Article

Factors influencing medication errors among nurses at a tertiary level hospital in Bangladesh

Mosha. Aktar Banu[1][*] ⓘD, Reva Mondal[1] and Taslima Begum[2]

[1]Department of Nursing Management, National Institute of Advanced Nursing Education and Research, Dhaka-1214, Bangladesh
[2]Director, National Institute of Advanced Nursing Education and Research, Dhaka-1214, Bangladesh

*Corresponding author: Mosha. Aktar Banu, Department of Nursing Management, National Institute of Advanced Nursing Education and Research, Dhaka-1214, Bangladesh. E-mail: aktarbanubely@gmail.com

Abstract: Medication errors represent a significant global issue, leading to numerous fatalities each year and adding complexity to healthcare systems. In Bangladesh, the prevalence of medication errors stands at 38%. This study aimed to identify the factors that influence medication errors among nurses at a tertiary-level hospital in the country. A descriptive cross-sectional study was conducted involving 114 registered nurses at Dhaka Medical College Hospital, utilizing a convenience sampling method. Data were gathered through face-to-face interviews using a structured questionnaire and analyzed using both descriptive and inferential statistics. The findings indicated that nurses in Bangladesh exhibited moderate to high susceptibility to medication errors in a tertiary-level setting. Key factors identified as contributing to these errors included inadequate staffing levels (4.41 ± 0.81), patients being off the ward for other care (4.39 ± 0.74), communication issues between nurses and physicians (4.36 ± 0.95), nurses being pulled between teams and other units (4.32 ± 0.77), and insufficient in-service training on new medications (4.23 ± 0.87). Moreover, nurses working ward (F=11.51, *P*=.001) and working experience (*t*=4.13, *P*=.041) had a significant relationship with factors influencing medication errors. The research found several variables that cause medication mistakes, including nurses' service experience and working ward. This study's results might help hospital administrators establish effective intervention methods and mitigate medication error risk variables to improve patient safety and care.

Keywords: medication errors; contributing factors; nurses; hospital settings; Bangladesh

1. Introduction

Mediation errors are one of the most frequently occurring types of medical errors, linked to the incorrect usage of medication that can potentially threaten to the patients' health, across a variety of stages in the medication process, including prescribing, transcribing, dispensing and administering (Aghakouchakzade *et al*., 2015). Medication error has been defined by Brabcova *et al*. (2023) as an error encompassing the incorrect administration or intake of a person's therapeutic doses, including wrong patient, wrong drug and incorrect diluents. In contrast, Mansouri *et al*. (2014) defined medication errors as shortcomings in the treatment process that may cause harm or have the potential to harm a patient's health. These errors often stem from not following any of the "ten rights," which include: the right patient, right medication, right time, right dose, right route, right education/advice, right to refuse, right assessment, right evaluation, and right documentation (Mohammed *et al*., 2022).

Asian J. Med. Biol. Res. **2024**, 10(4)

132

Several factors contribute to medication errors, including inadequate unit staffing levels, inadequate team communication, limited work experience, illegible physician medication order, nurses get repeatedly pulled from their teams and other units, unit staff not receiving enough education on new medication, environmental conditions, increased workload, low accuracy, neglect, drugs being confused due to similar trade name called LASA (Look-Alike Sound-Alike), similarly between name and packaging (Rahimi *et al.*, 2015; Brabcova *et al.*, 2023). Insufficient drug information and weaknesses in continuous education were the main causes of medication errors (Shohani and Tavan, 2018; Brabcova *et al.*, 2023).

The role of clinical nurses in medication errors prevention is complex and multifaceted. Prevention of medication errors is very important to provide quality patient care and patient safety. Nurses' responsibility for a majority of hospital-based medication administration plays a crucial role in this situation (Hayes *et al.*, 2015). Nurses were the last line of defense in healthcare settings to safeguard against errors as the administration is the last part of the medication process (Latif *et al.*, 2019). For avoiding potential risk and possible complication from medication error healthcare professionals should be aware about the recognition and administration medication. Nurses play a crucial role in the medication management process, which involves monitoring both the effectiveness and potential adverse effects of medications. Consequently, it is the responsibility of professional nurses to identify any errors related to medications, as they are tasked with thoroughly examining the medication prior to administration to the patient (Abdulmutalib and Safwat, 2020), and by implementing policies across various medication use processes, and creating guidelines for medication administration (Vazin *et al.*, 2014). If this responsibility is not properly done, it can cause serious threats to the patient's health and safety (Shohani and Tavan, 2018).

