NURSES KNOWLEDGE AND PRACTICES OF MEDICATION ADMINISTRATION IN EMERGENCY DEPARTMENTS

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ABSTRACT

Background: Medication administration errors in emergency departments (EDs) pose serious risks to patient safety. Nurses' knowledge and practices play a vital role in minimizing these errors. This study explored the knowledge and practices of nurses regarding medication administration in EDs across hospitals in Karachi, Pakistan.

Methodology: A descriptive cross-sectional study was conducted among 100 registered nurses working in the EDs of four public-sector hospitals: PNS Shifa, PNS Rahat, CMH Malir, and JPMC. Participants were selected through non-probability convenience sampling. Data were collected using a structured questionnaire and an observational checklist, both validated by experts and pilot tested. Ethical protocols, including informed consent and confidentiality, were strictly followed.

Results: Knowledge scores were categorized as good ($\geq$80), adequate (60–79), average (40–59), and poor ($\leq$40). Findings showed that 23% of nurses had good knowledge, 47% adequate, 27% average, and 3% poor. In practice, 11% were good, 36% adequate, 40% average, and 13% poor. Significant positive correlations were found between knowledge and practice ($r = .201$, $p < .05$), age ($r = .286$), and experience ($r = .394$). Medication errors showed negative correlations with knowledge, practice, age, and experience.

Conclusion: The findings demonstrate a higher proportion of nurses with adequate and average knowledge and practice levels, emphasizing the need for targeted interventions to enhance good performance. Positive correlations suggest that experience and age contribute to improved knowledge and practices, while lower error rates are linked to better knowledge, practices, and increased professional experience.

INTRODUCTION

Medication errors are a leading cause of preventable harm in healthcare, with the Institute of Medicine (IOM) estimating 44,000 to 98,000 annual deaths in the U.S. alone due to such errors, surpassing fatalities from traffic accidents, breast cancer, and AIDS [1]. Among these, medication administration errors (MAEs) represent a major concern, especially in nursing practice, as nurses are primarily responsible for the administration of drugs across various healthcare settings [2]. The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) defines medication errors as any preventable event that could cause inappropriate medication use or harm while the medication is under the control of a healthcare provider, patient, or consumer [3]. Globally, medication errors cost healthcare systems an estimated $42 billion per year [4]. In Europe, over 50% of all preventable harm is linked to medication errors, with associated costs ranging from €4.5 to €21.8 billion annually [5]. In underdeveloped nations like Pakistan, the issue is intensified by budget limitations, inconsistent healthcare standards, and insufficient nurse training [6]. Errors often occur during administration, including wrong dosage, dose omission, or incorrect speed, frequently worsened by distractions and multitasking [7]. Studies confirm that more than half of medication errors occur during the administration phase, making it the most error-prone part of the medication process [8]. In high-pressure environments like emergency departments (EDs), these errors are particularly prevalent. Emergency departments are prone to high error rates due to factors like overcrowding, multitasking, and urgent decision-making demands [9]. Mistakes range from incorrect dosages to missed timings, posing severe risks to patient health and increasing mortality, hospital stay duration, and healthcare costs [4]. Nurses' medication knowledge plays a pivotal role in preventing such errors. Yet, evidence suggests many nurses lack adequate understanding of pharmacology and drug protocols, largely due to insufficient pharmacological training in nursing education [10]. This knowledge gap, coupled with the theory-practice divide, significantly contributes to administration mistakes [11]. Strengthening nurses' pharmacological knowledge is thus essential for enhancing medication safety, especially in fast-paced emergency settings where quick decisions are crucial [9]. Education and systemic support have proven effective in reducing medication errors. Targeted training programs focusing on drug administration techniques have shown measurable success in minimizing mistakes and improving patient outcomes [12]. Moreover, promoting a culture of continuous learning and institutional support empowers nurses to maintain high standards of medication safety and patient care [13]. Therefore, this study aims to assess emergency department nurses' knowledge and practices regarding medication administration. The findings will identify key knowledge gaps and practice flaws, enabling the design of focused interventions that enhance medication safety and improve patient outcomes in high-risk settings.

