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Assess the Knowledge and Attitude of Nurses Regarding High Alert Medication in Tertiary Care Hospital in Karachi

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ABSTRACT

Inappropriate administration of high-alert drugs carries a significant risk of death or serious injury. **Objective:** To assess the level of knowledge and attitude regarding high-alert medication among nurses. **Methods:** This cross-sectional study was conducted in a tertiary care hospital in Karachi among 56 nurses from January 2024 to March 2024. Participants were selected through a convenient sampling technique. The sample size was calculated by open EPI softer by considering a 95% confidence level and a 5% margin of error. The data were entered and analyzed by Statistical Package Social Sciences (SPSS) software version 26.0. **Results:** According to the study results, (64.3%) of the participants had a Positive attitude and (73.2%) had a high level of knowledge regarding high-alert medications (35.7%) had a negative attitude, and (19.6%) had a moderate level of knowledge regarding HAMs. **Conclusions:** This study concluded that most of the nurses had positive attitudes and a high level of knowledge regarding high-alert medications.

INTRODUCTION

Administering high-alert drugs incorrectly can result in significant harm or even death. It is estimated that medication errors cost the global economy $42 billion annually [1]. Several studies have been conducted in inpatient as well as in outpatient settings and the medication error rates reported from these studies varied between 11.7% to 97.7% [2]. Moreover, in Pakistan medication errors frequently result in fatalities, though these incidents are not adequately documented. Recently, the issue of High Alert Medication (HAM) related errors in Pakistan was brought to light by the death of a 9-month-old baby owing to the sudden delivery of a 15% potassium chloride injection. Since administering medications is the nurses' primary duty, they must have extensive knowledge about HAMs, linked to patient safety and excellent treatment [3]. Mostly medication administration occurs in clinical placement where clinical placement refers to the practice-based component of healthcare education where students gain hands-on experience in a real-world clinical setting [4, 5]. Nowadays, medication errors are taken as the prime patient safety and quality care concern. Worldwide, 2%–5% of patients are admitted to hospitals due to wrong medication administration most of which are preventable [6, 7]. According to the statistics given by the Center for Disease Control and Prevention (CDCP), in the United States, medication errors are the 3rd leading cause of mortality with, 98,000 deaths per [8]. In this regard, research conducted on knowledge of HAMs, confirms that

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nurses lack knowledge regarding HAMs administration and regulation, specifically concerning the administration of IV boluses [9]. Another study was conducted to find whether most of the nurses had insufficient knowledge about the Administration of alert medication and its regulations. The results of the study confirmed that nurses have a low level of knowledge regarding high-alert medication and their administration [10]. The significance of high-alert medications is also crucial as they are frequently utilized in the ICU, medical ward, emergency room, and pediatric ward [9]. There are significant issues around pharmaceutical use, even though many low-middle-income countries (LMICs), including Pakistan, attempt to maintain patient safety within the constraints of available resources. Nurses' understanding of high-alert drugs seems to be strengthened by educational interventions [11-13]. In a nutshell, it is concluded that knowledge about high-risk medications is crucial for general health care professionals, particularly nurses.

Therefore, this study was thus conducted to assess the knowledge and attitude of nurses regarding high-alert medications.

METHODS

A Descriptive cross-sectional study was done from January to March of 2024 at Civil Hospital in Karachi, Pakistan. Additionally, 56 nurse males and females in the morning shift with at least one year of experience and employed by the Civil Hospital in Karachi, were chosen using a convenient sampling technique. The optimal sample size was 56, and this was further determined by open EPI calculator version 3.0, after taking into account a 5% margin of error and a 95% confidence level with population size (for finite population factor correction factor or fpc)(N):) 65. Prior to collecting data, the principal investigator received authorization and approval from the Medical Superintendent of the civil hospital Karachi for the research with reference number SSNHN/747/23. The permission ensures that the study is conducted in an ethical manner and that the participant's rights and confidentiality are upheld. The goal of the study, the method used to gather the data, and the participants' rights to decline or withdraw from the study at any moment were all explained to the participants. Moreover, informed consent was taken from each participant in both Urdu and English. Prior to taking part in the research. The goal of the study, how the data will be collected, the advantages and disadvantages of participation, and the rights of the participants are all explained during the informed consent process. A consent form that each participant signed indicated that they were willing to take part in the study. An open-access adapted questionnaire was developed by Hsiao *et al.*, in 2010 [14], and informed consent from was provided to the participating nurses The inclusion criteria was all the nurses working in the civil hospital Karachi in the morning shift, and the exclusion criteria was nurses' refusal to participate in the study, absent at the time of data collection and incomplete forms. The study tool was consisting of three parts, demographic information knowledge and attitude. The first part asked about demographic information (five questions). The second part consists of 15 questions assessing nurses' knowledge of high-alert medications. The three options provided for each question are "True ", "False", and "I don't know, the third option was included to minimize guessing and to prevent questions unanswered. While scoring each right answer carried one mark, zero was given to the wrong ones and I don't know. There was a maximum score of 15 and a minimum score of 0. A percentage was computed based on the overall score. Participants' knowledge of high-alert drugs was rated as poor by those with a score below 50%, as moderate by those with a score between 50% and 75%, and as high by those with a score above 75%. The third part consists of five questions assessing nurses' attitudes to high-alert medications. The three options provided for each question are "True ", "False", "I don't know. While scoring each right answer carried one mark, zero was given to the wrong ones and I don't know. There was a maximum score of 05 and a minimum score of 0 and the percentage was computed based on the overall score and was classified as positive (score above 50%) and negative (score below 50%).The statistical package for social sciences (SPSS) software, version 26.0, was used to enter and analyze the data. For assessing the knowledge and attitude of nurses regarding high-alert medication, frequency and percentage were calculated.

