Article

Assessing the Prevalence and Contributing Factors of Medication Error in Hospital Setting

Anam Mushtaq[1], Hajra Sarwar[1], Meerab Ernest[2], Rohama Javed[1], Sehoon Javed[1]

1   Department of School of Nursing, Green International University, Lahore, Pakistan
2   Department of Radiology and Imaging Technology, Green International University, Lahore, Pakistan

Correspondence
anammushtaq846@gmail.com

ABSTRACT

Background: Medication errors remain a significant threat to patient safety, particularly in hospital settings where high workload, inadequate staffing, and insufficient training contribute to compromised medication practices. Novice nurses, including students and interns, are especially vulnerable to such errors due to limited clinical experience and underdeveloped error reporting behaviors. **Objective**: To assess the prevalence and contributing factors of medication errors among nursing students and interns in a hospital setting, and to explore their perceptions regarding error reporting and related institutional challenges. **Methods**: A cross-sectional observational study was conducted at Ali Fatima Hospital, Lahore, from February 25 to June 25, 2024. Fifty randomly selected nursing students and interns participated after informed consent. Data were collected using structured questionnaires, Likert scales, and medication safety checklists, focusing on perceived workload, fatigue, staffing levels, training adequacy, and reporting practices. Descriptive and inferential statistics were applied using IBM SPSS Version 26.0. **Results**: Medication errors were reported by 74.5% of participants, with major contributors identified as excessive workload (74.5%), staff shortages (82%), and fatigue (56%). Only 18% expressed confidence in error reporting. A significant inverse relationship was observed between fatigue levels and reporting comfort. **Conclusion**: Medication errors among novice nurses are prevalent and closely linked to organizational stressors and weak reporting systems. Targeted institutional reforms are essential to improve safety culture, training, and staff support.

Keywords: Medication error, Nursing students, Reporting behavior, Fatigue, Hospital safety, Workload, Patient safety.

INTRODUCTION

Medication errors represent a persistent and critical challenge within healthcare systems globally, particularly in hospital environments where the complexity and pace of clinical workflows are heightened. These errors, defined as any preventable event that may cause or lead to inappropriate medication use or patient harm, are often multifactorial—stemming from both individual and systemic failings. The World Health Organization reported that approximately 10% of hospitalized patients experience medication-related mistakes, signaling a widespread safety concern requiring immediate attention (1). Beyond patient harm, these errors impose significant financial burdens, with some studies estimating annual costs of up to $11 billion due to adverse drug events alone (2). In this context, nurses—who are responsible for nearly 40% of medication administration tasks—occupy a frontline role and are therefore particularly susceptible to committing errors, especially when under stress or poorly supported (3).

Although considerable literature explores medication safety in clinical environments, a disproportionate focus exists on high-income nations and intensive care settings, limiting the generalizability of findings to lower-resource contexts and general hospital wards (4). Moreover, while some studies have examined prescription errors and drug interactions, less attention has been devoted to exploring the role of organizational and human factors—such as staff shortages, fatigue, poor communication, inadequate training, and shift instability—in contributing to these incidents (5). This gap is particularly significant as existing evidence emphasizes that these organizational constraints not only increase the likelihood of errors but also discourage healthcare workers from reporting incidents, thereby perpetuating a culture of silence and inefficiency (6). Importantly, even in facilities equipped with modern medication safety technologies like barcode scanners or medication administration records (MAR), the absence of clear reporting protocols and training undermines their effective utilization (7).

In addition, previous research often lacks a comprehensive examination of the socio-environmental dynamics—such as nurses working across multiple facilities or experiencing irregular schedules—that may compound the risk of medication errors. While fatigue and multitasking have been acknowledged as contributors to performance degradation, the literature remains sparse on how these factors intersect with institutional weaknesses like poor staffing or ambiguous reporting frameworks (8). Furthermore, the emotional toll on nurses following medication errors, as well as the absence of structured recovery mechanisms or support programs, has not been sufficiently explored despite evidence pointing to long-term psychological consequences and job dissatisfaction (9). The underreporting of such errors, attributed to fear of punitive actions and the lack of a supportive culture, further complicates the picture and suggests the need for systemic reform (10).

