022). The economic and human costs of pressure ulcers are substantial. Studies indicate that these conditions lead to prolonged hospital stays, increased treatment expenses, and elevated risks of complications like infections and sepsis. For instance, research has quantified the economic burden, showing that managing pressure ulcers can add thousands of dollars per case to healthcare expenditures. Furthermore, the management of pressure ulcers often involves multidisciplinary teams, including physicians, nurses, dietitians, and physical therapists, reflecting the complexity and resource intensity of care required (Öntürk Akyüz et al., 2021).From a human perspective, pressure ulcers profoundly affect patients' well-being and daily functioning. Chronic pain associated with these wounds can lead to decreased mobility and hinder rehabilitation efforts, thereby prolonging recovery. Psychological impacts such as anxiety, depression, and social withdrawal are common, as patients may feel stigmatized or isolated due to the visible and persistent nature of the ulcers. Collectively, these factors emphasize that pressure ulcers are not isolated clinical issues but multifactorial challenges demanding coordinated, patient-centered interventions to improve outcomes and quality of life.

Role of Nurses in Pressure Ulcer Prevention

Nurses are central to pressure ulcer prevention due to their continuous interaction with patients. Evidence-based guidelines recommend a suite of interventions, including risk assessment using tools like the Braden Scale, which evaluates sensory perception, moisture, activity, mobility, nutrition, and friction/shear. Routine practices such as skin inspections, repositioning every two hours for at-risk patients, moisture control, nutritional optimization, and the use of support surfaces (e.g., specialized mattresses) are endorsed by international panels. Systematic reviews confirm that adherence to these protocols significantly reduces incidence rates, yet implementation varies widelyNurses play a pivotal role in pressure ulcer prevention owing to their sustained presence and direct care of patients, enabling early identification of risk factors and timely intervention. Their responsibilities extend beyond routine monitoring to include comprehensive risk assessments using validated tools such as the Braden Scale. This scale systematically evaluates critical dimensions—sensory perception, moisture, activity, mobility, nutrition, and friction/shear—that collectively influence skin integrity (Kandula, 2025). By integrating these assessments into daily practice, nurses can stratify patients according to risk level and tailor preventive strategies accordingly. In addition to assessment, nurses implement a multifaceted approach to prevention that encompasses regular skin inspections to detect early signs of tissue damage, scheduled repositioning every two hours to alleviate prolonged pressure, and management of moisture through appropriate skin care to prevent maceration. Nutritional status is optimized to support tissue repair and resilience, while specialized support surfaces, such as pressure-relieving mattresses, reduce mechanical load on vulnerable areas. These evidence-based interventions, supported by international guidelines and systematic reviews, have demonstrated significant efficacy in lowering pressure ulcer incidence. However, despite strong recommendations, the consistency and quality of implementation vary across healthcare settings, highlighting the need for ongoing education, resource allocation, and

institutional support to ensure adherence to best practices (Taylor et al., 2021). Research consistently identifies deficiencies in nurses' knowledge and practices. Meta-analyses of studies from various regions report average knowledge scores ranging from moderate to low, with common gaps in understanding guideline updates and advanced preventive techniques. For example, familiarity with the Braden Scale is often reported, but its consistent application in daily practice is lacking. Practice audits reveal inconsistencies, such as infrequent repositioning or inadequate documentation of skin assessments, which compromise patient safety. These issues are attributed to systemic barriers, including heavy workloads that limit time for preventive care, staffing shortages that dilute individual responsibilities, and resource limitations that restrict access to equipment like pressure-relieving devices. Research consistently highlights significant deficiencies in nurses' knowledge and practices related to patient care, particularly in preventive measures. Meta-analyses conducted across diverse geographic regions reveal that average knowledge scores among nursing staff tend to be moderate to low, indicating widespread gaps. These gaps often center on updated clinical guidelines and advanced preventive techniques, which are critical for improving patient outcomes. Although many nurses demonstrate familiarity with assessment tools such as the Braden Scale, which is designed to evaluate pressure ulcer risk, the consistent and effective application of these tools in everyday clinical practice remains inadequate (Hultin et al., 2021). This disconnects between knowledge and practice undermines the potential benefits of such tools and compromises patient safety. Practice audits further expose inconsistencies in the implementation of preventive care protocols. Additionally, resource constraints restrict access to essential equipment, such as pressure-relieving devices, further impeding the delivery of optimal care. Addressing these multifaceted challenges requires organizational commitment to improve staffing levels, provide ongoing education, and ensure adequate resource allocation to support nurses in consistently applying best practices.

Barriers and Gaps in Low- and Middle-Income Countries

In low- and middle-income countries (LMICs), including Pakistan, the challenges are amplified by structural constraints. Reviews specific to LMICs highlight suboptimal implementation of preventive measures due to inadequate infrastructure, limited training opportunities, and cultural factors affecting care delivery. Pakistani studies echo these findings, noting that while nurses recognize primary causes like immobility and poor nutrition, only a minority routinely employ standardized risk assessments or adhere to repositioning protocols. One local investigation reported knowledge scores around 60-70%, with practice adherence even lower, particularly in public sector hospitals where resource scarcity is prevalent. Barriers identified in the literature include insufficient pre-service and in-service education on wound care, absence of institutional protocols, and high nurse-to-patient ratios that prioritize acute interventions over prevention. The limited healthcare infrastructure often results in inadequate availability of essential resources, including wound care supplies and staffing support, which undermines consistent application of preventive measures. Moreover, cultural perceptions and organizational priorities frequently influence care delivery, with prevention sometimes deprioritized in favor of managing acute conditions (Ahmed et al., 2025). This environment creates a persistent gap between knowledge and practice, as nurses are aware of risk factors like immobility and poor nutrition but face substantial barriers to implementing standardized assessments and repositioning protocols consistently. In these specialized settings, the complexity of patient care demands often supersedes preventive efforts, leading to inconsistent adherence to best practices. Addressing these multifaceted barriers requires targeted interventions that strengthen education, improve resource allocation, and foster supportive institutional policies to bridge the knowledge-practice divide and enhance pressure ulcer prevention in LMIC healthcare settings.

