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FACTORS INFLUENCING MEDICATION ADMINISTRATION ERRORS AND BARRIERS TO SELF-REPORTING AMONG NURSES IN PUBLIC SECTOR TERTIARY CARE HOSPITALS IN PESHAWAR

Original Research

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ABSTRACT

Background: Medication administration errors (MAEs) are a leading cause of adverse patient outcomes in healthcare settings. These errors often stem from complex systemic and human factors. Understanding the perspectives of frontline nursing staff is critical to identifying both the root causes of such errors and the obstacles to transparent reporting. Despite growing awareness, underreporting remains a persistent issue in many clinical environments, particularly in resource-limited settings such as Pakistan.

Objective: This study aimed to explore nurses' perspectives on the causes of medication administration errors and the barriers that prevent their reporting in public tertiary care hospitals.

Methods: A descriptive cross-sectional study was conducted from June to October 2022 across two public sector tertiary hospitals in Peshawar, Pakistan. A total of 209 registered nurses, selected through simple random sampling, completed a structured, self-administered questionnaire comprising three sections: demographic data, factors contributing to MAEs (22 items), and barriers to error reporting (13 items). Responses were rated on a 5-point Likert scale. Data were analyzed using SPSS version 26, employing descriptive statistics including frequency, percentage, mean, median, and standard deviation.

Results: The most significant contributing factor to MAEs was inadequate staffing (Mean = 4.23, SD = 0.76), followed by heavy workload (Mean = 3.94, SD = 1.15), look-alike/sound-alike drug names (Mean = 3.74, SD = 1.27), similar drug packaging (Mean = 3.48, SD = 1.25), and polypharmacy (Mean = 3.48, SD = 1.26). Less frequent contributors included incorrect pharmacy doses (Mean = 2.53, SD = 1.28) and miscommunication (Mean = 2.59, SD = 1.31). Barriers to error reporting included fear of blame (Mean = 3.94, SD = 1.16), perceived judgment (Mean = 3.51, SD = 1.15), and individual-focused organizational responses (Mean = 3.36, SD = 1.30).

Conclusion: The findings highlight the pressing need to address systemic deficiencies by promoting a non-punitive reporting culture, improving staffing levels, and empowering nurses to report errors without fear of retribution.

Keywords: Barriers to Reporting, Medication Administration Errors, Medication Safety, Nurses, Organizational Culture, Patient Safety, Workload.

INTRODUCTION

Medication administration errors (MAEs) remain one of the most pressing threats to patient safety in both developed and developing healthcare systems. These errors are among the most frequent types of medical mistakes and significantly contribute to adverse clinical outcomes, including morbidity and mortality (1). The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) defines a medication error as any preventable incident that may lead to inappropriate medication use or patient harm while the medication is under the control of a healthcare provider, patient, or consumer (2). Such errors occur across all stages of the medication use process—prescribing, transcribing, dispensing, administering, and monitoring—and have far-reaching consequences not only for patient health but also for the trust and efficiency of healthcare institutions (3,4). A multitude of factors are known to contribute to medication errors, including poor communication, insufficient training, time pressure, fatigue, high patient-to-nurse ratios, and system-level deficiencies such as inadequate staffing and lack of resources (5,6). Nurses, who spend approximately 40% of their clinical time administering medication, are particularly vulnerable to committing such errors, especially during the administration phase which accounts for more than half of all medication-related mistakes (7,8). This exposure is further intensified in environments where rapid task completion is demanded under strenuous conditions, often leading to errors in dosage calculation, incorrect route or timing of administration, or giving medications to the wrong patient (9).