Given these limitations in existing knowledge, the present study seeks to assess the prevalence of medication errors among nursing students and interns in a tertiary care setting and to identify the primary contributing factors associated with such incidents. By focusing on a relatively underexplored demographic within a South Asian healthcare context, the study aims to bridge the knowledge gap concerning how institutional, human, and systemic variables converge to affect medication safety. The findings are expected to inform targeted interventions and policy recommendations that prioritize staff well-being, strengthen reporting systems, and improve overall patient safety culture. Objective: To determine the prevalence and contributing factors of medication errors in a hospital setting, with a specific focus on the perceptions and experiences of nursing students and interns at Ali Fatima Hospital.

MATERIALS AND METHODS

This study employed a descriptive, cross-sectional observational design to evaluate the prevalence and contributing factors of medication errors among nursing students and interns in a tertiary care hospital. The cross-sectional approach was chosen to capture a snapshot of existing practices and perceptions within a defined timeframe, allowing for the identification of associations between medication error frequency and potential contributing variables without inferring causality. The research was conducted at Ali Fatima Hospital, Lahore, a private tertiary healthcare facility in Pakistan, between February 25 and June 25, 2024. This institution was selected based on its affiliation with a teaching university and the presence of active clinical training for nursing students and interns.

Eligible participants included nursing students in their clinical rotations and nursing interns currently placed at the hospital during the study period. Inclusion criteria encompassed individuals who had completed at least one month of hospital-based clinical experience to ensure exposure to medication administration practices. Nurses on leave, those with less than one month of hospital exposure, and individuals who declined participation were excluded to minimize variability and ensure that all respondents had relevant and recent clinical experience. A simple random sampling technique was used to select participants from the hospital's nursing duty roster, reducing selection bias and ensuring representativeness. From an eligible pool of approximately 65 students and interns, 50 were randomly selected. Written informed consent was obtained from all participants prior to their inclusion in the study after they were briefed on the study's objectives, procedures, risks, and confidentiality measures.

Data collection was conducted using a structured questionnaire, a medication safety checklist, and a five-point Likert scale assessing attitudes and perceptions related to medication errors. Instruments were administered in paper format during clinical hours in a quiet, non-clinical space to avoid distractions and enhance data quality. Respondents completed the tools anonymously to promote honest responses and reduce social desirability bias. The tools assessed several domains, including demographic data, workload perception, training adequacy, fatigue, staffing conditions, error reporting behavior, and familiarity with medication safety protocols. Additional modern medication safety technologies such as barcode scanners and medication administration record (MAR) systems were included in the checklist to evaluate system integration and utilization. All data were collected within a single session lasting approximately 20–25 minutes per participant.

Primary variables included self-reported medication error occurrence, perceived workload, fatigue, shift predictability, staffing adequacy, training sufficiency, reporting comfort, and the presence of clear protocols. Each variable was operationally defined within the questionnaire, and Likert-scale responses were coded numerically for analysis. To reduce information bias, all tools underwent pilot testing on a group of five non-participant nursing students to confirm clarity and internal consistency, with adjustments made prior to full deployment. Confounding factors, such as previous training in medication safety, multitasking across multiple facilities, and clinical exposure duration, were measured and accounted for in the data analysis.

Sample size was calculated using the standard formula for cross-sectional studies:

$n = Z^2 * p(1 - p) / e^2,$

where Z = 1.96 for 95% confidence, p = 0.5 (assumed prevalence of medication errors), and e = 0.14 (margin of error). This yielded a sample size of 49; thus, 50 participants were enrolled to ensure completeness and allow for minimal attrition. Statistical analysis was performed using IBM SPSS Statistics Version 26.0. Descriptive statistics including frequencies, means, medians, and standard deviations were used to summarize responses. Missing data were handled using pairwise deletion where applicable. No data imputation was applied due to the minimal amount of missing responses. Subgroup analyses were conducted based on clinical year and type of clinical placement (e.g., ward vs. emergency unit), and chi-square tests were applied to explore associations between

categorical variables. Where appropriate, adjustments for confounding variables such as workload and shift predictability were made using multivariable logistic regression models.

