



Knowledge, Attitudes, and Practices of Nurses Regarding Medication Errors at Saidu Group of Teaching Hospitals, Swat

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ABSTRACT

Aims: Medication errors (MEs) are a significant concern in healthcare systems globally, particularly in resource-constrained environments. Nurses, as primary caregivers, play a crucial role in ensuring safe medication administration, yet often face challenges due to systemic inefficiencies.

Methods: A descriptive cross-sectional study was conducted at the Saidu Group of Teaching Hospitals (SGTH), Swat, between October 20 and November 20, 2024. Data were collected from 200 registered nurses using structured, closed-ended questionnaires focused on assessing their knowledge, attitudes, and practices (CAP) regarding medication safety.

Results: The findings revealed that 97% of nurses routinely checked medication expiry dates, and 93.3% emphasized the importance of reporting errors. However, approximately one-third reported inadequate staffing. A total of 136 medication errors were documented during the study, with dosing errors (27.21%) and incomplete prescriptions (25.74%) being the most common.

Conclusion: Although nurses at SGTH exhibit strong knowledge and a generally positive attitude towards medication safety, systemic barriers such as staffing shortages and increased workload hinder the consistent implementation of safe practices. Targeted training, supportive policies, and improved institutional resources are recommended to mitigate medication errors and enhance patient safety.



Introduction

Social value

Medication errors (MEs) remain one of the most serious and preventable threats to patient safety in healthcare systems worldwide. The World Health Organization (WHO) defines a medication error as any preventable event that may lead to inappropriate medication use or patient harm while the medication is in the control of a healthcare professional, patient, or consumer [1].

These errors occur at various stages of the medication process, including prescribing, dispensing, administration, and monitoring, and they undermine public confidence in healthcare delivery. In many hospital settings, nearly every patient experiences at least one medication error per day, contributing to adverse outcomes, prolonged hospital stays, and increased healthcare costs [2,3].

Nurses, who serve as the frontline caregivers, are central to ensuring medication safety. Studies have shown that nurses spend approximately 16% to 40% of their work hours on medication-related activities, often under stressful conditions and with frequent interruptions [4,5]. Such workplace pressures increase the risk of errors, especially during the administration stage, which is considered the most error-prone phase of the medication process [6].

Scientific value

Globally, the burden of MEs is alarming. The Institute of Medicine reported that 44,000–98,000 deaths occur annually in the United States due to medication-related errors [7]. Similarly, WHO highlights the significant financial and emotional impact of these errors, both on patients and healthcare staff [8]. Studies from the United Kingdom, Mexico, and Nigeria reveal that prescribing and monitoring errors are common, with factors such as high workload, illegible prescriptions, and lack of reporting systems contributing to their occurrence [9–11].

In Pakistan, research has shown that medication errors occur in approximately 5.5% of hospital cases, with nearly 2% attributed to nursing practice [12]. Factors contributing to these errors include inadequate staffing, communication barriers, and limited adherence to safety protocols. Despite this, few studies in Pakistan have systematically examined nurses' knowledge, attitudes, and practices regarding medication errors in public-sector hospitals. This gap highlights the need for further investigation, particularly in resource-limited healthcare settings such as Swat.

Conceptual framework

This study is grounded in the Systems Approach to Human Error framework, which emphasizes that medication errors often result from systemic weaknesses rather than individual negligence. Understanding how institutional factors such as workload, reporting culture, and supervision influence nursing practices provides a foundation for developing sustainable safety interventions.

Aim and objectives

The present study aims to assess the knowledge, attitudes, and practices of nurses regarding medication errors at Saidu Group of Teaching Hospitals (SGTH), Swat, Pakistan. Specifically, it seeks to:

1. Evaluate the level of nurses' knowledge about medication error prevention;
2. Examine nurses' attitudes toward reporting and managing medication errors; and
3. Identify common practices and barriers related to medication safety in a public-sector hospital context.

Method and material

Study design

A quantitative descriptive cross-sectional design was employed to assess nurses' knowledge, attitudes, and practices regarding medication errors. This design was selected to obtain a comprehensive snapshot of current medication safety behaviors among nurses in a real-world hospital context.

Setting

The study was conducted at Saidu Group of Teaching Hospitals (SGTH), located in Swat District, Khyber Pakhtunkhwa, Pakistan. SGTH is a major tertiary care institution that provides specialized services to a large catchment area across northern Pakistan. The study period extended from 20 October to 20 November 2024.