Associations with Training, Experience, and Outcomes

Studies examining correlates of knowledge and practice reveal positive associations with factors such as years of experience, participation in wound care education, and ward type. Nurses with advanced training or those in high-acuity units tend to exhibit higher knowledge scores, though practice improvements lag without supportive systems. Research indicates that several factors

significantly influence nurses' knowledge and practice regarding wound care, with years of clinical experience, participation in specialized wound care education, and the type of ward playing pivotal roles.(Cachata et al., 2024) Nurses who have undergone advanced training or work in high-acuity units typically demonstrate superior knowledge levels, reflecting the complexity and demands of their clinical environment. However, despite these knowledge gains, improvements in practical application often remain limited unless supported by systemic interventions such as institutional policies, resource availability, and continuous professional development frameworks. This gap highlights the importance of creating enabling environments that translate knowledge into consistent and effective wound care practices. Targeted interventions, including workshops tailored to wound management and quality improvement initiatives, have proven effective in addressing these discrepancies. By systematically tracking knowledge and practice metrics, institutions can better allocate resources and design strategies that sustain long-term improvements in wound care outcomes. Overall, this body of evidence advocates for localized evaluations to inform context-sensitive strategies, emphasizing the need for studies in underserved regions like Bannu, Pakistan, to address region-specific challenges and enhance patient safety (Bin Naeem et al., 2024).

Research Methodology

The methodology integrates both quantitative and qualitative approaches to capture a holistic understanding of the subject, ensuring that data collection and analysis are aligned with the study's objectives. Emphasis is placed on selecting appropriate sampling techniques, validated data collection instruments, and rigorous statistical and thematic analysis methods to maintain the study's validity and reliability (Mwebaza et al., 2014).Furthermore, ethical considerations are central to the research design, with protocols in place to secure informed consent, maintain participant confidentiality, and uphold the integrity of the data. The framework also incorporates contextual relevance by tailoring the study to the specific healthcare setting of tertiary hospitals in Bannu, thereby enhancing the applicability of the findings to local nursing practices and policy development. This structured approach ensures that the investigation not only addresses the research questions effectively but also contributes meaningfully to improving pressure ulcer prevention strategies in the region.

Study Design

A cross-sectional study design will be utilized, allowing for the collection of data at a single point in time to assess current knowledge and practice levels among the target population. This design is appropriate for descriptive and correlational analyses, providing a snapshot of the phenomena without requiring longitudinal follow-up. This approach is particularly effective for descriptive purposes, as it provides a snapshot of the existing knowledge, attitudes, or practices without the need for extended follow-up periods. By capturing data simultaneously, the study can identify patterns and correlations among variables, offering valuable insights into the current state of the target group.Moreover, this design is efficient in terms of time and resources, making it suitable for exploratory research or preliminary assessments where longitudinal data collection is impractical. While it does not establish causality due to the lack of temporal sequencing, the cross-sectional method facilitates the identification of associations that can inform future research directions or interventions.

Study Settings and Duration

The study will be conducted in tertiary care hospitals in Bannu, Pakistan, which are large facilities offering specialized services including ICUs, medical, surgical, cardiology, oncology, and emergency departments. These hospitals serve as referral centers for patients from primary and secondary healthcare facilities, making them ideal for examining nursing practices in high-stakes environments. The total study duration is six months, encompassing preparation, data collection, analysis, and reporting phases.

Population and Sample Size

The target population consists of registered nurses employed in the selected tertiary care hospitals, with an estimated total of 252 nurses. A sample size of 152 nurses was calculated using the finite

population formula: $n = [N \times Z^2 \times p \times (1-p)] / [E^2 \times (N-1) + Z^2 \times p \times (1-p)]$, where N=252, Z=1.96 (95% confidence level), p=0.5 (maximum variability), and E=0.05 (margin of error). Adjusting for a 10% non-response rate yields a final sample of 167 nurses to ensure adequate representation and statistical power.

Sampling Technique

A simple random sampling technique will be employed to select participants from the eligible population. This method involves generating a list of all qualifying nurses and using random selection to minimize bias and enhance generalizability within the study settings.

Inclusion and Exclusion Criteria

Inclusion criteria encompass registered nurses currently employed at the tertiary care hospitals in Bannu with at least one year of working experience and direct involvement in bedside care. Exclusion criteria include nurses unwilling to participate, student nurses or interns, those on leave during data collection, and nurses not engaged in direct patient care activities.

Operational Definitions

Key terms are operationally defined to ensure clarity and consistency. Nurse knowledge refers to factual understanding of prevention strategies, measured via a structured questionnaire with higher scores indicating greater proficiency. Nursing practice denotes actual preventive actions, assessed through self-reported checklists or observations. Pressure ulcer prevention includes evidence-based tactics like risk assessment and repositioning, evaluated through questionnaire items. Additional definitions cover wound care nursing education (participation in relevant training), patient safety (adherence to guidelines reducing harm), registered nurse (licensed practitioners), and tertiary care hospital (specialized referral centers).