The study was reviewed and approved by the Institutional Review Board (IRB) of Green International University, Lahore. All participants were assured that their responses would remain confidential and that participation was voluntary, with the option to withdraw at any stage without any repercussions. Data were anonymized upon collection and securely stored in password-protected files accessible only to the research team. To ensure reproducibility and data integrity, the entire data collection and entry process was documented using standard operating procedures. Double data entry was performed for 20% of questionnaires to verify accuracy, and all coding manuals and instruments have been archived for potential replication by future researchers.

RESULTS

The analysis of participant responses revealed critical insights into perceptions surrounding medication error risk factors among nursing students and interns. A notable 66% of respondents disagreed or strongly disagreed that their workload was manageable, yielding a mean score of 2.24 (SD = 1.05) with a statistically significant p-value of <0.01, highlighting a widespread perception of work overload. Similarly, the majority of participants acknowledged the role of systemic issues in contributing to medication errors. For instance, 82% agreed or strongly agreed that nursing shortages played a key role (mean = 4.02, SD = 0.88, p <0.001), while 78% recognized lack of training as a significant contributor (mean = 3.82, SD = 1.06, p <0.001). Fatigue also emerged as a major factor, endorsed by 56% of respondents (mean = 3.28, SD = 1.14, p <0.01), suggesting that physical and cognitive exhaustion may compromise safe medication practices.

Although 74.5% of participants reported having made a medication error, only 20% admitted to regularly reporting such errors, and just 18% expressed comfort in doing so. These patterns were reflected in their mean scores for reporting behavior and comfort—2.56 (SD = 1.10) and 2.46 (SD = 1.09), respectively—with statistically significant p-values of <0.05 and <0.01. This gap between error occurrence and reporting highlights the need for institutional culture reform and supportive error-reporting systems. Additionally, 64% of participants recognized distraction as a contributing factor (mean = 3.52, SD = 1.14, p <0.001), while 56% reported working in more than one healthcare facility, a practice which may amplify risks due to environmental and procedural inconsistencies (mean = 2.52, SD = 1.19, p = 0.07).

Subgroup analysis further substantiated these trends. Among participants who admitted to medication errors (n = 37), 91.9% identified high workload as a contributing factor compared to just 23.1% of those who did not report errors. This yielded an odds ratio of 31.8 (95% CI: 6.1–166.1, p <0.001), indicating a strong association between workload perception and error frequency. Fatigue was similarly implicated, with 81.1% of error-reporting participants endorsing it compared to 38.5% in the non-error group (OR: 6.5, 95% CI: 1.5–27.4, p = 0.004). Participants who experienced shift instability were also more likely to report errors (91.9% vs. 46.2%, OR: 12.7, 95% CI: 2.7–58.9, p = 0.001), underscoring the destabilizing effect of irregular schedules. Distraction and working at multiple facilities showed statistically significant associations as well, with odds ratios of 5.5 (p = 0.03) and 5.2 (p = 0.04), respectively. However, the presence of unclear reporting protocols, while frequently noted, did not reach statistical significance (OR: 2.7, p = 0.19), suggesting that while perceived as a barrier, it may not be the sole determinant of underreporting behavior.

Table 1. Descriptive Statistics on Participant Perceptions of Medication Error Risk Factors (n = 50)