Study population and sampling strategy:

The target population comprised all registered nurses employed at SGTH, totaling approximately 430 at the time of the study. The sample size of 79 nurses was calculated using the RAOSOFT sample size calculator with a 10% margin of error, a 95% confidence level, and a population size of 430. Due to logistical constraints, a non-probability convenience sampling method was used. Inclusion criteria required participants to have at least one year of clinical experience and to be available during the data collection period. Nurses who were unwilling to participate or off duty were excluded.

Data collection:

Data were collected using a structured, pre-coded, and closed-ended questionnaire developed from previously validated tools. The instrument consisted of five sections: (1) informed consent, (2) demographic characteristics, (3) educational background, (4) nursing practices, and (5) attitudes toward medication errors. The tool was refined through a pilot study involving 20 nurses at SGTH, after which 26 items were modified for clarity and contextual relevance.

Questionnaires were distributed by hand in various hospital departments, and participation was voluntary. Written informed consent was obtained prior to completion. Participants were assured of the right to withdraw from the study at any stage without any consequence. Some nurses requested to complete the questionnaire later due to workload and returned it after a brief interval.

Data analysis:

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize demographic data and major variables. Inferential analyses were applied where appropriate to explore relationships between knowledge, attitudes, and practices.

Ethical considerations:

The study adhered to ethical research principles of autonomy, beneficence, and confidentiality. Ethical clearance was obtained from the relevant institutional review board prior to data collection. Participants were assured that their responses would remain anonymous and used solely for academic purposes.

Results

A total of 200 registered nurses from Saidu Group of Teaching Hospitals (SGTH), Swat, participated in this descriptive cross-sectional study. The findings have been presented under four categories: demographic characteristics, nurses' knowledge, attitudes, and practices regarding medication errors.

Demographic Characteristics of Participants

A total of 200 registered nurses participated in the study. Table 1 displays the demographic profile of the respondents. The majority were male (n = 137, 68.33%), while female participants accounted for 31.67% (n = 63). In terms of qualification, most nurses held a diploma in nursing (n = 132, 65.83%), followed by BSc Nursing degree holders (n = 48, 24.17%), and Post RN graduates (n = 20, 10%).

Regarding work experience, a substantial proportion (n = 124, 62%) had less than five years of experience. Nurses with 5 to 10 years of experience constituted 32% (n = 64), while only 6% (n = 12) had more than 10 years of work experience.

Table 1: Demographic Characteristics of Participants (N = 200)

Variable	Category	n	Percentage (%)
Gender	Male	137	68.33%
	Female	63	31.67%
Qualification	Diploma in Nursing	132	65.83%
	BSc Nursing	48	24.17%
	Post RN	20	10.00%
Experience	< 5 years	124	62.00%
	5–10 years	64	32.00%
	11–15 years	12	6.00%

Figure 1. Gender Distribution of Participants

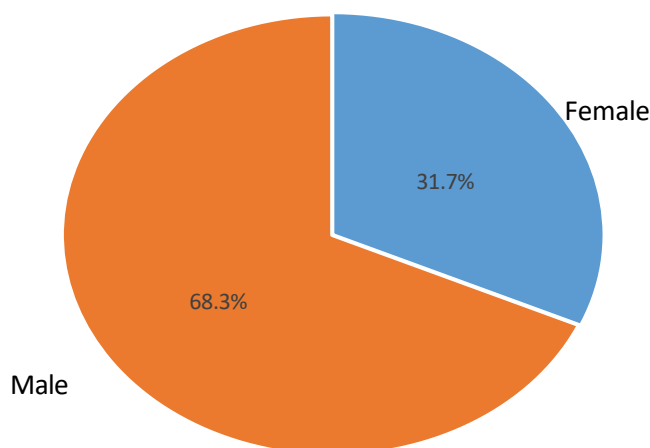


Figure 2. Educational Qualifications of Participants

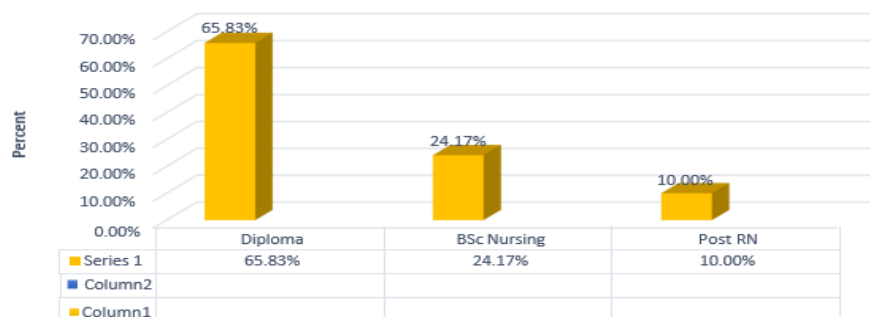


Figure 3. Clinical Experience of Participants



Interpretations:

The demographic characteristics of the participating nurses are visually represented in Figures 1 to 3. Figure 1 illustrates the gender distribution, showing that a significant majority of the respondents were male (68.33%), while only 31.67% were female. This indicates a male-dominant nursing workforce within the study sample, which may reflect institutional or regional gender employment trends in nursing. Figure 2 presents the educational qualifications of the participants. The majority of nurses (65.83%) held a diploma in nursing, followed by 24.17% with a BSc Nursing degree, and only 10% were Post RN graduates. Figure 3 displays the distribution of work experience. Most nurses (62%) had less than five years of experience, while 32% had between five and ten years, and only 6% had over ten years of experience.

Nurses' Knowledge Regarding Medication Safety

The findings indicated a high level of knowledge among nurses regarding safe medication practices. A significant majority (97%) reported always checking the expiry date before administering medications—an essential component of medication safety. Furthermore, 73.3% of respondents stated they do not administer medications prepared by other nurses, reflecting awareness of accountability and safety.

In addition, 71.6% of nurses explained possible side effects to patients before giving medication, and 68.3% reported that they inform patients about the medication process, demonstrating patient-centered care and communication.

Figure 4. Nurses' Knowledge Regarding Medication Safety Practices

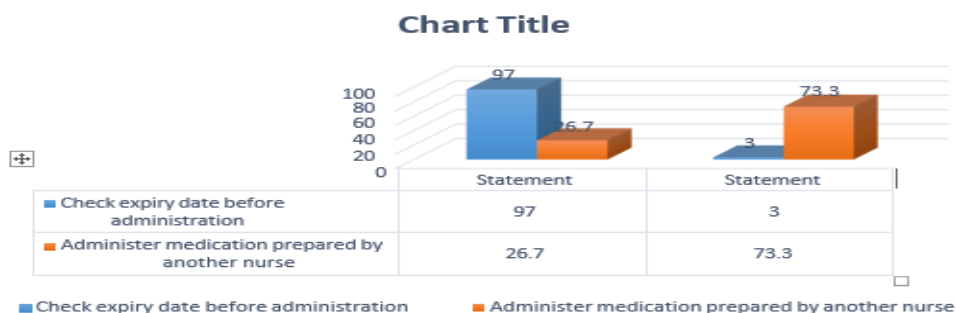


Figure 4: The bar chart illustrates nurses' knowledge regarding safe medication practices. A significant majority (97%) of nurses reported checking the expiry date before administering medications, indicating high awareness of this crucial safety step. In contrast, only 26.7% reported administering medication prepared by another nurse, suggesting a cautious and appropriate approach to medication administration practices.

Nurses' Attitudes towards Medication Errors

Most participants (93.3%) believed it is essential to report any error in the medication process. Furthermore, 67% of respondents reported that there was adequate staffing in their unit, while the remaining nurses felt that the staff was insufficient. The perception of peer support among nurses in error situations is also a noteworthy finding, with 74% agreeing that they receive support from colleagues

Figure 5. "Nurses' Attitudes towards Medication Errors"