In Bangladesh, a total of 692 medication errors were reported among 1,234 prescribed medications, averaging 3.46 errors per prescription. Additionally, 63 medication errors resulted from unclear handwriting, 219 medications were missing dosage strength information, and 42 medications were found to be available in multiple dosage strengths in the market (Paul *et al.*, 2015). Another study in Bangladesh conducted by Latif *et al.* (2019), showed that, there was a significant relationship between working experience and medication administration practice. The prevalence rate of medication errors around 38% (Islam *et al.*, 2021). In Bangladesh, healthcare systems struggle with quality, equity, and efficiency issues. Several studies have been conducted worldwide to identify factors affecting medication errors and show a significant impact on increasing patient safety and quality. A very few numbers of studies have been conducted on medication errors in Bangladesh. However, no study has been conducted on identifying factors regarding medication errors yet.

To address this gap, the study seeks to explore the factors that influence medication errors among nurses at a tertiary-level hospital in Bangladesh. Additionally, the research examines the relationship between factors such as staffing levels, communication, and nurses' work experience, and how these contribute to the incidence of medication errors. By understanding the underlying causes, hospital administrators can design targeted interventions to mitigate risk factors, enhance the quality of care, and foster a safer healthcare environment. Therefore, this study aims to explore the factors that influence medication errors among nurses at a tertiary hospital in Bangladesh. The findings will provide valuable insights into the factors that contribute to medication errors, helping nurses, administrators, and policymakers develop strategies to reduce these errors and improve patient safety.

2. Materials and Methods
2.1. Ethical approval
Ethical approval for this study was obtained from the Institutional Review Board (IRB) of the National Institute of Advanced Nursing Education and Research (memo no-IRB No. Exp. NIA-S-259, dated 21st September 2023), under the Bangabandhu Sheikh Mujib Medical University. Additionally, legal authorization for data collection was granted by the director of the selected hospital. After receiving approval, the researcher met with the nursing superintendent and supervisor to facilitate data collection from the nurses. Participants were given an information sheet explaining the study's purpose, the voluntary nature of participation, and their right to withdraw at any time without consequences. Informed consent was secured by asking participants if they were willing to participate, with a 'yes' response indicating their agreement.

2.2. Study design
A descriptive cross-sectional study design was implemented to determine the factors affecting medication errors among nurses at a tertiary-level hospital in Bangladesh. The study was conducted from January 2023 to December 2023.

Asian J. Med. Biol. Res. **2024**, 10(4)

133

2.3. Study participants

The participants of the study were Registered Nurses (RN) at Dhaka Medical College Hospital (DMCH), that is one of the largest tertiary-level hospitals located in the northern region of Dhaka city (Figure 1). The hospital is a large facility with 2,600 beds and serves as a referral center for patients of all categories. It has approximately 2,900 registered nurses, providing an adequate sample size for data collection. All registered nurses who are working in medicine ward, surgery ward, orthopedic ward, and critical care unit (SD-HDU and cardiology ward) at DMCH were study participants in this study.
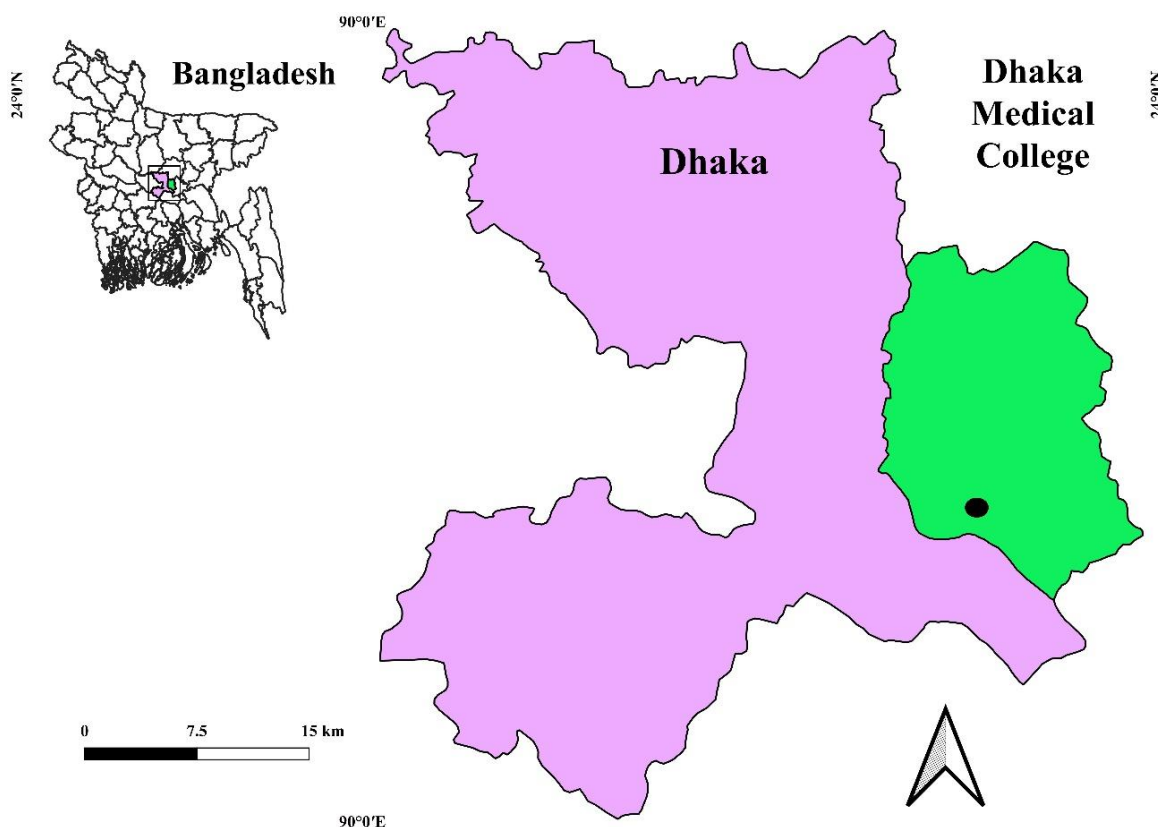
Figure 1. Study was conducted at Dhaka Medical College Hospital, Bangladesh.