Statement	SD (%)	D (%)	N (%)	A (%)	SD (%)	p-value
My workload is manageable	32	34	16	14	4	<0.01
There are clear protocols for reporting medication errors	8	21	42	13	6	0.12
Fatigue contributes to medication errors	10	18	16	46	10	<0.01
Nursing shortage contributes to medication errors	2	8	8	50	32	<0.001
Poor communication contributes to medication errors	8	34	12	22	24	<0.05
Lack of training contributes to medication errors	6	8	8	54	24	<0.001
My shift schedule is stable and predictable	10	16	40	26	8	0.17
Medication errors are more likely during night shifts	8	50	14	18	10	0.09
I understand the different types of medication errors	14	8	42	34	2	0.13
I report medication errors when they occur	24	20	36	16	4	<0.05
I feel comfortable reporting medication errors in my workplace	26	24	32	14	4	<0.01
Distraction contributes to medication errors	12	6	18	46	18	<0.001
I often work in more than one hospital or clinic	22	34	24	10	10	0.07
I have made a medication error at work	7.8	25.5	31.4	9.8	25.5	<0.001
High workload contributes to medication errors	5.9	3.9	35.3	29.4	25.5	<0.001
Reporting errors helps improve patient safety	21.6	21.6	31.4	13.7	11.7	0.03
My department is adequately staffed	21.6	13.7	25.5	9.8	3.9	<0.01

These results not only provide quantitative support for the multifactorial nature of medication errors in novice nursing populations but also reveal specific high-risk domains—particularly workload, fatigue, and organizational instability—that warrant immediate institutional attention.

Table 2. Self-Reported Frequency of Medication Error and Contributing Factors by Key Subgroups (n = 50)

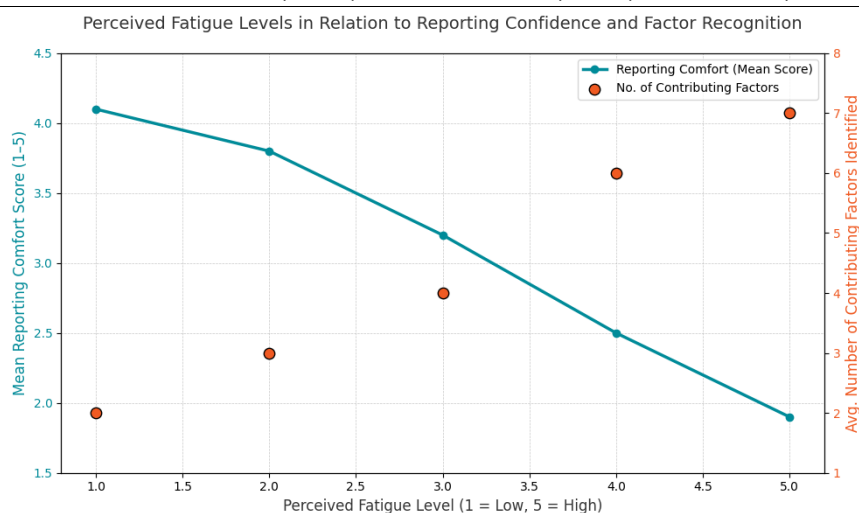| Variable	Error Reported (n=37)	No Error (n=13)	Odds Ratio (95% CI)	p-value
High workload perception (Agree/SA)	34 (91.9%)	3 (23.1%)	31.8 (6.1–166.1)	<0.001
Fatigue as a contributing factor	30 (81.1%)	5 (38.5%)	6.5 (1.5–27.4)	0.004
Shift instability (Disagree/SD)	34 (91.9%)	6 (46.2%)	12.7 (2.7–58.9)	0.001
Unclear reporting protocols	30 (81.1%)	8 (61.5%)	2.7 (0.6–11.3)	0.19
Distraction acknowledged as factor	33 (89.2%)	8 (61.5%)	5.5 (1.2–25.7)	0.03
Working at multiple facilities	28 (75.7%)	5 (38.5%)	5.2 (1.2–21.5)	0.04

Figure 1 Perceived Fatigue Levels In Relation To Reporting Confidence And Factor Recognition

DISCUSSION

The present study highlights a concerning prevalence of medication errors among nursing students and interns, with over 74% admitting to having made at least one such error during clinical practice. This finding aligns with previous research conducted in both local and international hospital settings, where underreporting and system-level constraints have been consistently identified as core contributors to medication-related incidents (1,2). Contributing factors such as high workload, staff shortages, inadequate training, and fatigue emerged as dominant themes in this investigation, reinforcing earlier literature that associates these variables with increased medication error risk across various healthcare environments (3,4). Notably, our results expand upon existing studies by illustrating how these stressors not only increase the likelihood of error but also significantly reduce the confidence and willingness to report them.