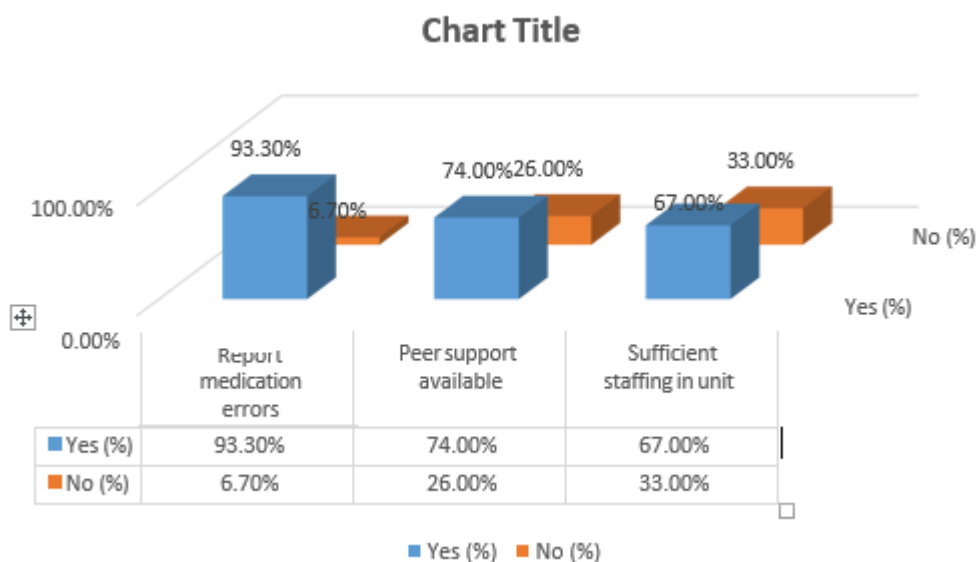


Figure 5: The chart displays nurses' attitudes towards medication errors. A strong majority (93.3%) of nurses believe errors should be reported, showing a positive safety culture. Moreover, 74% reported having peer support when medication errors occur, while 67% felt their unit was adequately staffed. These findings suggest a generally supportive work environment but also highlight that one-third of the nurses perceive staffing insufficiencies, which may impact safe medication practices.

Nurses' Practices Regarding Medication Administration

The findings revealed several key practices followed by nurses to ensure medication safety. A significant proportion (97%) of nurses reported checking the expiry date of medications before administration, which demonstrates adherence to a critical safety measure. Additionally, 79% of respondents stated that they carry the Medication Administration Record (MAR) while administering medications. About 69.5% reported labeling the medication cup with patient details, and 71.6% explained the side effects to patients before administering medication.

However, only 26.7% of nurses indicated that they would administer medication prepared by another nurse, which reflects cautious and appropriate practice in clinical settings. Overall, these practices suggest a generally positive approach to minimizing medication errors.

Figure 6. Nurses' Practices in Medication Administration

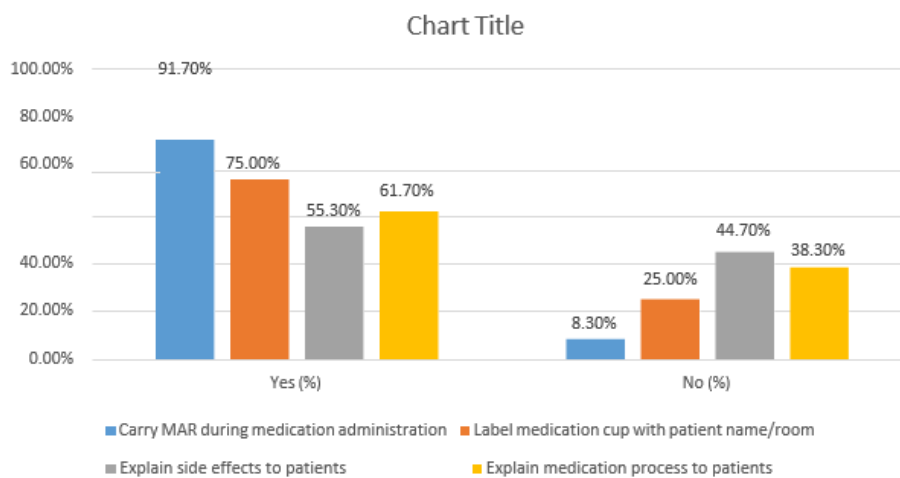


Figure 6: The bar chart represents the nurses' self-reported practices in medication administration. A high proportion (91.7%) reported carrying the MAR during administration, and 75% labeled medication cups with the patient's name or room number. However, only 55.3% and 61.7% reported explaining side effects and the medication process to patients, respectively. These findings indicate strong procedural practices but suggest a need to improve patient communication.

Nurses' Knowledge, Attitudes, and Practices (CAP) Regarding Medication Errors

Statement	Yes (%)	No (%)
Check expiry date before administration	97.0	3.0
Label medication cup with patient info	69.5	30.5
Carry MAR during medication administration	79.0	21.0
Explain side effects before giving medicine	71.6	28.4
Explain medication process to patient	68.3	31.7
Administer medication prepared by another nurse	26.7	73.3
Report medication errors	93.3	6.7
Peer support available	74.0	26.0
Sufficient staffing in unit	67.0	33.0

Observed Medication Errors

a total of 136 medication errors were identified in 200 medication orders by clinical pharmacists during the study period. Among these, dosing errors (27.21%) were the most prevalent, followed closely by incomplete prescription errors (25.74%).