The sample size was determined using G*Power analysis, utilizing version 3.1.9.2 developed by Cohen (1988). This analysis was based on a bivariate normal correlation model with a two-tailed significance level (α) of 0.05, an expected power (1-β) of 0.80, and a medium effect size (π) of 0.25. The calculated sample size was 95. To account for potential attrition, an additional 20% was added, resulting in a final sample size of 114 (95 + 19). A convenience sampling method was employed to select nurses who met the inclusion criteria, which included being a registered nurse with at least one year of clinical experience, being available during the data collection period, and expressing a willingness to participate. Nurses who were ill, on leave, or in training during the data collection period were excluded from the study.

2.4. Instruments

The instruments for data collection consisted of two parts, including part I, the socio-demographic questionnaire (SDQ) and part II, Medication Administration Error survey (MAE survey). In the part I, the socio-demographic questionnaire (SDQ), the questionnaire was developed by researchers on the basis of reviewed of the literature (Shohan and Tavan, 2018; Alzoubi *et al*., 2023). It consists of 11 items including age, gender, marital status, monthly income, education, working department, dealing number of patients, working experience in hospital, working experience in unit, shift work and training. It took about 2-3 minutes for participants to complete.

For the part II, the MAE Survey tool developed by Wakefield *et al*. (2005). The questionnaire consists of three sections, with the first section focused on identifying reasons for medication errors (ME). This section was used to assess factors influencing medication errors among nurses at a tertiary-level hospital in Bangladesh and contains 29 items. Responses are measured on a 5-point Likert scale, ranging from 5 (strongly agree) to 1 (strongly disagree). A number of previously studies were used this tool (Çetin and Cebeci, 2021; Alzoubi *et al*,

Asian J. Med. Biol. Res. **2024**, 10(4)

134

2023; Brabcova *et al*, 2023). It is a valid and reliable tool with Cronbachs alpha value were 0.96 (Alzoubi *et al*., 2023). In this study the Cronbachs alpha of reasons for medication errors (ME) occurrence was 0.89. This is an instrument open access questionnaire. It took about 12-15 minutes for participants to complete.

The original questionnaires were initially in English. To translate them into Bengali, two bilingual translators were involved. First, one translator translated the MAE survey from English to Bengali. Then, a second translator independently back-translated the Bengali version into English. The original English version and the back-translated version were compared to identify discrepancies and ensure the clarity and accuracy of the translation. The comparison was done by the advisor and the researchers themselves, who checked for any differences or inconsistencies. By employing this back-translation process, the researcher aimed to ensure that the Bengali versions of the questionnaires accurately captured the meaning and intent of the original English versions. This approach helps to minimize the potential loss of meaning or misinterpretation during the translation process.

2.5. Data collection
Data were collected using a self-administered structured questionnaire, which took each nurse approximately 14 to 18 minutes to complete. The questionnaires, along with informed consent forms, were placed on a desk near the nurses' duty station. Nurses were instructed to voluntarily take a questionnaire and, after completing it, drop it in a designated box. Anonymity, privacy, and confidentiality were strictly upheld. After the study's publication in a scientific journal, all primary data will be destroyed, while raw data will be securely stored in the researcher's locked cabinet for three years.

2.6. Data analysis
Data analysis was performed using SPSS version 27, incorporating both descriptive and inferential statistical methods. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were employed to summarize the socio-demographic characteristics and key study variables. To explore the relationships between nurses' socio-demographic factors and the elements contributing to medication errors, inferential statistics including Pearson's correlation, one-way ANOVA, and *t*-tests were utilized. A *p*-value of less than 0.05 was set as the threshold for statistical significance.