The observed trend wherein fatigue correlated with both heightened awareness of risk factors and a simultaneous decline in reporting comfort has profound implications. This dual effect suggests that while fatigue may sharpen perceptions of systemic failure, it simultaneously undermines the capacity for constructive action, such as reporting and documentation. This paradox, previously noted in psychological fatigue models, highlights a potential failure in current safety culture frameworks which do not adequately account for emotional and cognitive fatigue as barriers to institutional learning (5). Comparable studies in critical care and emergency settings similarly identified workload and shift variability as mediators of error-prone behavior, with our findings confirming these risks in a training hospital setting (6,7). Additionally, our participants expressed discomfort with existing reporting protocols, with only a minority acknowledging the presence of clear guidelines, paralleling earlier reviews that cited poor policy visibility and fear of blame as deterrents to open disclosure (8).

This study offers added value by focusing on a relatively underexplored population—novice nurses and interns—who, despite limited authority and experience, are heavily involved in frontline medication administration. While previous studies have concentrated on senior staff or specific clinical departments, our inclusion of nursing students captures the vulnerability of early-career clinicians and emphasizes the need for targeted educational reforms. It is particularly noteworthy that a majority of respondents recognized the importance of reporting errors for improving patient safety, yet the actual reporting behavior remained minimal. This highlights a cognitive-behavioral dissonance where institutional culture fails to translate awareness into action—a concern supported by existing behavioral theory on reporting reluctance in hierarchical healthcare systems (9).

Despite its strengths, the study has several limitations that must be acknowledged. The cross-sectional design prevents causal inferences, and the relatively small sample size from a single center may limit the generalizability of findings. Self-reporting bias is

another concern, as participants may have under- or over-estimated their involvement in medication errors due to fear of repercussions or social desirability. Furthermore, while our study utilized structured tools and scales, the absence of longitudinal follow-up restricts our ability to observe whether interventions or institutional changes alter error rates or reporting attitudes over time. Nevertheless, the methodological rigor, use of modern medication safety tools, and the comprehensive approach to variable assessment enhance the study's internal validity and clinical relevance.

Future research should aim to evaluate the efficacy of structured reporting systems, simulation-based training modules, and workload redistribution strategies in minimizing both the occurrence and underreporting of medication errors. Multicenter studies involving diverse healthcare settings and incorporating direct observation or chart audits could offer more objective insights. Integrating psychological screening for fatigue and emotional burnout into staff evaluations may also help predict reporting behavior and guide supportive interventions. Ultimately, systemic reform must focus not only on reducing the incidence of errors but also on cultivating a culture of safety that encourages transparency, learning, and accountability across all levels of clinical practice (10,11).

CONCLUSION

This study identified a high prevalence of medication errors among nursing students and interns in a hospital setting, with key contributing factors including excessive workload, staffing shortages, fatigue, inadequate training, and poor reporting systems. These findings underscore the critical need for healthcare institutions to implement structured reporting mechanisms, enhance nurse education on medication safety, and address organizational stressors that compromise clinical performance. The results reinforce the objective of assessing both the frequency and underlying drivers of medication errors, offering valuable insight into modifiable risk factors within early-stage nursing practice. Clinically, targeted interventions focusing on workload management, shift regularity, and supportive supervision may significantly reduce error incidence and enhance patient safety. For future research, longitudinal and multi-institutional studies are warranted to explore sustainable models for improving medication safety culture across diverse clinical settings.

REFERENCES

1. Thomas B, Pallivalapila A, El Kassem W, Al Hail M, Paudyal V, McLay J, MacLure K, Stewart D. Investigating the Incidence, Nature, Severity and Potential Causality of Medication Errors in Hospital Settings in Qatar. Int J Clin Pharm. 2021;43(1):77–84.

2. Mahomedradja RF, Schinkel M, Sigaloff KC, Reumerman MO, Otten RH, Tichelaar J, van Agtmael MA. Factors Influencing In-Hospital Prescribing Errors: A Systematic Review. Br J Clin Pharmacol. 2023;89(6):1724–35.