Globally, medication errors affect nearly 10% of hospitalized patients, with an estimated 7% of these cases resulting in fatal outcomes (10). Each year, approximately 98,000 deaths are attributed to medical errors in general, and about 7,000 are specifically linked to medication-related incidents (11). Beyond the physical consequences for patients, healthcare professionals involved in these errors often experience emotional distress, professional guilt, and fear of punishment, leading to underreporting of adverse events—a phenomenon that further hampers the opportunity for institutional learning and prevention (12). In low-resource settings, including South Asian countries, the problem is compounded by limited data availability, underdeveloped pharmacovigilance infrastructure, and cultural barriers to transparent communication of clinical mistakes (13,14). The financial burden of medication errors is equally alarming, with global estimates suggesting an annual cost of $42 billion USD due to preventable harm (15). Initiatives such as the World Health Organization's "Medication Without Harm" campaign aim to reduce severe, avoidable medication-related harm by 50% within five years, emphasizing the urgency for systemic interventions (16). Nevertheless, the burden of MAEs in countries like Pakistan remains underexplored, with minimal research conducted to examine their frequency, causes, and reporting behaviors among nurses in tertiary care settings (17).

Despite being the frontline executors of medication administration, nurses are rarely equipped with sufficient support or safe platforms to report errors without fear of blame. The reluctance to disclose medication mistakes, driven by fear of punitive actions or professional stigma, poses a critical barrier to quality improvement in healthcare systems (18). Understanding the underlying factors contributing to MAEs and the challenges that inhibit error reporting is therefore crucial for the development of practical, context-specific strategies aimed at enhancing patient safety. Given this background, the current study seeks to explore the contributing factors behind medication administration errors and identify the barriers to their reporting from the perspective of nurses working in public tertiary care teaching hospitals in Peshawar. By highlighting systemic vulnerabilities and behavioral patterns, the research aims to inform future interventions that can foster a culture of safety, transparency, and continuous learning in clinical practice.

METHODS

The study employed a descriptive cross-sectional design and was conducted between June and October 2022 in two public tertiary care teaching hospitals located in the Peshawar region of Pakistan. The target population included registered nurses directly involved in patient care, with more than one year of clinical experience. Nurses meeting these criteria were eligible for inclusion, while those not actively engaged in medication administration or with less than one year of experience were excluded to ensure participant relevance. A calculated sample size of 227 was determined to achieve adequate statistical power, and participants were selected through a simple probability sampling technique to minimize selection bias and ensure representativeness. Data collection was carried out using a self-administered, structured questionnaire adapted from the validated instrument, which has been previously used to investigate both the

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causes of medication administration errors (MAEs) and nurses' perceptions of barriers to error reporting (10). The questionnaire was divided into three key sections. The first section captured general participant demographics across nine items, such as age, gender, qualification, years of experience, and marital status. The second section consisted of 22 items focused on identifying perceived causes of MAE occurrence. The third section addressed barriers to reporting medication errors, comprising 13 items measured on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The overall internal consistency of the instrument was robust, with a Cronbach's alpha of 0.899, indicating high reliability for the measurement tool.

Prior to data collection, ethical approval was obtained from the institutional review board (IRB) of the participating hospitals. Each participant was provided with a detailed explanation of the study's objectives and procedures. Written informed consent was obtained, and assurances regarding anonymity, confidentiality, and voluntary participation were clearly communicated. No personally identifiable information was collected, and participants had the option to withdraw at any point without any consequences. Data were entered and analyzed using SPSS version 22. Descriptive statistics were applied to summarize the dataset. Mean, median, interquartile range (IQR), and standard deviation were calculated for continuous variables such as age and job experience. Frequencies and percentages were computed for categorical variables including gender, marital status, educational qualifications, and workplace organization. In addition, mean scores, standard deviations, and response distributions were computed for the questionnaire items related to causes of MAEs and unreported medication errors.