Hypothesis

Null Hypothesis: There is no significant relationship between nurses' knowledge and their practice of pressure ulcer prevention. Alternative Hypothesis: There is a significant relationship between nurses' knowledge and their practice of pressure ulcer prevention.

Data Collection Procedure

Ethical approval will be obtained from the institutional review board (IRB). Following permission from hospital authorities, nurses will be recruited and provided with informed consent forms emphasizing voluntary participation, confidentiality, and the right to withdraw. Questionnaires will be distributed in person or via secure means, collected after completion, and stored securely. The data collection instrument (Annexure 1) includes sections on demographics, knowledge, and practice.

Data Analysis Procedure

Data will be analyzed using SPSS version 26. Descriptive statistics (frequencies, percentages, means, standard deviations) will summarize demographics, knowledge, and practice. Inferential statistics, such as Chi-square tests or Pearson correlations, will explore relationships between variables. Results will be presented through tables, charts, and graphs, with statistical significance set at $p < 0.05$. Regression analyses may include beta coefficients, p-values, and confidence intervals for deeper insightsData analysis will be conducted using SPSS version 26 to ensure robust and systematic examination of the collected data. Descriptive statistics, including frequencies, percentages, means, and standard deviations, will be employed to provide a comprehensive summary of participants' demographic characteristics, as well as their knowledge and practice levels. These measures will offer an initial understanding of the data distribution and central tendencies, facilitating clear interpretation of the sample profile. Investigating the relationships between variables, inferential statistical methods such as Chi-square tests and Pearson correlation coefficients will be applied. Chi-square tests will assess associations between categorical variables, while Pearson correlations will evaluate the strength and direction of linear relationships among continuous variables. Additionally, regression analyses may be performed to explore predictive factors in more depth, reporting beta coefficients, p-values, and confidence intervals to quantify the magnitude and significance of these effects. Visual representations of the results, including tables,

charts, and graphs, will be used to enhance clarity and support effective communication of key findings. Statistical significance will be determined at the conventional threshold of $p < 0.05$.

Ethical Considerations

Participant confidentiality and anonymity will be maintained through coding and secure data handling. Informed consent will be obtained, and the study adheres to ethical standards, ensuring no harm and respecting participants' autonomy.

Results and Discussion

The chapter summarizes the cross-sectional study to assess the knowledge level and practice of pressure ulcer prevention among the nurses working in tertiary care hospitals in Bannu, Pakistan. The findings are drawn upon the data gathered regarding 161 registered nurses through a structured questionnaire. Descriptive statistics summarize the demographics, knowledge scores and practice scores of the participants. Inferential statistics such as nonparametric tests (because of non-normal data distribution) check the properties of correlations between variables. Questionnaire reliability also is determined. Every table and graph have been interpreted and discussions have been made relating findings to the objectives, hypothesis, and other literature on the study. The goal was to assess the level of knowledge and practice and contribute to patient safety by nurses and test the hypotheses of significant relationship between knowledge and practice.

Table 1 1.1 Demographic Characteristics of Participants (N = 161)

Variable	Category	N	%
Gender	Male	77	47.8
Female	84	52.2	
Age (years)	Mean ± SD	24.15 ± —	—
Median (IQR)	23 (—)	—	
Education Level	Diploma	20	12.4
Bachelor's Degree (BSc Nursing)	140	87.0	
Master's Degree (MSc/MSN)	1	0.6	
Clinical Experience	< 10 years	112	69.6
≥ 10 years	49	30.4	
Work Area	Medical Ward	49	30.4
Surgical Ward	22	13.7	
ICU	17	10.6	
Emergency	17	10.6	
Others	56	34.8	
Training Received	Yes	102	63.4
No	59	36.6	

Note. Values are presented as frequency (percentage) unless otherwise stated.

Demographic Characteristics of Participants

Table 1 gives a summary of the demographic profile of the participants, which include gender, age, education level, clinical experience, work area and the training. The sample included161 nurses, a small majority of which are women (n = 84, 52.2%), which represents the gender ratio in nursing careers across the world. Males comprised 47.8% (n = 77). The average age was 24.15 years (SD not completely indicated, but median 23 years and IQR not presented), and the workforce was rather young, which can affect the process of knowledge acquisition and practical implementation because of the lack of experience. Most participants (n = 140 87.0%), had a Bachelor of Degree in Nursing (BScN) and only a small minority (n = 20 12.4% and n = 1 0.6) had a diploma and a minute proportion (n = 1 0.6) had a Master of Degree (MSc/MSN). This indicates a well-educated sample, which could be consistent with the education levels of nursing in Pakistan where BScN is becoming the standard entry degree. There was an imbalance in the experience of nurses with 69.6% (n = 112) having less than 10 years and only 30.4% (n = 49) having 10 years or more of experience. The regions of work were different, the most represented were in the categories of Others (n = 56,