RESEARCH METHODOLOGY

This study used a descriptive cross-sectional design with a quantitative approach to assess nurses' knowledge and practices regarding medication administration in emergency departments. The target population consisted of registered nurses working in emergency rooms, and due to the limited size and resource constraints, a non-probability convenience sampling method was adopted. The study was conducted in four public sector hospitals in Karachi: PNS Shifa, PNS Rahat, CMH Malir, and Jinnah Postgraduate Medical Centre (JPMC), with 25 nurses selected from each hospital, totaling 100 participants. Inclusion criteria included registered nurses providing direct patient care in emergency departments, while those in administrative or non-clinical roles were excluded. The study was conducted over a period of 12 months following the approval of the research synopsis, with data collection taking place over six months from November 2015 to April 2016. The research was carried out at the Institute of Nursing, University of Health Sciences Lahore, and data collection

occurred within the emergency departments of the selected hospitals in Karachi. Data collection tools included a structured, self-developed questionnaire and observational checklists. The questionnaire was divided into four parts: demographic information, knowledge assessment, practice observation, and error observation. The knowledge questionnaire comprised 20 yes/no questions focusing on emergency drug administration, storage, and dosage calculations. Each correct answer was scored 5 marks, with total scores categorized as poor (<40%), average (40–59%), adequate (60–79%), and good (≥80%). An observational checklist consisting of 20 items was used to assess nurses' medication practices, covering the preparation, administration, and documentation of medications. Each correct practice was scored 7.7 marks, with aggregate practice scores also categorized as poor, average, adequate, and good. A separate 13-item checklist was developed based on previous literature to record common medication errors observed in the same domains. All tools were validated through expert review and a pilot study. Reliability was tested using Cronbach's alpha in SPSS version 22 to ensure internal consistency. Ethical approval was obtained from the Ethical Review Committee of the University of Health Sciences Lahore. Written permissions were granted by the administrative authorities of the participating hospitals, and informed consent was collected from all participants. Confidentiality and privacy were strictly maintained, and the data were used solely for research purposes. No harm or risk was posed to any participant during the study.

RESULTS

The study included 100 nurses, divided into three age groups with a nearly equal distribution: 33% in group one, 34% in group two, and 33% in group three. The majority of participants were female (85%), while male nurses made up 15% of the sample.

Table 1: Demographic Information of Nurses

Variables	Frequency	Mean ± SD
Age (years)		34.63 ± 9.25
20-29	33	
30-39	34	
≥40	33	
Gender		
Male	15	
Female	85	
Work experience as RN		11.09 ± 8.74
1-10	56	
11-20	26	
21-30	18	
Work experience as ER		2.44 ± 1.96
No experience	9	
1-2	48	
3-5	37	

>5		6	
Education			
Diploma in nursing		40	
BSN nursing		54	
Post RN		3	
MSN		3	

The majority of nurses held a BSN degree (54%), followed by diploma holders (40%), while only 3% each had Post-RN or MSN qualifications. Most nurses had up to 10 years of general experience (56%), with fewer having 20 years (26%) or more (18%). In emergency

departments specifically, 48% had 1–2 years of experience, 37% had 3–4 years, and only 6% had over 5 years. Overall, the nursing workforce was predominantly female, with moderate overall experience and limited specialized experience in emergency care

Table 2: Level of knowledge and medication practice of nurses

Levels	Value	frequency	Percentage
Level of Knowledge			
Good Knowledge	≥80	23	23
Adequate Knowledge	60-79	47	47
Average knowledge	40-59	27	27
Poor/insufficient knowledge	<40	3	3
Level of Medication Practice			
Good medication Practice	>80	11	11.0
Adequate medication Practice	60-79	36	36.0
Average medication Practice	40-59	40	40.0
Poor/insufficient medication Practice	<40	13	13.0

The majority of nurses (47%) demonstrated adequate knowledge (scores 60–79), while 27% had average knowledge (40–59), 23% showed good knowledge (80 and above), and only 3% had poor knowledge (below 40). In

terms of medication practices, most nurses (40%) exhibited average performance, 36% showed adequate practices, 13% had poor practices, and only 11% demonstrated good medication practices.