3. Results
3.1. Distribution of socio demographic characteristics of the study nurses
The findings revealed that the average age of the nurses was 33.77 (SD=6.17) years, ranging from 25 to 54 years. Most of the nurses (81.6%) were female, and 90.4% were married. In terms of monthly income, the average income was 37416.77 BDT (SD=7988.55 BDT) and the majority of nurses (79.8%) reported, an income level was less than 40,000 BDT where the range was between 30,000 to 65,000 BDT. Nearly half of the nurses (46.5%) were with Diploma in Nursing, followed by those with a BSc in Nursing (43.9%). Most of the nurses (95%) had 10 years or less than 10 years of work experience, with an average of 8.52 years (SD=5.27), ranging from 2 to 25 years. Among the nurses, 36.0% were from Medicine wards, 25.4% were from Critical Care Unit, 20.2% were from Surgery ward and 18.4% were from Orthopedic ward. The majority (90.4%) of the nurses worked in shifting and rotational duties. On average, one nurse dealt with 33.12 patients (SD=27.4) per shift. Regarding training related to medication errors, 95.6% of the nurses reported that they had not received any training in this area (Table 1).

Table 1. Socio-demographic profile of the participating nurses (N=114).

Variable	Category	Frequency (n)	Percentage (%)	Mean (SD)
Age (Years) (Min- Max) (25-54)	25-34 years	76	66.7	33.77 ± 6.17
	35-44 years	30	26.3	
	45-54 years	8	7.0	
Gender	Male	21	18.4	
	Female	93	81.6	
Marital status	Unmarried	11	9.6	
	Married	103	90.4	
Monthly income (Min-Max) (30000-69000)	< 40,000	91	79.8	37416.77 ± 7988.55
	40,001-50,000	14	12.3	
	> 50,000	9	7.9	

Asian J. Med. Biol. Res. **2024**, 10(4)

135

Table 1. Contd.

Variable	Category	Frequency (n)	Percentage (%)	Mean (SD)
Professional education	Diploma in nursing	53	46.5	
	B.Sc. in nursing	50	43.9	
	Master/MPH	11	9.6	
Working Experience in year	≤ 10 years	95	83.3	8.52 ±5.27
	> 10 years	19	16.7	
Working ward	Medicine ward	41	36.0	
	Surgery ward	23	20.2	
	Orthopedic ward	21	18.4	
	Critical Care Unit	29	25.4	
Working experience in unit in years	≤ 5 years	14	12.3	2.83±.45
	> 5 years	100	87.7	
Shift of duty	Mostly Fixed	11	9.6	
	Rotational (morning, evening, night)	103	90.4	
Number of patients receive care from you/day (Min-Max) (2-100)				33.12±27.47
Training related to medication errors	Yes	5	4.4	
	No	109	95.6	

3.2. Distribution of factors related to medication errors among nurses

The questionnaire comprised 29 items on a 1-5-point Likert scale aimed at identifying factors of MEs. The study found that the average score of factors related to medication errors among nurses was 3.77 on a 5-point Likert scale. Nurses who had participated in this study had stated that the most common factors contributing to Medication Errors (MEs) was unit staffing levels are inadequate (4.41 ± 0.81). This was followed by patients are off the ward for other care/procedure (4.39 ± 0.74) and poor communication between nurses and physicians (4.36 ± 0.95)- e.g., illegible physician medication orders (4.22 ± 1.02) and unclear orders (4.18 ± 0.98).

Other contributing factors to medication errors included nurses being pulled between teams and from other units (4.32 ± 0.77), insufficient in-service training on new medications for unit staff (4.23 ± 0.87), and interruptions for nurses while administering medications to attend to other duties (4.19 ± 0.97). In contrast, the three least significant factors related to medication errors were incorrect transcription of medication orders to the Kardex (2.50 ± 1.18), errors in preparation (2.80 ± 1.09), and incorrect dosing (2.82 ± 1.16) (Table 2).

Table 2. Distribution of factors related to medication errors among nurses (N=114).

Variables	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)	Mean ± SD
The names of many medications are similar	46 (40.4)	46 (40.4)	5 (4.4)	9 (7.8)	8 (7.0)	3.99 ± 1.19
Different medications look alike	42 (36.8)	60 (52.6)	6 (5.3)	4 (3.5)	2 (1.8)	4.19 ± 0.83
The packaging of many medications is similar	42 (36.8)	58 (50.9)	8 (7.0)	4 (3.5)	2 (1.8)	4.18 ± 0.84
Physicians' medication orders are not legible	61 (53.5)	30 (26.3)	10 (8.8)	13 (11.4)	0 (0.0)	4.22 ± 1.02
Physicians' medication orders are not clear	53 (46.5)	41 (36.0)	7 (6.1)	13 (11.4)	0 (0.0)	4.18 ± 0.98
Physicians change orders frequently	33 (28.9)	55 (48.2)	10 (8.8)	15 (13.2)	1 (0.9)	3.91 ± 0.99
Abbreviations are used instead of writing the orders out completely	37 (32)	53 (46.5)	9 (7.9)	9 (7.9)	6 (5.3)	3.93 ± 1.09
Verbal orders are used instead of written orders	15 (13.2)	38 (33.3)	13 (11.4)	35 (30.7)	13 (11.4)	3.06 ± 1.30
Pharmacy delivers incorrect doses to this unit	10 (8.8)	27 (23.7)	21 (18.4)	45 (39.5)	11 (9.6)	2.82 ± 1.16
Pharmacy does not prepare the med correctly	7 (6.1)	23 (20.2)	38 (33.3)	32 (28.1)	14 (12.3)	2.80 ± 1.09

Asian J. Med. Biol. Res. **2024**, 10(4)

136

Table 2. Contd.