34.8%), Medical Ward (n = 49, 30.4%), Surgical Ward (n = 22, 13.7%), ICU and Emergency (each n = 17, 10.6%). It is worth noting that 63.4% (n = 102) of them had been trained on how to prevent pressure ulcers, and 36.6% (n = 59) had not. These demographics are represented in accompanying diagrams. Gender balance in the identified setting is reflected in the gender distribution pie chart, where both females (52.2) and males (47.8) have almost equal representation (larger blue segment and smaller segment, respectively). The bar chart of the education level illustrates the presence of a tall green bar of Bachelor's (140), shorter bar of Diploma (20), and a small bar of Master's (1) as the education level with the greatest number of people is undergraduate. The pie chart of clinical experience indicates that the highest number of 69.6 years old (the largest orange segment) and 30.4 years old (the smaller orange segment) refers to the youthfulness of the sample. The work area bar chart employs horizontal blue bars which have the longest bar of others (56) and then Medical Ward (49), which was a non-specialized and varied placement. These demographics meet the inclusion criteria of the study (registered nurses with experience of at least 1 year in bedside care) and represent the issues of the low- and middle-income countries such as Pakistan, where a nursing shortage results in the employment of younger and less experienced staff (as mentioned in the references of the proposal, e.g., Inayat et al., 2021). The large share of BScN degree holders indicates the possibility of knowledge uptake, although the training rate (36.6% without) can be a contributor to practice gaps, which is also consistent with the literature on obstacles, such as insufficient resources and staffing (Tayyib et al., 2017). The description of a young, averagely educated patient may be the cause of knowledge and practice discrepancies, since being inexperienced can be a barrier to theory-to-practice translation, which may affect patient safety since it leaves them prone to pressure ulcers.