Table 3 shows the types and frequencies of medication errors reported during the study. Transcription and administration errors also contributed significantly. These findings highlight specific areas where targeted interventions and training can reduce the incidence of medication errors in clinical practice.

Type of Error	Frequency (n)	Percentage (%)
Dosing Error	37	27.21%
Incomplete Prescription	35	25.74%
Transcription Error	23	16.91%
Dispensing Error	15	11.03%
Administration Error	26	19.12%

Figure 7. Types of Observed Medication Errors (N = 136)

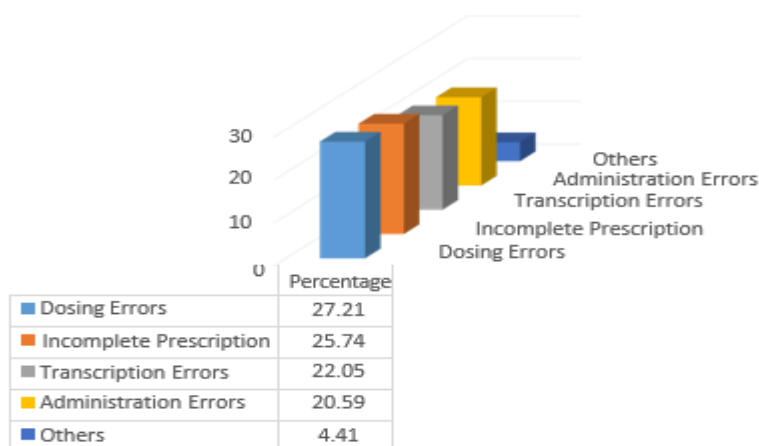


Figure 7: The graph presents the types of medication errors observed among 136 identified errors. Dosing errors (27.21%) were most prevalent, followed closely by incomplete prescriptions (25.74%). Transcription and administration errors contributed 22.05% and 20.59%, respectively. These findings emphasize the importance of improving prescribing practices, ensuring accurate transcription, and reinforcing safe administration procedures to minimize errors.

Discussion

This study examined the knowledge, attitudes, and practices of nurses regarding medication errors (MEs) at Saidu Group of Teaching Hospitals (SGTH), Swat. The findings highlight that MEs remain a persistent challenge in clinical care, particularly during the medication administration phase, consistent with international studies identifying this stage as the most error-prone [14].

A significant finding was that 93.3% of nurses recognized the importance of reporting medication errors, indicating strong awareness of patient safety standards. However, previous studies suggest that underreporting remains a global problem, often driven by fear of punitive action, inadequate

support, and ambiguous institutional policies [15,16]. This suggests that although nurses possess positive attitudes toward reporting, barriers may prevent these attitudes from translating into practice. Therefore, developing structured, non-punitive reporting mechanisms is essential to encourage transparency and promote a culture of learning.

During the study period, 136 medication errors were identified in 200 prescriptions, with dosing errors (27.21%) and incomplete prescriptions (26%) being the most frequent. These results align with previous findings from Mexico and Pakistan, where dosing errors are consistently reported as a dominant category, particularly in resource-limited healthcare environments [17,18].

In terms of gender distribution, 68.33% of participants were male, yet 87% of those admitting to committing medication errors were female. This imbalance could indicate greater honesty in reporting among female nurses or differences in workload and task allocation. Further qualitative research is warranted to explore gender-based variations in medication safety practices.

The administration phase emerged as the most vulnerable stage for medication errors, a finding corroborated by WHO and other international studies [1,19]. This phase is often associated with distractions, multitasking, and excessive workloads. Although 67% of respondents perceived staffing levels as sufficient, the remaining one-third expressed concerns about staff shortages.

These findings reinforce global evidence emphasizing that optimal nurse-to-patient ratios are vital for minimizing errors and ensuring safe care delivery [20].

Encouragingly, the majority of nurses demonstrated strong adherence to safety measures: 97% checked medication expiry dates before administration, and 73.3% refrained from administering medications prepared by others [21]. Moreover, 71.6% reported explaining possible side effects to patients, reflecting alignment with WHO and NPSA recommendations for patient-centered communication [1,13,22].