Variables	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)	Mean ± SD
Pharmacy does not label the med correctly	12 (10.5)	22 (19.4)	33 (28.9)	35 (30.7)	12 (10.5)	2.89 ± 1.16
Pharmacists are not available 24 hours a day	35 (30.7)	27 (23.7)	15 (13.2)	26 (22.8)	11 (9.6)	3.43 ± 1.38
Frequent substitution of drugs (ie, cheaper generic for brand names)	44 (38.6)	49 (43.0)	11 (9.7)	7 (6.1)	3 (2.6)	4.09 ± 0.98
Poor communication between nurses and physicians	67 (58.8)	31 (27.1)	8 (7.0)	6 (5.3)	2 (1.8)	4.36 ± 0.95
Many patients are on the same or similar medication	38 (33.3)	41 (36.0)	19 (16.7)	14 (12.2)	2 (1.8)	3.87 ± 1.07
Unit staff do not receive enough in-services on new medications	51 (44.7)	45 (39.5)	12 (10.5)	5 (4.4)	1 (.9)	4.23 ± 0.87
On this unit, there is no easy way to look up information on medication	43 (37.7)	38 (33.4)	16 (14.0)	16 (14.0)	1 (0.9)	3.39 ± 1.08
Nurses on this unit have limited knowledge about medications	28 (24.5)	45 (39.5)	15 (13.2)	22 (19.3)	4 (3.5)	3.62 ± 1.16
Nurses get pulled between teams and from other units	54 (47.4)	47 (41.2)	9 (7.9)	4 (3.5)	0 (0.0)	4.32 ± 0.77
When scheduled medications are delayed, nurses do not communicate the time when the next dose is due	37 (32.5)	34 (29.8)	17 (14.9)	20 (17.5)	6 (5.3)	3.67 ± 1.25
Nurses on this unit do not adhere to the approved medication administration procedure	21 (18.4)	35 (30.7)	14 (12.3)	25 (21.9)	19 (16.7)	3.12 ± 1.39
Nurses are interrupted while administering medications to perform other duties	54 (47.4)	40 (35.1)	8 (7.0)	12 (10.5)	0 (0.0)	4.19 ± 0.97
Unit staffing levels are inadequate	62 (54.4)	44 (38.6)	2 (1.8)	5 (4.4)	1 (0.9)	4.41 ± 0.81
All medications for one team of patients cannot be passed within an accepted time frame	44 (38.6)	32 (28.1)	22 (19.3)	12 (10.5)	4 (3.5)	3.88 ± 1.15
Medication orders are not transcribed to the Kardex correctly	7 (6.1)	21 (18.4)	26 (22.8)	37 (32.5)	23 (20.2)	2.50 ± 1.18
Errors are made in the Medication Kardex	28 (24.6)	53 (46.5)	20 (17.5)	11 (9.6)	2 (1.8)	3.82 ± 0.97
Equipment malfunctions or is not set correctly (eg, IV pump)	28 (24.6)	53 (46.5)	20 (17.5)	11 (9.6)	2 (1.8)	3.82 ± 0.97
Nurse is unaware of a known allergy	18 (15.8)	37 (32.5)	13 (11.4)	30 (26.3)	16 (14.0)	3.10± 1.34
Patients are off the ward for other care/procedure	58 (50.9)	45 (39.5)	8 (7.0)	3 (2.6)	0 (0.00)	4.39 ± 0.74
Total factors related to medication errors Mean of mean						3.77 ± 0.52

3.3. Relationship between demographic characteristics and factors influencing medication errors among nurses

Table 3 illustrates the relationship between demographic characteristics and factors influencing medication errors among nurses. The findings indicated that there was a significant relationship between working ward specialization and factors influencing medication errors (F=11.51, *P*=0.001), showing significant differences in mean among medicine ward, surgery ward, orthopedic ward and critical care units. Post-hoc comparisons using the Turkey HSD test indicated that the mean score for critical care units (116.14 ± 8.52) was statistically higher significant from the mean score for orthopedic wards (115.29 ± 12.65). like ways, the mean score for surgery ward was statistically lower significant from the mean score for medicine ward, which suggested that the nature of the working ward in which a nurse practiced significantly compressed the probability of medication errors.