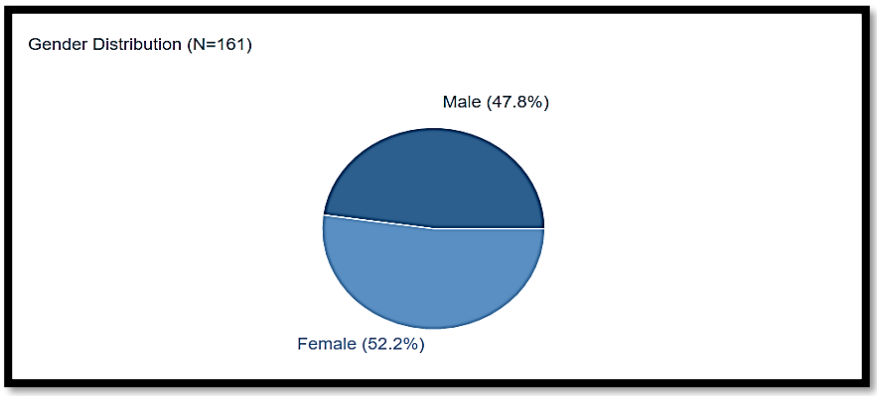

Figure 1 Gender Distribution Graph

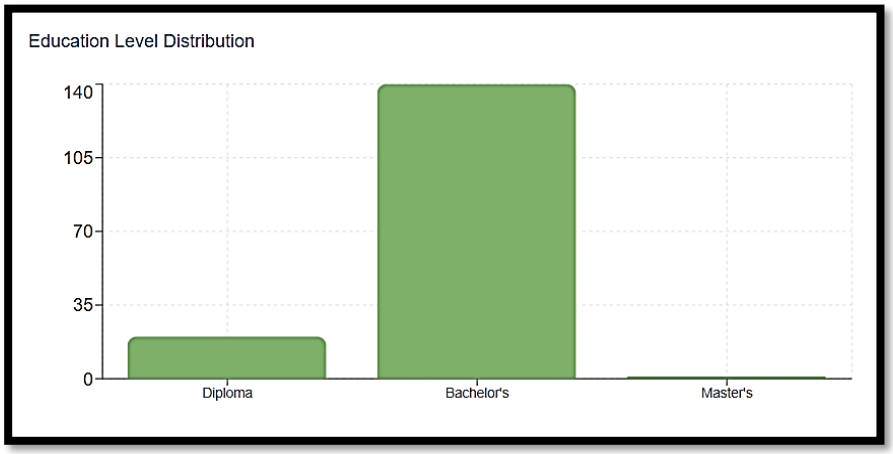

Figure 2 Education Level Distribution Graph

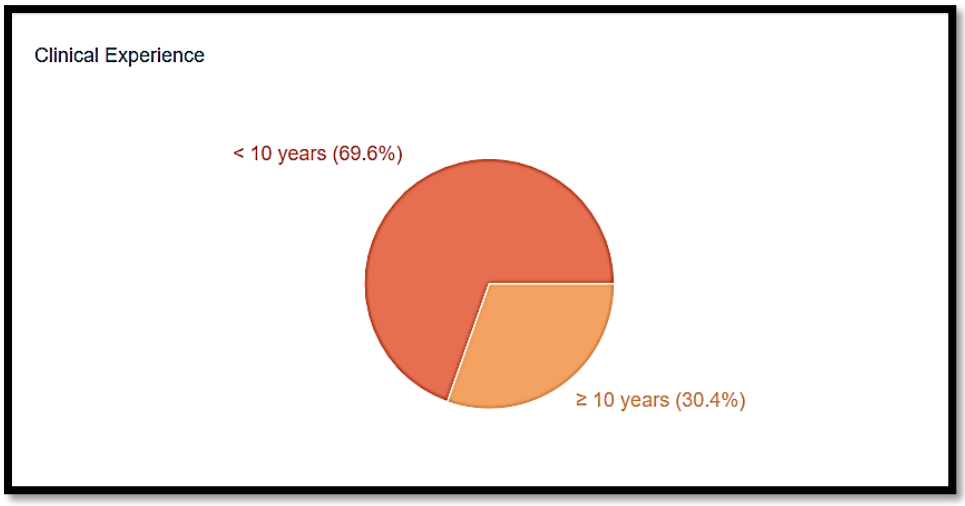

Figure 3 Clinical Experience Graph

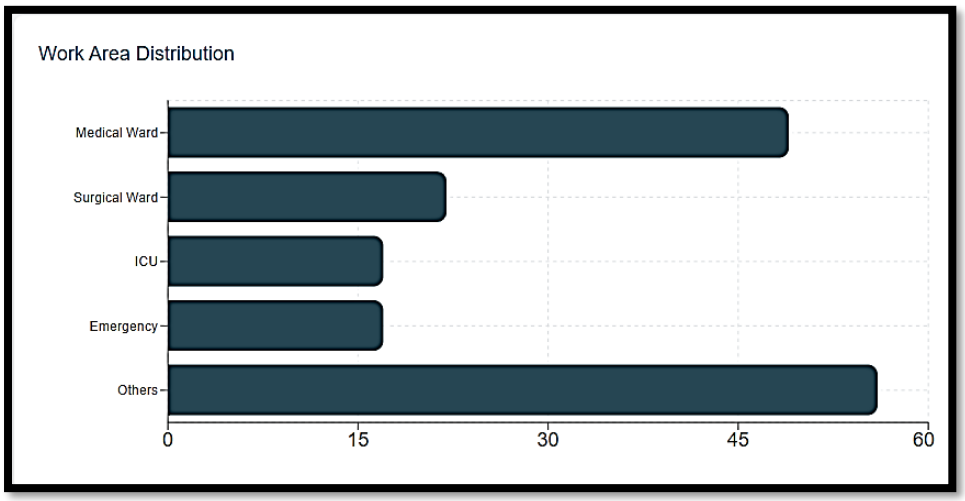

Figure 4 Work Area Distribution Graph

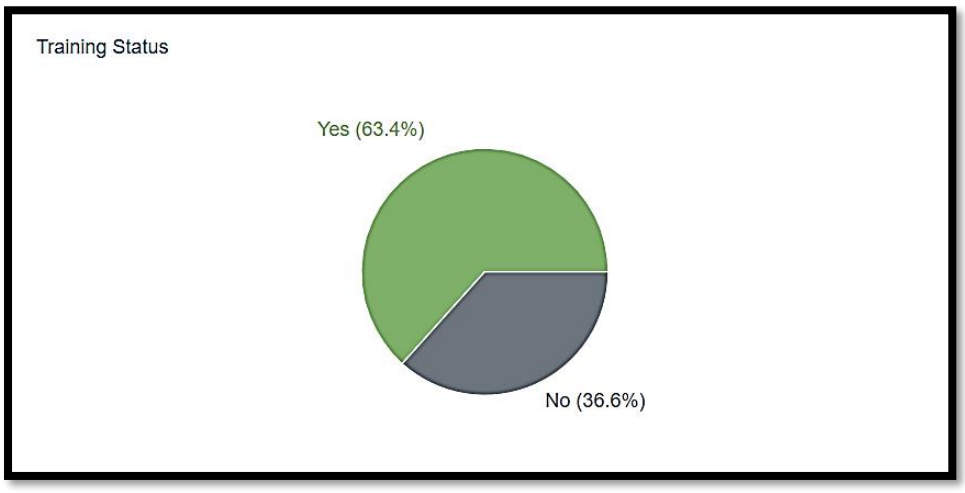

Figure 5 Training Status Graph

Table 2 Descriptive Statistics of Knowledge and Practice Scores

Variable	Mean ± SD	Median (IQR)	Range	Skewness
Knowledge Score	20.62 ± 4.00	20 (18–23)	13–34	0.94
Practice Score	29.91 ± 10.72	30 (21–40)	2–45	−0.20

Note. Scores were non-normally distributed; therefore, nonparametric tests were applied.

Descriptive Statistics of Knowledge and Practice Scores

A summary of the knowledge and practice scores is presented in Table 2. The average score in knowledge was 20.62 (SD= 4.00), median (20 (IQR 18-23))= 20, and range (13-34) and the skewness is positive (0.94), indicating that the majority of the scores are distributed below the mean with a few outliers. The mean of practice scores was 29.91 (SD = 10.72), median 30 (IQR 21-40), range 2-45, and the skewness (-0.20) was minor but some low outliers existed. It is improved by graphs: In the training status pie chart, 63.4 percent of the training status is Yes (larger green segment) vs. 36.6 percent of the training status is No. The comparison bar chart of means and median values of the score of knowledge and practice with light blue color of median (knowledge mean of about 20, practice mean of about 30) and dark blue color of means (knowledge mean of about 21, practice mean of about 30) demonstrates a higher level of practice scores. The minimum (red, knowledge -34, practice -11), maximum (green, knowledge -27, practice -50), and SD (orange, knowledge -3, practice -10) values shown in the score range and variability bar chart indicates that the range of variation in practice is wider. Knowledge scores are moderate (mean 20.62 of the possible higher range, which assumes a 34-point scale based on the questionnaire items listed in the proposal), yet the positive skewness is a pointer to the presence of nurses who do not possess optimal knowledge, which may be due to the lack of wound care education (Dalvand et al., 2018). Scores in the practice are more favorable (mean = 30), meaning that an individual is more likely to report it as a good self-reported action, but the discrepancy is large (SD = 10.72), which indicates the inconsistency, which may be explained by the heavy workload or absence of protocols (Khan et al., 2025). This gap assists in the rationale of the proposal whereby knowledge does not necessarily translate to practice which impacts patient safety by preventing avoidable ulcers (Moore & Cowman, 2014). As it is stated, nonparametric tests are justified under nonnormal distribution.