RESULTS

1. Demographic Variable

Out of a total of 227 distributed questionnaires, 209 nurses completed the survey, yielding a response rate of 92.1%. Among the participants, 42 (20.1%) were male and 167 (79.9%) were female. The majority of respondents were between 26–30 years old (n=102, 48.8%), followed by those aged 20–25 years (n=79, 37.8%). Nurses aged 31–35 years accounted for 11.5% (n=24), while those aged 36–40 years and 41 years or older comprised 1.0% each (n=2). Educational qualifications indicated that 132 (63.2%) held a BSN or Post RN qualification, while 77 (36.8%) held a nursing diploma. No participants reported having an MSN degree. With respect to workplace units, 59 (28.2%) nurses were from medical units, 58 (27.8%) from ICU/CCU/ER units, 50 (23.9%) from surgical units, 31 (14.8%) from pediatric units, and 11 (5.3%) from oncology units. Regarding experience in the current unit, 96 (45.9%) had 1–2 years of experience, 63 (30.1%) had 3–4 years, and 50 (23.9%) had more than 5 years. Total clinical experience showed that 90 (43.1%) had more than 5 years of service, 72 (34.4%) had 3–4 years, and 47 (22.5%) had 1–2 years. Patient load per nurse indicated that 94 (45.0%) cared for more than 15 patients per day, 43 (20.6%) cared for 11–15 patients, 37 (17.7%) for 6–10 patients, and 35 (16.7%) for 1–5 patients. Among the respondents, 142 (67.9%) reported having experienced medication administration errors (MAEs) during their clinical careers, while 67 (32.1%) did not. Of those reporting MAEs, the intravenous route was the most frequently associated route (n=115, 55.0%), followed by intramuscular (n=15, 7.2%) and subcutaneous routes (n=9, 4.3%). Only 3 (1.4%) reported errors through oral administration.

2. Factors Contributing to Medication Errors

Nurses identified several key factors contributing to medication administration errors. The most cited cause was an inadequate number of staff nurses per shift, with a mean score of 4.23 (±0.76), followed by heavy workload in wards, scoring a mean of 3.94 (±1.15). Look-alike and sound-alike drug names and packaging were also major contributors. Specifically, similar drug names had a mean of 3.74 (±1.27), and medications with similar appearances also scored 3.74 (±1.29). Other significant causes included similar drug packaging (3.48 ±1.25) and multiple medications for several patients (3.48 ±1.26). On the other hand, the least frequently endorsed contributing factor was the pharmacy delivering incorrect doses (2.53 ±1.28), followed by nurses being unaware of patient allergies (2.56 ±1.26), lack of timely communication about delayed doses (2.59 ±1.31), failure to adhere to policy documentation (2.60 ±1.24), and lack of convenient access to drug information (2.86 ±1.24). Limited medication knowledge among nursing staff and patients leaving the ward for alternate treatments also shared the same mean score of 2.86, albeit with slight variations in standard deviation.

3. Barriers to Reporting of Medication Administration Errors

Nurses reported several obstacles that hinder error reporting. The most common reason was fear of being blamed if harm occurred to the patient (mean = 3.94 ±1.16). Excessive emphasis on medication errors as indicators of nursing performance quality was the second-highest reason (3.51 ±1.15). Administrative attitudes prioritizing personal blame over systemic issues (3.36 ±1.30) and fear of adverse

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consequences (3.24 ±1.23) were also major deterrents.Conversely, the least reported barrier was disagreement with the hospital's definition of a medication error (2.33 ±1.26). Other less common reasons included failure to recognize that an error had occurred (2.50 ±1.25), not reporting errors when no harm was caused (2.56 ±1.39), and fear of reprimand by doctors (2.64 ±1.36).

Table 1: Demographic Data of the Participants

Item	Category	Count (N=209)	N %
Gender	Male	42	20.1%
	Female	167	79.9%
Age	20-25 yrs.	79	37.8%
	26-30 yrs.	102	48.8%
	31-35 yrs.	24	11.5%
	36-40 yrs.	2	1.0%
	41& above	2	1.0%
Education level	Diploma	77	36.8%
	BSN/Post RN	132	63.2%
	MSN	0	0.0%
Working Unit/Ward	Medical	59	28.2%
	Surgical	50	23.9%
	ICU/CCU/ER	58	27.8%
	Pediatric	31	14.8%
	Oncology	11	5.3%
Experience in the current unit	1-2 yrs.	96	45.9%
	3-4 yrs.	63	30.1%
	greater than 5 yrs.	50	23.9%
Total Experience:	1-2 yrs.	47	22.5%
	3-4 yrs.	72	34.4%
	greater than 5 yrs.	90	43.1%
Average patients Assigned	1-5 patient	35	16.7%
	6-10 patient	37	17.7%
	11-15patient	43	20.6%
	>15 patients	94	45.0%
Experience with Medication administration errors (MAEs)?	Yes	142	67.9%
	No	67	32.1%
Routes of Medication Administration Errors	Intravenous	115	55.0%
	Oral	3	1.4%
	Subcutaneous	9	4.3%
	Intramuscular	15	7.2%
	None	67	32.0%