The study also showed that, working experience was statistically significant with factors influencing medication errors (t=4.13, P=0.041), showing significant mean differences between ≤10 years' work experience (110.92 ± 13.89) and >10 years work experience (101.00 ± 18.92), which implies that nurses those who have ≤10 years' work experience they were more prone to medication errors. The number patients receive care by nurse exhibit marginal variations in mean with a trending but non-significant relationship (P=0.22). While the remaining socio-demographic characteristics did not show significant association with factors influencing medication errors among nurses. This analysis provides insights into specific demographic elements potentially influencing medication errors, highlighting the crucial influence of working wards and work experience on error occurrences.

Table 3. Relationship between demographic characteristics and factors influencing medication errors among nurses (N-114).

Variable	Categories	Factors influencing medication errors (FIME)		
		Mean ± SD	**F/t/r**	**P**
Age (Min-Max) (25-54)	25-34 years	108.28 ± 14.07	0.55	0.58
	35-44 years	110.73 ± 19.32		
	45-54 years	113.12 ± 5.46		
Gender	Male	107.80 ± 18.78	-0.48	0.63
	Female	109.59 ± 14.38		
Marital status	Unmarried	108.27 ± 16.47	-0.23	0.62
	Married	109.36 ± 15.15		
Monthly income (Min-Max) (30,000-65,000)	<40,000	109.14 ± 15.15	0.48	0.81
	40,001-50,000	112.21 ± 16.26		
	>50,000	105.89 ± 15.05		
Professional education	Diploma in nursing	106.38 ± 16.27	2.09	0.13
	B.Sc. in nursing	112.44 ± 14.98		
	Master/MPH	108.72 ± 6.48		
Working experience in year (Min-Max)(2-25)	≤ 10years	110.92 ± 13.89	2.17	0.041
	> 10 years	101.00 ± 18.92		
Working ward	Medicine ward	108.80 ± 14.83	11.51	0.001
	Surgery ward	95.91 ± 16.32		
	Orthopedic ward	115.29 ± 12.65		
	Critical Care Unit	116.14 ± 8.52		
Working experience in unit in years	>2 years	121.75 ± 3.40	1.47	0.23
	2-5 years	110.40 ± 15.49		
	>5 years	108.65 ± 15.33		
Shift of duty	Fixed)	108.64 ± 12.03	-0.143	0.89
	Rotational (morning, evening, night)	109.33 ± 15.55		
Number of patients receive care from you/day (Min-Max) (2-100)		36.18 ± 33.28	0.12	0.22
Training related to medication errors	Yes	104.40 ± 12.38	-0.73	0.47
	No	109.49 ± 15.33		

4. Discussion

The current study showed that the mean value of factors related to medication errors among nurses was 3.77 which indicated that, nurses of Bangladesh were moderate to high susceptible to medication errors at a tertiary level hospital (Table 2). Similar results were found in Saudi Arabia with a slightly higher mean score (Alzoubi *et al.,* 2023), which suggested a higher influence of factors related to medication errors compared to the current study. From twenty-nine items of factors related to medication errors among nurses, the most common factors were identified that contribute to medication errors (MEs) that were inadequate unit staffing levels (4.41 ± 0.81), patients are off the ward for other care (4.39 ± 0.74), communication problems with nurses and physicians (4.36 ± 0.95), nurses get pulled between teams and from other units (4.32 ± 0.77) and unit staff do not receive enough in-services on new medications (4.23 ± 0.87), which was consistent with the findings of previous studies conducted in Jordan and USA (Alzoubi *et al*., 2023; Brabcova *et al*., 2023).

Current study result showed that, more than fifty percent nurses strongly agree, thirty-eight percent nurses agree, four percent nurses disagree, two percent neutral and only one percent nurses were strongly disagreeing with

Asian J. Med. Biol. Res. **2024**, 10(4)

138

unit staffing levels were inadequate. Similarly, several studies in Saudi Arabia, it was the second most common factor of MEs (Elasrag and Abu-Snieneh, 2020; Alzoubi *et al*., 2023). Although it was one of the top issues in this study. The insufficient nursing staff available during shifts and poor nurse-to-patient ratios emerged as the primary factors influencing the incidence of medication errors among nurses, ultimately compromising the safety of care (Marznaki *et al*., 2020). One potential consequence of undersized nursing staff in the Bangladesh health service because, in public hospital of Bangladesh, still now nurse patient ratio was inadequate according to the international guideline, at present, there were 7.4 health workers per 10,000 people in Bangladesh (Kashem, 2020).

The present study found that more than half of the nurses strongly agree, while more than one third agreed, seven percent were in neutral, and only more than two percent were disagreeing with patients are off the ward for other care/procedure. This differs from a study conducted in USA (Brabcova *et al*., 2023). These differences could be attributed to variation in different organizational protocols.