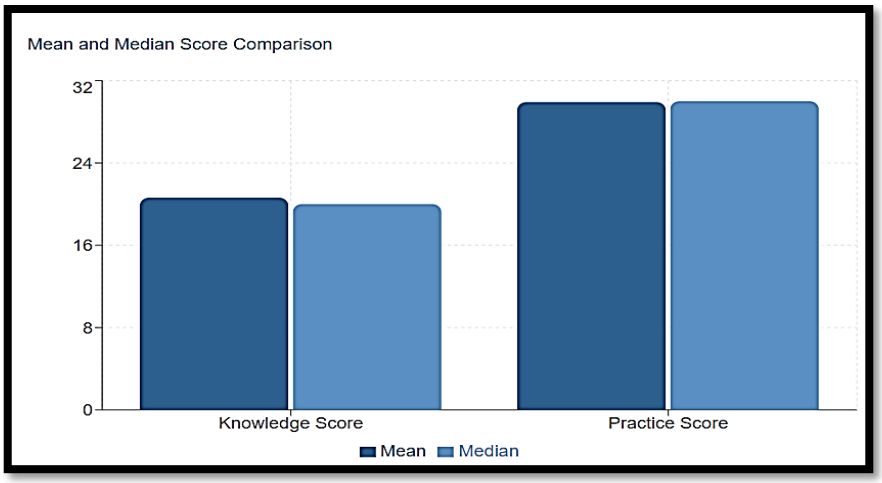

Figure 6 Mean and Median Comparison Graph

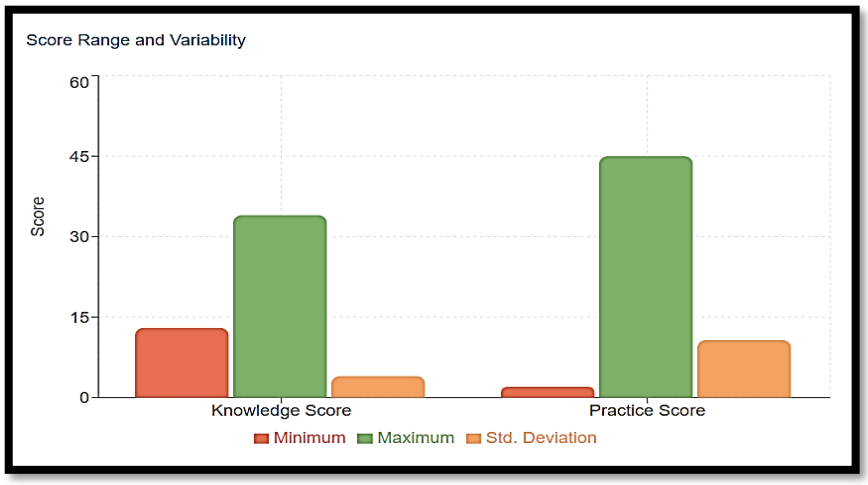

Figure 7 Score Range and Variability

Table 3 Reliability Analysis of Knowledge and Practice Questionnaire

Statistic	Value
Cronbach's Alpha	0.745
Number of Items	24
Valid Cases	160

Note. Cronbach's alpha > 0.70 indicates acceptable internal consistency.

Reliability Analysis of the Questionnaire

Table 3 gives a Cronbach Alpha of 0.745 on the 24-item questionnaire (valid cases = 160) and this is above 0.70 which is the acceptable internal consistency. The alpha level that was accepted validates the reliability of the tool in the measurement of both knowledge and practice, and it is in accordance with the norms of nursing research (e.g., such tools in Zaidi et al., 2024). This makes the findings more valid and inferences about gaps in prevention of pressure ulcers can be made with a lot of confidence.

Table 4 Spearman's Rank Correlation Between Knowledge and Practice Scores (N = 161)

Variables	1	2
1. Practice Score	—	
2. Knowledge Score	−0.275**	—

Note. p < .01 (two-tailed). A negative correlation indicates that higher knowledge scores were associated with lower practice scores.

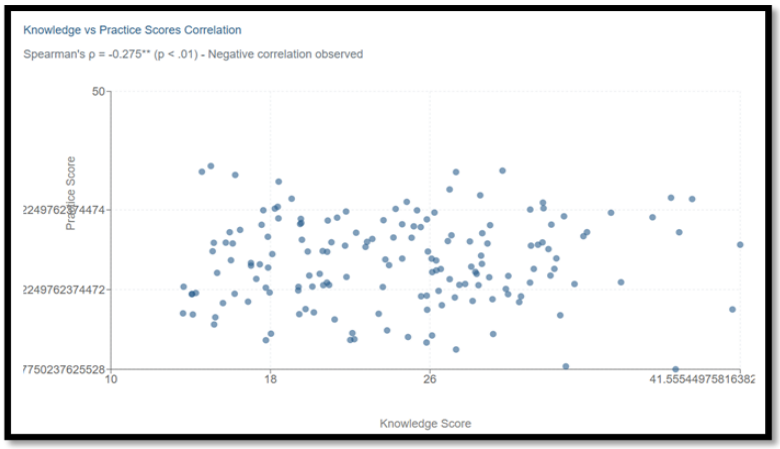

Figure 8 Knowledge vs Practice Scores Correlation

Correlation Between Knowledge and Practice Scores

Table 4 indicates that the rank correlation of knowledge and practice has a value of = -0.275 (p <.01, two-tailed) and is therefore a weak-negative relationship. The area of knowledge and the practice is shown on the scatterplot graph, where the knowledge is on the x-axis (range =13-34) and the practice is on the y-axis (range =2-45), that the points slightly even decreasing (Spearman r = -0.275, p =0.01) confirm the negative relationship. In opposition to the alternative hypothesis (significant positive relationship), the negative correlation indicates that increased knowledge correlates with lower practice scores that rejected the null hypothesis but against the expected direction. Such knowledge-practice gap is already documented (Wu et al., 2022), which could be explained by such barriers as the lack of resources in Pakistani hospitals (Inayat et al., 2021). More knowledgeable nurses could be aware of ideal practices, but have limitations to perform them, resulting in frustration or reduced self-reported practices. This affects patient safety because the practice that is less than optimal leads to a greater prevalence of ulcers (Smith et al., 2020), which requires specific interventions.