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Table 2: Factors Contributing to Medications Errors

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean & Standard Deviation	
Items	**Count**	**N %**	**Count**	**N %**	**Count**	**N %**	**Count**	**N %**	**Count**	**N %**	**Mean**	**S. D**
Similar drug names or labels	22	10.5%	15	7.2%	26	12.4%	78	37.3%	68	32.5%	3.74	1.27
Different medications look alike	22	10.5%	17	8.1%	26	12.4%	73	34.9%	71	34.0%	3.74	1.29
3# Similar drug packing	24	11.5%	22	10.5%	35	16.7%	86	41.1%	42	20.1%	3.48	1.25
Physicians' medication orders are not clear	33	15.8%	41	19.6%	36	17.2%	68	32.5%	31	14.8%	3.11	1.32
Physicians change orders frequently	24	11.5%	43	20.6%	64	30.6%	58	27.8%	20	9.6%	3.03	1.15
Verbal orders are used instead of written orders	44	21.1%	37	17.7%	40	19.1%	53	25.4%	35	16.7%	2.99	1.40
Abbreviations are used instead of writing the orders out completely	35	16.7%	39	18.7%	43	20.6%	63	30.1%	29	13.9%	3.06	1.31
Pharmacy delivers incorrect doses to this unit	59	28.2%	50	23.9%	47	22.5%	37	17.7%	16	7.7%	2.53	1.28
Frequent substitution of drugs (i.e. Cheaper generic for brand names)	41	19.6%	40	19.1%	40	19.1%	60	28.7%	28	13.4%	2.97	1.34
Many medications on multiple patients	25	12.0%	22	10.5%	32	15.3%	88	42.1%	42	20.1%	3.48	1.26
Insufficient knowledge and information on new medications	30	14.4%	29	13.9%	47	22.5%	79	37.8%	24	11.5%	3.18	1.23
Poor communication between nurses and physicians	41	19.6%	36	17.2%	42	20.1%	59	28.2%	31	14.8%	3.01	1.36
On this unit, there is no easy way to look up information on new medications	40	19.1%	37	17.7%	66	31.6%	45	21.5%	21	10.0%	2.86	1.24
Distractions by other patients, co-workers, or events on the unit	21	10.0%	40	19.1%	53	25.4%	67	32.1%	28	13.4%	3.20	1.19
Heavy workload in the ward	11	5.3%	16	7.7%	30	14.4%	70	33.5%	82	39.2%	3.94	1.15
Inadequate number of staff in each working shift	2	1.0%	5	2.4%	14	6.7%	110	52.6%	78	37.3%	4.23	.76
Equipment malfunctions or is not set correctly (e.g., IV pump)	33	15.8%	35	16.7%	44	21.1%	61	29.2%	36	17.2%	3.15	1.33
Nurse is unaware of a known allergy	52	24.9%	58	27.8%	46	22.0%	36	17.2%	17	8.1%	2.56	1.26

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Items	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean & Standard Deviation	
	Count	N %	Count	N %	Count	N %	Count	N %	Count	N %	Mean	S. D
Nurses on this unit have limited knowledge about medications	38	18.2%	54	25.8%	48	23.0%	38	18.2%	31	14.8%	2.86	1.32
When scheduled medications are delayed, nurses do not communicate the time when the next dose is due	54	25.8%	57	27.3%	40	19.1%	37	17.7%	21	10.0%	2.59	1.31
Failure to adhere to policy and procedure documents	53	25.4%	48	23.0%	51	24.4%	44	21.1%	13	6.2%	2.60	1.24
Patients are off the ward for other care	42	20.1%	41	19.6%	53	25.4%	51	24.4%	22	10.5%	2.86	1.29