Furthermore, another factor that increases the risk of MEs was communication problems with nurses and physicians (4.36 ± 0.95), e.g., illegible physician medication orders (4.22 ± 1.02), unclear orders (4.18 ± 0.98) and frequent changes to instructions (3.3 ± 1.3). The study showed that more than fifty percent nurses strongly agree, twenty-seven percent nurses agree, seven percent nurses' neutral, five percent nurses disagree and only two percent nurses strongly disagree with poor nurse-physician communication. This finding was like the previous study conducted in USA, they found that communication problems with doctors including-frequent changes to instruction, illegibility of records and unclear medical records (Brabcova *et al*., 2023).

Reducing the incidence of MAEs requires timely, accurate, and understandable written and spoken information exchanged between physicians and nurses. The chilly and mistrustful connection that exists between physicians and nurses was another issue which should be seen as a significant problem. Members of a team were frequently unable to work together, and they were frequently uninterested in exchanging knowledge. Building and development mature professional teams that have the capacity for self-reflection and self-management, as well as a sense of harmony and belonging in both formal and informal relationships (Brabcova *et al*., 2023). On the other hand, the lowest three factors contributing to medication errors, that were medication orders incorrectly transcribed to the Kardex (2.5 ± 1.18), incorrect preparation (2.80 ± 1.09) and incorrect doses (2.82 ± 1.16), which were inconsistent with the previous study conducted in Saudi Arabia (Alzoubi *et al*., 2023).

One of the most significant findings in this study was the strong association between working ward specialization and factors influencing medication errors ($P=0.001$) (Table 3). The results indicated that nurses working in Critical Care units reported a statistically higher mean score of medication errors (116.14 ± 8.52) compared to Orthopedic wards (115.29 ± 12.65). Similarly, another study conducted in USA, had found a significant association of medication errors within internal medicine unit (Brabcova *et al*., 2023). This finding suggested that the nature of the working ward in which a nurse practiced significantly compressed the probability of medication errors.

In the current study, another crucial finding was the significant influence of working experience on medication errors ($P=0.041$). Nurses with less than 10 years of work experience had a higher mean score of medication errors (110.92 ± 13.89) compared to those with more than 10 years of work experience (101.00 ± 18.92). Similarly, several studies conducted in Bangladesh, USA and Africa, they found, there was a significant relationship between working experience and medication administration practice (Latif *et al*., 2019; Asefa *et al*., 2021; Mohammed *et al*., 2022; Brabcova *et al*., 2023). This suggests that short experienced and a lower number of years of experienced nurse's higher chances of making medication errors.

Nurses improved their skills and knowledge regarding safe medication administration practices through practical experience. Moreover, seasoned nurses were well-versed in various medication administration procedures. Experienced nurses might have developed better clinical judgment, medication administration skills, and situational awareness, which contributed to error reduction (Mohammed *et al*., 2022). In contrast to age ($P=0.58$), gender ($P=0.63$), marital status ($P=0.82$), monthly income ($P=0.81$), and professional education ($P=0.13$) did not show substantial influences on medication errors. Several studies conducted in East Africa had found that gender and education did influence medication errors (Jember *et al*., 2018; Asefa *et al*., 2021), which was inconsistent with this study.

The study also explored the effect of various other factors such as shift duty ($P=0.89$), number of patients receive care ($P=0.22$) and training related to medication errors ($P=0.47$); however, no significant relationship with medication errors among nurses was found. Another study conducted in Iran, had found a significant relationship between the employment status and medication errors (Tabatabaee *et al*., 2022), which was dissimilar with the current study. This suggested that medication error rates among nurses did not significantly

Asian J. Med. Biol. Res. **2024**, 10(4)

139

differ based on these demographic factors as previously thought. It was possible that other unmeasured variables or systemic issues within healthcare organizations played a more substantial role in medication errors.

There were some limitations to this study. Firstly, the researcher used descriptive cross-sectional study due to time bound. Secondly, the study was conducted in a single setting that limits the generalizability of the findings to other healthcare settings in Bangladesh. Additionally, the study used a convenient sampling technique, which may introduce bias and affect the representativeness of the sample. Lastly, a self-administered questionnaire was used that could be response bias which influence the study findings.

5. Conclusions

This study investigated factors contributing to medication errors among nurses in a Bangladeshi tertiary hospital. Findings revealed moderate to high susceptibility to errors, with key causes including understaffing, off-ward patient care, communication gaps, frequent reassignments, and insufficient training on new medications. Nurses with less than ten years of experience and those in critical care were especially prone to errors. The results emphasize the need for better staffing, improved communication, and enhanced training to reduce errors and improve patient safety. Future research should explore systemic factors like workload, environment, and organizational culture, and expand to other hospitals for broader insights.

Data availability
All relevant data are presented within the manuscript.

Conflict of interest
None to declare.