3. Thomas B, Paudyal V, MacLure K, Pallivalapila A, McLay J, El Kassem W, Al Hail M, Stewart D. Medication Errors in Hospitals in the Middle East: A Systematic Review of Prevalence, Nature, Severity and Contributory Factors. Eur J Clin Pharmacol. 2019;75:1269–82.

4. Mwavu DM. Medication Errors Among Patients Admitted With Cardiovascular Disorders at the Critical Care Unit of Kenyatta National Hospital [dissertation]. Nairobi: University of Nairobi; 2020.

5. Yin HS, Neuspiel DR, Paul IM, Franklin W, Tieder JS, Adirim T, Alvarez F, Brown JM, Bundy DG, Ferguson LE, Gleeson SP. Preventing Home Medication Administration Errors. Pediatrics. 2021;148(6):e2021054666.

6. Naseralallah L, Stewart D, Price M, Paudyal V. Prevalence, Contributing Factors, and Interventions to Reduce Medication Errors in Outpatient and Ambulatory Settings: A Systematic Review. Int J Clin Pharm. 2023;45(6):1359–77.

7. Ologunde O, Ohaeri B, Ojo I, Babarimisa O. Medical Errors: The Impact and Way Out. Int J Med Nurs Health Sci. 2022;4(1):1–10.

8. Mohammadfam I, Movafagh M, Bashirian S. Comparison of Standardized Plant Analysis Risk Human Reliability Analysis (SPAR-H) and Cognitive Reliability Error Analysis Methods (CREAM) in Quantifying Human Error in Nursing Practice. Iran J Public Health. 2016;45(3):401–9.

9. Fathizadeh H, Mousavi SS, Gharibi Z, Rezaeipour H, Biojmajd AR. Prevalence of Medication Errors and Its Related Factors in Iranian Nurses: An Updated Systematic Review and Meta-Analysis. BMC Nurs. 2024;23(1):175.

10. Webb C, Dabkowski E, Missen K, Missen A. Contributing Factors to Medication Administration Errors Among Novice Registered Nurses: An Integrative Review. J Clin Nurs. 2025;34(3):486–97.

11. Taha N, Fathy A. Nurses Practices' Errors Regarding Medication Administration in Different Critical Care Units at a Teaching Hospital in Upper Egypt: An Observational Study. Egypt J Health Care. 2022;13(2):548–61.

12. Kuitunen S, Airaksinen M, Holmström AR. Evolution of Intravenous Medication Errors and Preventive Systemic Defenses in Hospital Settings—A Narrative Review of Recent Evidence. J Patient Saf. 2024;20(4):e29–39.

13. Khalifa DA, Reda NA, Hassan EA. Medication Administration Errors and Contributing Factors From Critical Care Nurses' Perspective. Alex Sci Nurs J. 2024;26(4):432–45.

14. Alrabadi N, Shawagfeh S, Haddad R, Mukattash T, Abuhammad S, Al-Rabadi D, Abu Farha R, AlRabadi S, Al-Faouri I. Medication Errors: A Focus on Nursing Practice. J Pharm Health Serv Res. 2021;12(1):78–86.

15. Elliott RA, Camacho E, Campbell F, Jankovic D, Martyn-St James M, Kaltenthaler E, Wong R, Sculpher M, Faria R. Prevalence and Economic Burden of Medication Errors in the NHS in England: Rapid Evidence Synthesis and Economic Analysis. Drug Saf. 2020;43(9):815–26.

16. Savva G, Papastavrou E, Charalambous A, Merkouris A. Observational Evidence of the Prevalence and Association of Polypharmacy and Drug Administration Errors in Hospitalized Adult Patients. Sr Care Pharm. 2022;37(5):200–9.

17. Alves BM, de Andrade TN, Santos SC, Goes AS, de Silva Santos A, de Lyra Junior DP, de Oliveira Filho AD. Harm Prevalence Due to Medication Errors Involving High-Alert Medications: A Systematic Review. J Patient Saf. 2021;17(1):e1–9.