Table 3: Barriers to Reporting of Medication Administration Errors

Items	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean & Standard Deviation	
	Count	N %	Count	N %	Count	N %	Count	N %	Count	N %	Mean	S. D
Nurses do not agree with the hospital's definition of a medication error	64	30.6%	71	34.0%	33	15.8%	23	11.0%	18	8.6%	2.33	1.26
Nurses do not recognize an error occurred	51	24.4%	70	33.5%	40	19.1%	29	13.9%	19	9.1%	2.50	1.25
Filling out an incident report for a medication error takes too much time	31	14.8%	55	26.3%	40	19.1%	62	29.7%	21	10.0%	2.94	1.25
Medication error is not clearly defined	45	21.5%	46	22.0%	37	17.7%	55	26.3%	26	12.4%	2.86	1.35
No need to report if no patient is harmed	61	29.2%	59	28.2%	26	12.4%	38	18.2%	25	12.0%	2.56	1.39
Nurses believe other	39	18.7%	34	16.3%	52	24.9%	57	27.3%	27	12.9%	3.00	1.31

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Items	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean & Standard Deviation	
	Count	N %	Count	N %	Count	N %	Count	N %	Count	N %	Mean	S. D
nurses will think they are incompetent												
Patient or family might develop a negative attitude	24	11.5%	46	22.0%	39	18.7%	67	32.1%	33	15.8%	3.19	1.27
Nurses fear adverse consequences from reporting medication errors	25	12.0%	38	18.2%	33	15.8%	87	41.6%	26	12.4%	3.24	1.23
The response by the nursing administration does not match the severity of the error	34	16.3%	42	20.1%	46	22.0%	74	35.4%	13	6.2%	2.95	1.21
Nurses fear reprimand from doctor	53	25.4%	59	28.2%	32	15.3%	40	19.1%	25	12.0%	2.64	1.36
Nurses could be blamed if something happens to the patient	13	6.2%	18	8.6%	15	7.2%	85	40.7%	78	37.3%	3.94	1.16
Too much emphasis is placed on medication errors as a measure of the quality of nursing care provided	13	6.2%	32	15.3%	41	19.6%	82	39.2%	41	19.6%	3.51	1.15
Nursing administration focuses on the personal	26	12.4%	30	14.4%	40	19.1%	69	33.0%	44	21.1%	3.36	1.30

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Items	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean & Standard Deviation	
	Count	N %	Count	N %	Count	N %	Count	N %	Count	N %	Mean	S. D
rather than looking at the hospitals												