Table3: Comparison of education, Age, and Experience of nurses on Knowledge, Practices and Error

Varia ble	Gro up	Knowledge			Practice			Error		
		(M ± SD)	F	p	(M ± SD)	F	P	(M ± SD)	F	p
Educa tion	BSN	65.1 ± 13.7[bc]	7.212	<.001	58.45 ± 19.46	0.354	.787	53.9 ± 7.31[a]	5.176	0.002

Category	Sub	Knowledge (Mean ± SD)	F	p	Practices (Mean ± SD)	F	p	Error (Mean ± SD)	F	p
	Diploma	64.2 ± 13.4[bc]			58.04 ± 19.11			53.5 ± 6.36[a]		
	MSN	86.7 ± 5.8[ab]			63.67 ± 12.66			40.5 ± 1.49[b]		
	Post RN	36.7 ± 5.8[b]			48.33 ± 12.42			61.54 ± 7.69[a]		
Age (years)	20–29	60.5 ± 15.1[a]	4.352	.015	49.7 ± 19.1[a]	5.457	.006	57.09 ± 6.67[a]	8.65	<.001
	30–39	62.6 ± 15.6[ab]			63.5 ± 18.1[b]			53.21 ± 6.75[b]		
	≥40	70.2 ± 10.7[b]			60.8 ± 16.9[b]			50.31 ± 6.53[b]		
Experience	No experi	53.33 ± 16.01[a]	5.619	.001	46.67 ± 19.19[a]	3.61	.016	56.67 ± 3.73[a]	4.95	.003
	1–2 years	63.75 ± 12.57[a]			55.94 ± 19.34[a]			55.45 ± 7.01[a]		
	3–5 years	65.00 ± 14.29[a]			64.83 ± 16.37[b]			51.09 ± 6.90[b]		
	>5 years	82.50 ± 12.94[b]			67.17 ± 8.50[b]			47.86 ± 6.97[b]		

The analysis revealed that nurses' education, age, and experience significantly influenced their knowledge, practices, and error rates. Nurses with MSN degrees had significantly higher knowledge scores compared to other education levels, while Post RN nurses showed the highest error rates. However, practice scores did not vary significantly across educational levels. With increasing age, nurses showed significantly higher knowledge and practice scores, along with fewer errors. Similarly, more experienced nurses (>5 years) demonstrated the highest knowledge and practice scores and lowest error rates, while those with no experience performed the lowest in all domains. Overall, the study indicates that higher education, older age, and greater professional experience are associated with better knowledge, improved medication practices, and fewer errors, emphasizing the importance of education and clinical exposure in enhancing nursing performance in emergency departments.

Table 4: Relationship among Knowledge, Practices, Error, age and experience of nurses

	1	2	3	4
1.Knowledge Score	-			

2.Practice Score	.201*	-		
3. Error Score	-.218*	-.240*	-	
4. Age (years)	.286**	.254*	-.403**	-
5. Experience (years)	.394**	.320**	-.325**	.433**
*p<.05, **p<.01				

Table 4 shows relationship among Knowledge, Practices, Error, age and experience of nurses. Pearson correlation coefficient was calculated to find statistically significant correlation among Knowledge, Practices, Error, age and experience of nurses. There was significant positive correlation of Knowledge with Practice (r=.201, p<.05), age (r=.286, p<.01) and experience (r=.394, p<.01). There was significant positive correlation of Practice with age (r=.254, p<.05), and experience (r=.320, p<.01). There was significant negative correlation of Error with knowledge (r=-218, p<.05), practice (r=-240, p<.05), age (r=-403, p<.01) and experience (r=-.325, p<.01).