Nevertheless, a consistent gap remains between knowledge and practice. Similar to findings from studies in Nigeria and Iran, underreporting and inconsistent adherence to protocols persist due to fear of blame and lack of clear institutional guidance [10]. To overcome this, healthcare organizations must cultivate a non-punitive culture focused on identifying system failures rather than individual fault. As emphasized such an approach fosters a sustainable safety culture and continuous improvement [25].

Experience also plays a critical role in medication safety. In this study, 62% of nurses had less than five years of professional experience, consistent with literature showing that inexperience is a key factor associated with higher medication error rates [26]. Implementing structured orientation programs, continuing education, and mentorship systems can help novice nurses strengthen clinical judgment and reduce error likelihood.

Another challenge identified is the reliance on manual documentation. Unlike high-income countries utilizing electronic systems such as eMAR (Electronic Medication Administration Records) and BCMA (Barcode Medication Administration), hospitals like SGTH still depend on paper-based systems [27]. Gradual integration of digital technologies could markedly reduce transcription and administration errors and improve overall medication safety [28].

Despite its strengths, this study has limitations. Being self-reported, findings may be influenced by recall or social desirability bias. Additionally, as a single-center study, the results may not fully represent the broader nursing population in Pakistan. Nonetheless, the research provides valuable

insights into the current state of medication safety in public-sector hospitals and underscores the need for institutional, educational, and technological reforms to minimize medication errors and strengthen nursing practice.

Conclusion and Recommendations

This study highlighted the frequency, nature, and underlying factors contributing to medication errors within a resource-limited hospital environment. The findings indicate that while nurses generally possess adequate knowledge and a positive attitude toward medication safety, several systemic barriers such as insufficient staffing, heavy workloads, and the lack of standardized medication protocols continue to impede safe medication administration.

The medication administration phase was identified as the most vulnerable stage for errors, with dosing and incomplete prescription errors being the most frequently observed. Encouragingly, the majority of nurses demonstrated a strong commitment to safety principles, particularly through consistent checking of medication expiry dates and their recognition of the importance of reporting errors. However, the gap between positive attitudes and actual reporting behavior underscores the need for institutional reforms that promote open communication and a non-punitive culture of safety.

The following strategies are suggested to improve patient safety and minimize medication errors;

Implement Continuous Education: Regular training and workshops on medication safety should be mandatory for all nursing staff.

Introduce Structured Orientation: A comprehensive orientation program for newly recruited nurses can help standardize practices from the outset.

Adopt Health Information Technologies: The implementation of electronic systems like eMARs and barcode scanners is recommended to enhance accuracy and reduce manual medication errors.

Promote a Just Culture: Creating a culture that supports error reporting without fear of punishment is key to improving accountability and learning in healthcare setting

Policy and Protocol Development: Clear, evidence-based policies for each stage of medication administration must be developed and monitored.

Address Systemic Gaps: Improvements in staffing levels, workload distribution, and inter professional communication are critical to improving medication safety.

By addressing these key areas, this study contributes to the ongoing efforts to strengthen nursing roles in patient safety. These findings can guide policy makers, administrators, and educators in developing targeted interventions that align with national and international healthcare quality and safety standards.

Limitations of the Study

While this study offers valuable insights, certain limitations must be acknowledged. Firstly, the research was limited to a single public teaching hospital Saidu Group of Teaching Hospitals in Swat which may restrict the applicability of the findings to other healthcare environments, including private institutions or rural healthcare centers. Secondly, the cross-sectional design only

captures data at a single point in time, limiting the ability to observe changes or trends in nurses' behaviors over time. Thirdly, part of the information regarding medication errors was obtained through self-reporting, which may be subject to response bias due to concerns about judgment or institutional repercussions. Lastly, due to limited resources and time constraints, the study involved only 200 participants. While this sample size was sufficient for preliminary analysis, it may not fully reflect the broader population of nursing professionals. Future research should adopt a multi-center approach, include a larger and more diverse sample, and utilize longitudinal designs to provide a deeper and more accurate understanding of medication errors and the various factors influencing nursing practice.

Conflict of Interest Statement:

The authors declare no conflict of interest.

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Ethical Approval:

Ethical approval was obtained from the research ethics committee at Saidu Group of Teaching Hospitals, Swat. Informed consent was secured from all participants.

Statistician Statement:

The authors affirm that the statistical methods used were appropriate and that the data were analyzed and interpreted accurately. Statistical analysis was performed using SPSS version 26 by the lead author.

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