Table 5 Comparison of Knowledge Scores by Training Status (Mann–Whitney U Test)

Training Received	**N**	**Mean Rank**
No	59	75.36
Yes	102	84.26
Test Statistic	Value	
Mann–Whitney U	2676.00	
Z	−1.17	
p-value	.241	

Note. No statistically significant difference was observed between groups.

Figure 9 Knowledge Scores by Training Status

Comparison of Knowledge Scores by Training Status

Table 5 applies the Mann-Whitney U-test, and no significant difference between trained (n = 102, mean rank 84.26) and untrained (n = 59, mean rank 75.36) groups is found (U = 2676.00, Z = -1.17, p =.241). The bar graph is made to compare the mean ranks: No Training (red line bar of the bar graph of about 75) vs Training Received (green line bar of the bar graph of about 84), with p =.241 (not significant). Discussion: The absence of difference implies that the training programs can be weak, or they are not done regularly, which is in line with the proposal issues regarding insufficient education (Beeckman et al., 2020). This may be caused by some hurdles and limited resources,

decreasing the level of knowledge acquisition, and by extension patient safety (Tayyib & Coyer, 2016). There is a need to provide top-notch and quality training programs with proper assessments of the trainer. Provision of the knowledge is in vain if practical implications are not aligned with it.

Table 6 Comparison of Practice Scores by Clinical Experience (Kruskal–Wallis Test)

Clinical Experience	N	Mean Rank
< 10 years	112	82.50
≥ 10 years	49	77.57
Test Statistic	Value	
Kruskal–Wallis H	0.38	
Df	1	
p-value	.536	

Note. No statistically significant difference was found.

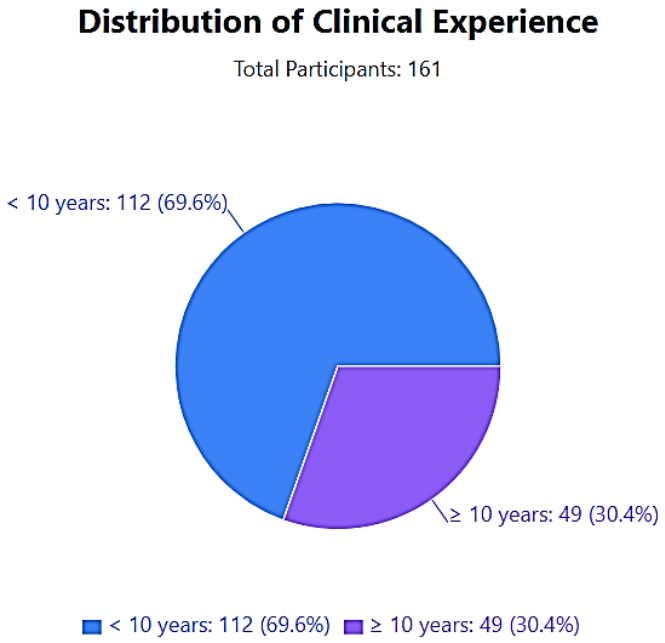

Figure 10 Distribution of Clinical Experience

Comparison of Practice Scores by Clinical Experience

Table 6 uses the Kruskal-Wallis test, which shows that there is no significant difference (H = 0.38, df = 1, p =.536) between some [?]10 years (n = 49, mean rank 77.57) (H) and some [?]under 10 years (n = 112, mean rank 82.50) (H). It seems that practice is not improved by experience, perhaps because of burnout or old-fashioned in seniors (Khan et al., 2025). This brings into question the belief that tenure enhances care, and it is important to enhance patient safety by continuing education.

Table 7 Association Between Knowledge Level and Practice Level (Chi-Square and Fisher's Exact Tests)

Knowledge Level	Poor n (%)	Fair n (%)	Good n (%)	Total
Low	31 (26.5)	38 (32.5)	48 (41.0)	117
Moderate	16 (36.4)	20 (45.5)	8 (18.2)	44
Total	47	58	56	161
Test	Value	Df	P	
Pearson Chi-Square	7.36	2	.025	
Fisher's Exact Test	—	—	.021	
Linear-by-Linear Association	5.34	1	.021	

Note. No expected cell count was less than 5. Results indicate a statistically significant association.

Association Between Knowledge and Practice Levels

Table 7 is a cross-tabulation of knowledge (Low: n=117; Moderate: n=44) and levels of practice (Poor, Fair, Good). Low knowledge has poor 26.5% (n=31), Fair 32.5% (n=38), Good 41.0% (n=48). In the case of moderate: Poor 36.4% (n=16), Fair 45.5% (n=20), Good 18.2% (n=8). Chi-Square = 7.36 (df=2, p=.025), Fisher Exact p=.021, Linear-by-Linear =5.34 (p=.021), and there is significance of association. The bar graph indicates frequencies in terms of level of practice: Higher bars of low knowledge in good practice (dark blue) though frequency is stacked by overall association.