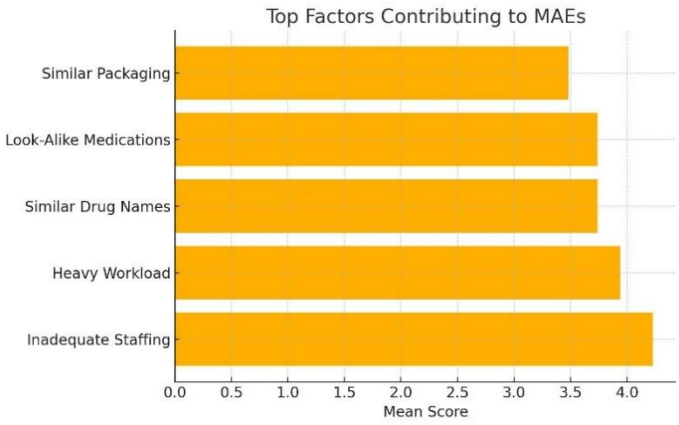

Figure 1 Top Factors Contributing to MAEs

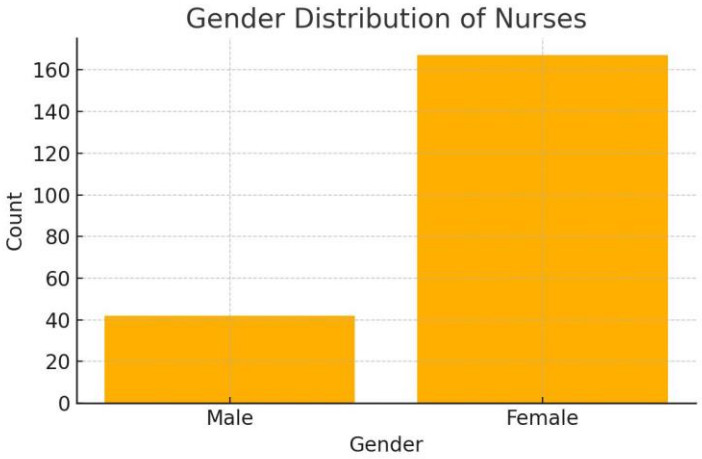

Figure 2 Gender Distribution of Nurses

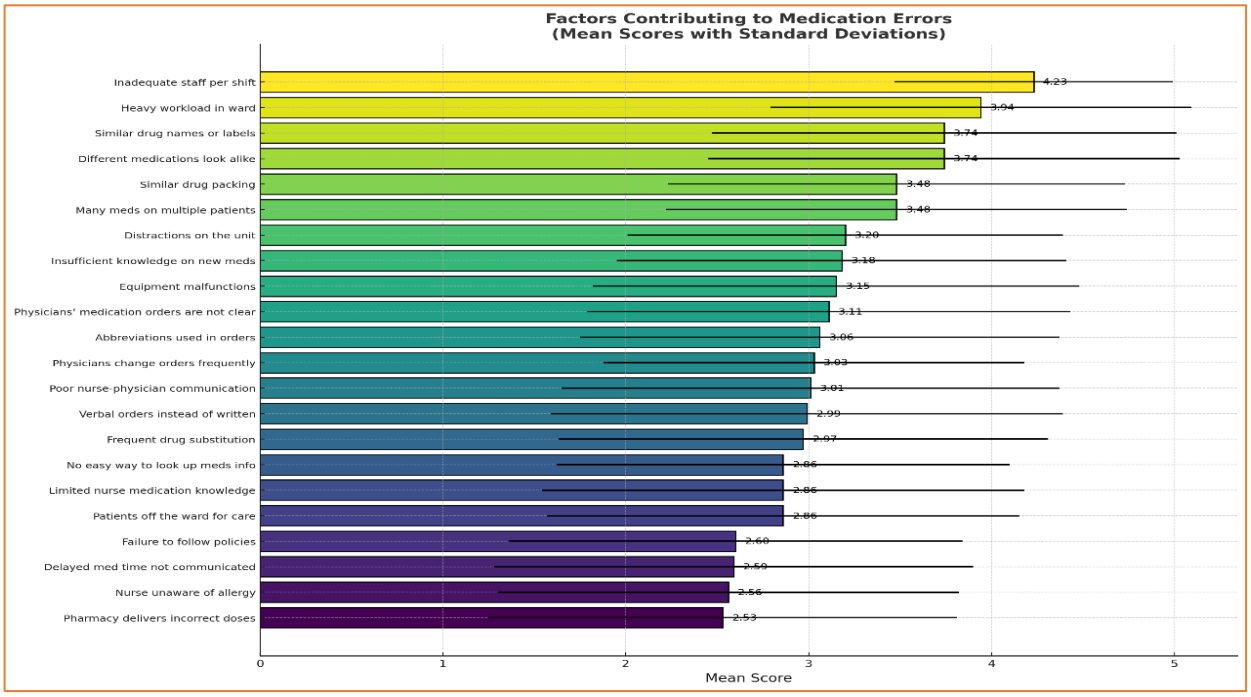

Figure 3 Factors Contributing to Medication Errors

(Mean Scores with Standard Deviations)