Authors' contribution
Mosha. Aktar Banu: participated in planning, coordinating, prepared the methodology, carried out data collection, formal analysis and wrote the original draft; Reva Mondal: coordinating, reviewed, edited the article and co-supervised the study; Taslima Begum: edited the article and supervised the study. All authors have read and approved the final manuscript.

References
Abdulmutalib I and A Safwat, 2020. Nursing strategies for reducing medication errors. Egypt. J. Nurs. Health Sci., 1: 77-98.
Aghakouchakzade M, M Izadpanah and A Yadegari, 2015. Knowledge, attitude, and practice towards medication errors and adverse drug reaction reporting among medical students. J. Pharm. Care, 3: 49-53.
Alzoubi MM, A Al-Mahasneh, K Al-Mugheed, M Al-Barmawi, SA Alsenany and ASM Farghaly, 2023. Medication administration error perceptions among critical care nurses: a cross-sectional, descriptive study. J. Multidis. Healthcare, 16: 1503-1512.
Asefa KK, D Dagne and WN Mekonnen, 2021. Medication administration error reporting and associated factors among nurses working in public hospitals, Ethiopia: a cross-sectional study. Nurs. Res. Pract., 2021: 1-8.
Brabcova I, H Hajduchova, V Tothova, I Chloubova, M Cerveny, R Prokesova and S O'Hara, 2023. Reasons for medication administration errors, barriers to reporting them and the number of reported medication administration errors from the perspective of nurses: a cross-sectional survey. Nurse Educ. Pract., 70: 103642.
Çetin SB and F Cebeci, 2021. Perceptions of clinical nurses about the causes of medication administration errors: a cross-sectional study. Florence Nightingale J. Nurs., 29: 56.
Cohen J, 1988. Statistical power analysis for the behavioral sciences. Lawrence Erlbaum Associates, Publishers, New Zealand.
Elasrag GAE and HM Abu-Snieneh, 2020. Nurses' perception of factors contributing to medication administration errors. Int. J. Res. Pharm. Sci., 11: 44-56.
Hayes C, T Power, PM Davidson, J Daly and D Jackson, 2015. Nurse interrupted: development of a realistic medication administration simulation for undergraduate nurses. Nurse Edu. Today, 35: 981-986.
Islam MT, MB Begum and R Khatun, 2021. Prevalence of medication errors by nurses at the tertiary level hospital in Bangladesh. Int. J. Innov. Sci. Eng. Technol., 8: 82-87.

Asian J. Med. Biol. Res. **2024**, 10(4)

140

Jember A, M Hailu, A Messele, T Demeke and M Hassen, 2018. Proportion of medication error reporting and associated factors among nurses: a cross-sectional study. BMC Nurs., 17: 1-8.

Kashem A, 2020. Govt eyes WHO standard in health worker distribution by 2030. Available at: https://www.tbsnews.net/bangladesh/health/government-eyes-who-standard-health-worker-distribution-2030-87019.

Latif MA, M Nesa and DR Mallick, 2019. Medication management by clinical nurses at tertiary level hospital in Bangladesh. EASMB, 2: 173-83

Mansouri A, A Ahmadvand, M Hadjibabaie, M Javadi, SM Khoee, F Dastan and K Gholami, 2014. A review of medication errors in Iran: sources, underreporting reasons, and preventive measures. Iranian J. Pharm. Res., 13: 3-17.

Mohammed T, S Mahmud, B Gintamo, ZN Mekuria and Z Gizaw, 2022. Medication administration errors and associated factors among nurses in Addis Ababa Federal Hospitals, Ethiopia: a hospital-based cross-sectional study. BMJ Open, 12: e06653.

Marznaki ZH, S Pouy, WJ Salisu and AE Zeydi, 2020. Medication errors among Iranian emergency nurses: a systematic review. Epidemiol. Health, 42: 1-8.

Paul TR, MA Rahman, M Biswas, M Rashid and MAU Islam, 2015. Medication errors in a private hospital of Bangladesh. Bangladesh Pharm. J., 17: 32-37.

Rahimi F, SA Rezaei, R Baghaei and A Feizi, 2015. Factors influencing medication errors according to nurses' decisions to do self-report. Int. J. Basic Clin. Pharmacol., 4: 130-133.

Shohani M and H Tavan, 2018. Factors affecting medication errors from the perspective of nursing staff. J. Clin. Diagn. Res., 12: 1-7.

Tabatabaee SS, V Ghavami, J Javan-Noughabi and E Kakemam, 2022. Occurrence and types of medication error and its associated factors in a reference teaching hospital in northeastern Iran: A retrospective study of medical records. BMC Health Serv. Res., 22: 1-7.

Vazin A, Z Zamani and N Hatam, 2014. Frequency of medication errors in an emergency department of a large teaching hospital in southern Iran. Drug Healthc. Patient Safe., 6: 179-184.

Wakefield BJ, T Uden-Holman and DS Wakefield, 2005. Administration error reporting survey. Adv. Patient Saf., 4: 475.