DISCUSSION

Medication administration in emergency departments (EDs) is one of the most complex and error-prone responsibilities of nurses, with global literature revealing widespread deficiencies in nurses' knowledge and practices [14]. Nurses' knowledge in medication administration plays a fundamental role in patient care. In our study, the majority of participants reported having received information about medication administration, and the findings indicated an adequate level of knowledge, as reflected by the percentage of accurate responses. Specifically, 47% of nurses scored between 60%-79% on the total knowledge score, indicating a satisfactory level of knowledge. However, a contradictory study conducted by Fathy et al. (2020) revealed that nurses' average knowledge and practice scores related to medication administration were below satisfactory levels [15]. In the current study, medication practices were divided into four distinct categories: 11% of nurses demonstrated good practices, achieving a score of ≥80; 36% exhibited adequate practices, with scores ranging from 60 to 79; 40% displayed average practices, scoring between 40 and 59; and 13% showed poor or insufficient practices, with scores ≤40. These results are consistent with the findings of a study conducted by Noviyanti et al. (2023), which examined the knowledge and skills of emergency room nurses at Saiful Anwar Hospital in Malang [16]. Although the majority of nurses in that study demonstrated a solid understanding of medication administration principles and possessed strong skills in general practice, many faced significant challenges with accurate drug dose calculations. This highlights a recurring issue in medication practices, emphasizing the importance.

Nurses with MSN degrees had better knowledge, though practice differences across qualifications were insignificant, supporting the results of another study [17]. However, post- RN nurses showed higher error rates [18]. Factors like poor training, lack of protocols, and high patient loads contributed significantly to errors. Studies in Saudi Arabia and Egypt confirmed the influence of demographics, staffing ratios, and training on medication practices and attitudes [19].

Lastly, studies from Malaysia highlighted underreporting due to blame culture and identified illegible orders as a major cause of errors, emphasizing the need for systemic reforms and non-punitive reporting cultures [20]. Overall, the study

underscores the urgent need for training, clear protocols, and supportive environments to enhance medication safety in emergency departments. These results align with the challenges highlighted by Johnson et al. (2021), who identified time pressures, limited resources, and high workload as major barriers to optimal practice in healthcare settings. Such factors can lead to compromised adherence to best practices, potentially resulting in medication errors, patient discomfort, and inadequate patient education [21]. The study highlighted the importance of addressing these systemic issues by investing in better training, ensuring adequate staffing, and reinforcing adherence to medication administration protocols. By doing so, healthcare facilities can improve patient safety, minimize errors, and enhance the overall quality of care provided to patients in high- pressure environments like emergency departments.

CONCLUSION

The study revealed that nurses in Pakistan's emergency departments have inadequate knowledge and practices largely due to lack of training and absence of clear guidelines. A positive correlation was found between nurses' knowledge and their practice. Many nurses cited the absence of policies as a barrier to effective emergency care. Overwork and time constraints were also major factors affecting nursing performance and patient outcomes. The study's strength lies in being possibly the first to assess emergency department nurses' knowledge and practices in Pakistan, using a pre-tested questionnaire and public hospital sample. However, it faced limitations such as lack of national literature, absence of a checklist to track practices, and potential respondent bias.

Recommendations
- Provide regular training programs to enhance nurses' knowledge and awareness of emergency department practices.
- Develop and implement clear hospital policies and clinical guidelines for medication administration.
- Strengthen pharmacology education in nursing curriculum and conduct annual medication certification.
- Encourage experienced nurses to mentor and educate less knowledgeable colleagues.
- Identify and reduce systemic barriers such as understaffing and lack of organizational support.

Authors Contribution:

1. Shaheen Butt: Principal author. Responsible for designing the study, conducting data collection and analysis, and drafting the manuscript.

2. Kunwar Arqum: Provided guidance throughout the research process and critically reviewed the manuscript for intellectual content. Assisted in manuscript writing and contributed to the design and implementation of the interventional study.

3. Muhammad Ramish: Contributed to data collection and interpretation of results.

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