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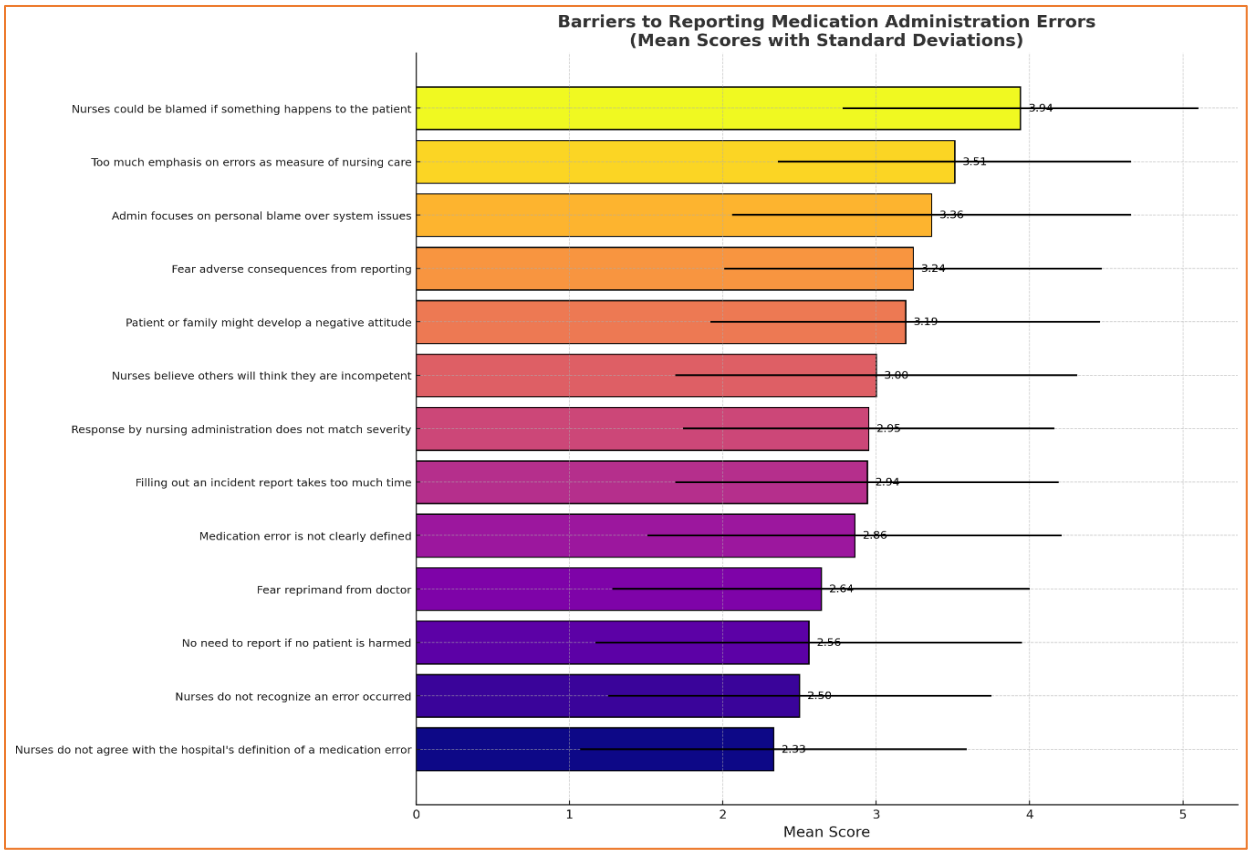

Figure 4 Barriers to Reporting Medication Administration Errors

(Mean Scores with Standard Deviations)