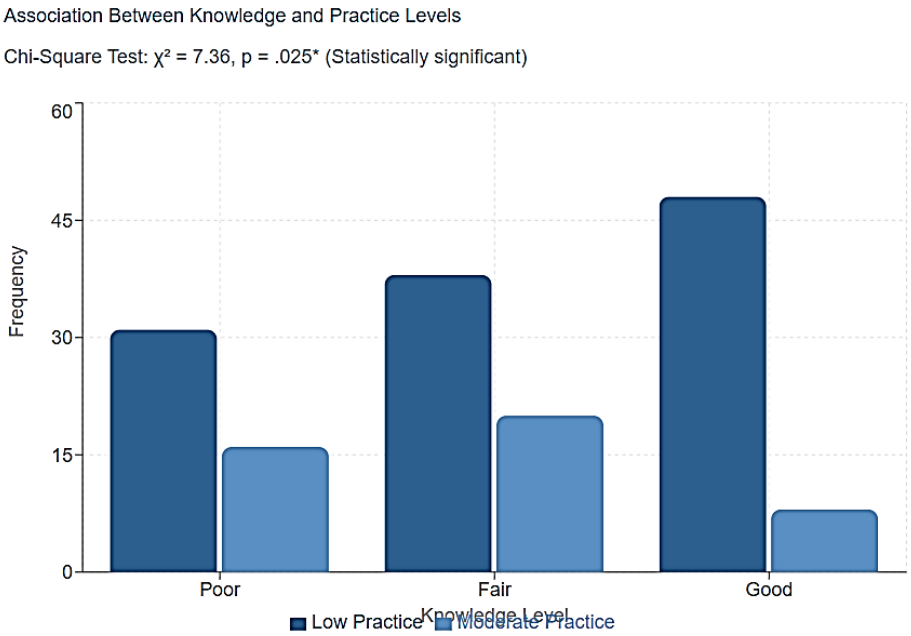

Figure 11 Association Between Knowledge and Practice Levels

The pronounced association (p<.05) supports the hypothesis to a extent, yet the trend is moderate knowledge associated with worse/fair practice, which supports the adverse correlation. This can be a sign of overconfidence or middle-level obstacles (Dalvand et al., 2018). To improve patient safety, this highlights the importance of filling the gaps with protocols (National Pressure Ulcer Advisory Panel, 2014), which will decrease morbidity in the hospitals of Bannu. In general, the results indicate moderate knowledge, inconsistent practice and negative interdependence contrary to expectations affected by demographics and systemic concerns.

Conclusion

The research presented is a cross-sectional study that was conducted in tertiary care hospitals in Bannu, Pakistan, to assess the knowledge and practice of registered nurses in preventing pressure ulcer (also referred to as pressure injury) comprehensively. Having 161 nurses as a sample, the results are valuable to provide information regarding the current state of nursing care in a resource-limited environment and which issues are vital in-patient safety. The demographic image indicated a relatively young population (mean age 24.15 years, median 23 years) with only a minor female majority (52.2%), a large proportion of Bachelor's degree graduates in nursing (87.0%), and high proportion of less than 10 years of clinical experience (69.6%). Participants had undergone training on the prevention of pressure ulcers, which was 63.4 percentage, but there was still a lot of gaps in the implementation. The study found that participants had moderate knowledge of pressure ulcer prevention (mean = 20.62 ± 4.00) but higher and more variable practice scores (mean = 29.91 ± 10.72). The questionnaire demonstrated acceptable reliability (Cronbach's α = 0.745). However, inferential analysis revealed a statistically significant but weak negative correlation between knowledge and practice (Spearman r = –0.275, p = .01), indicating that greater theoretical

knowledge did not necessarily translate into better clinical practice. This finding highlights a notable knowledge–practice gap, consistent with evidence from low- and middle-income countries (LMICs), including Pakistan. No significant differences were found in knowledge based on training status or in practice based on clinical experience. However, Chi-square and Fisher's Exact tests showed a significant association between categorized knowledge and practice levels, with moderate knowledge often linked to poor or fair practice adherence. The negative correlation may reflect contextual and systemic barriers, such as high workload, staff shortages, limited resources (e.g., pressure-relieving equipment), lack of institutional guidelines, and insufficient ongoing training—factors commonly reported in LMIC healthcare settings. The implications for patient safety are substantial. Pressure ulcers are largely preventable but are associated with significant morbidity, reduced quality of life, increased hospital stays, higher treatment costs, and greater healthcare burden. In resource-limited contexts like Pakistan, indirect costs and mortality risks further intensify the problem, making pressure ulcers an important indicator of care quality. This study sheds light on a definitive gap in the knowledge and practice of the nurses on pressure ulcer prevention in tertiary care hospitals in Bannu, which is caused by systemic and context-specific barriers in the environment that are characterized by limited resources. The findings emphasize the fact that the intermediate level of knowledge, variable practice, and the existing inverse knowledge-practice relationship demand urgent actions to be taken in terms of multiple interventions. Constant and practical training to increase the competency of nurses combined with institutional changes, like the implementation of protocols, resource availability, and multidisciplinary teamwork is a crucial part of successful prevention. In the end, these gaps will lead to fewer pressure ulcers, less suffering among patients, decreased hospitalization, cost containment, and the improvement of the overall level of patient safety and care in the Pakistani healthcare system.

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