DISCUSSION

The present study identified significant systemic and organizational contributors to medication administration errors (MAEs) and explored key barriers that prevent nurses from reporting such incidents. The findings revealed that inadequate staffing levels and overwhelming workloads remain central issues contributing to MAEs in clinical settings. These stressors are compounded by challenges such as look-alike/sound-alike medications and similar drug packaging, which create opportunities for confusion during administration. Environmental distractions and managing medications for multiple patients further increase the cognitive burden on nurses, heightening the risk of error during critical tasks. These findings align with prior research, which emphasized how organizational structure and environmental design play pivotal roles in the emergence of medication-related events (17,18). Less frequently cited factors in this study included errors stemming from pharmacy dose deliveries, unrecognized allergies, and communication delays related to scheduled doses (19). These results indicate that while systemic failures dominate as primary contributors, lapses in interdisciplinary coordination and communication still pose noteworthy but less frequent risks. The recognition of these low-frequency issues is important in building a holistic understanding of the medication error landscape and ensuring targeted interventions are not overlooked (20).

In terms of reporting behavior, the study underscored that fear of blame and punitive action were among the most dominant deterrents to error reporting. Nurses perceived that reporting errors—especially those associated with patient harm—could result in personal accountability and administrative scrutiny. Such perceptions reflect a culture where individual fault is emphasized over system-level analysis, reinforcing silence rather than transparency. Other major inhibitors included the belief that reporting reflects negatively on nursing performance and a lack of institutional focus on systems improvement. These findings are consistent with earlier literature,

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which highlighted that punitive environments, lack of feedback mechanisms, and ambiguous definitions of errors continue to erode the motivation to report near misses or actual errors (21,22). Minor barriers to reporting were also identified, including disagreement with institutional definitions of medication errors, unawareness that an error occurred, and assumptions that non-harmful events do not warrant reporting. These perceptions suggest lingering confusion over what constitutes a reportable error and underscore the need for clearer institutional guidelines and structured awareness programs.

The strengths of this study include its use of a validated instrument with high internal consistency and its focus on nurse perceptions within real-time working environments in tertiary hospitals. It offers meaningful data from frontline providers and highlights critical organizational deficits that could inform health system interventions. The findings contribute to the growing body of evidence pointing toward the importance of developing non-punitive, system-centered cultures in healthcare institutions to encourage error disclosure and continual quality improvement. Nonetheless, the study has limitations. Its cross-sectional nature restricted causal interpretations and captured perceptions at only one point in time. Data were self-reported, which raises concerns about social desirability bias. Some respondents may have underreported their experiences due to fear or institutional culture, potentially skewing the data. Moreover, the inclusion of only two tertiary hospitals limits the generalizability of findings across different healthcare settings and geographic regions within Pakistan. There was also minimal exploration of how demographic or professional variables—such as age, experience, or education level—may influence MAE incidence or reporting behavior, which represents a missed analytical opportunity. In particular, the perspectives of novice nurses were not examined independently, despite existing evidence that inexperience significantly affects error susceptibility and reporting confidence. Future studies should adopt longitudinal or mixed-methods designs to better capture evolving perceptions and behaviors related to MAEs over time. Including a larger and more diverse sample that incorporates nurses from various clinical settings, including rural and private hospitals, would enhance external validity. Emphasis should also be placed on examining how specific demographic and professional variables intersect with error reporting behavior to better inform targeted training interventions. Cultivating a blame-free culture and investing in educational support, particularly for early-career nurses, are essential steps toward safer medication practices and improved patient outcomes.

CONCLUSION

This study concludes that medication administration errors are predominantly influenced by systemic and environmental shortcomings, particularly inadequate nurse staffing, excessive workload, and a prevailing culture of blame that discourages error reporting. These findings highlight the urgent need to foster a non-punitive environment where nurses feel supported and empowered to report errors without fear. Strengthening institutional policies, improving interprofessional communication, and investing in workforce capacity are essential steps toward promoting medication safety. The insights gained offer a foundation for targeted reforms in hospital systems to enhance patient care quality and safeguard against preventable harm.

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AUTHOR CONTRIBUTION

Author	Contribution
Zohaib Surani	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Ashfaq Ahmad	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Shukria Saleem	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Touseef Ahmad	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Syed Bahar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Abdul Qadir Khan	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Abdullah	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Tariq Jamil	Writing - Review & Editing, Assistance with Data Curation

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