RESULTS

Table 1 shows the distribution of demographic variables of study participants. It has been noted that 17 (30.4%) subjects belonged to the 23-30 age group, 25 (44.6%) belonged to the 31-40 age,12 (21.4%) belonged to the 41-50 age group and 2 (3.6%) belonged to the 50 above age group. 24 (42.9%) subjects were female, while the remaining 32 (57.1%) were male. 12 (21.4%) had the professional qualification of a Diploma in general nursing 9 (16.1%) had BSN and 35 (62.5%) Post RN. 5 (8.9%) subjects had less than 03 years of professional experience, 10 (17.9%) has 3-6 years' professional experience while remaining 41 (73.2%) has more than 06 years' professional experience. The area of practice of most participants was in the critical wards 29 (51.8%) while 27 (48.2%) had an area of practice in critical areas.

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Table 1: Distribution of Demographic Variable

Variables	Frequency (%)
Gender	
Male	32 (57.1)
Female	24 (42.9)
Age	
23-30	17 (30.4)
31-40	25 (44.6)
41-50	12 (21.4)
>50	2 (3.6)
Qualification	
Diploma	12 (21.4)
GBSN	9 (16.1)
Post RN	35 (62.5)
Working Area	
Critical	29 (51.8)
Non-Critical	27 (48.2)
Experience	
<3 Years	5 (8.9)
3-6 Years	10 (17.9)
> 6 Years	41 (73.2)

Category of knowledge and attitude scores were assessed by frequency and percentage, table 2 showed that the majority of the participants 41 (73.2%) had a high level of knowledge followed by 11 (19.6%) participants had a moderate level of knowledge and only 4 (7.1%) participant had a low level of knowledge regarding high alert medications. Moreover, the majority of the participants 36 (64.3%) had a positive attitude and 20 (35.7%) participants had a negative attitude level regarding high-alert medications.

Table 2: Category of Knowledge and Attitude Scores (n=56)

Category of Knowledge		
S.No.	**Levels of Knowledge**	**Frequency (%)**
1	Low Level of Knowledge	4 (7.1%)
2	Moderate Level of Knowledge	11 (19.6%)
3	High Level of Knowledge	41 (73.2%)
Total		56 (100%)
Category of Attitude		
S.No.	**Levels of Knowledge**	**Frequency (%)**
1	Positive Attitude	36 (64.3%)
2	Negative Attitude	20 (35.7%)
Total		56 (100%)

A total of 56 nurses participated in the study they were all included in the analysis. Table 3 showed that all responded to the questionnaire, and a response rate of 100% was achieved in knowledge and attitude.

Table 3: Response in Knowledge and Attitude

S. No.	Statement	True N (%)	False N (%)	I Don't Know N (%)
1	Insulin syringe can be replaced by 1 mL syringe.	33 (58.9)	23 (41.1)	0 (0)
2	'cc' or 'mL' is the dosage expression for insulin injection.	19 (33.9)	36 (64.3)	1 (1.8)
3	Port-A route can be used for blood withdrawal and drug injection generally.	40 (71.4)	15 (26.8)	1 (1.8)
4	Streptokinase modified by genetic engineering is used as clot bluster.	43 (76.8)	8 (14.3)	5 (8.9)
5	For chemotherapy dose calculation, while adults are based on BW, children BSA	39 (69.6)	7 (12.5)	10 (17.9)
6	For convenience, heparin and insulin should be stored together in the refrigerator.	32 (57.1)	24 (42.9)	0 (0)
7	Each drug better have multiple concentrations for nurses to choose.	39 (69.6)	15 (26.8)	2 (3.6)
8	If a ward stores Atracurium for tracheal intubation, the drug should be stored with other drugs and easily accessed by nurses.	31 (55.4)	24 (42.9)	1 (1.8)
9	When an emergency happens, fast IV push 10% CaCl2 10 mL in 1–2 min.	20 (35.7)	35 (62.5)	1 (1.8)
10	10% Ca gluconate and 10% CaCl2 are the same drugs and interchangeable.	18 (32.1)	36 (64.3)	2 (3.6)
11	If patient can tolerate, potassium can be administered orally instead of IV route.	38 (67.9)	16 (28.6)	2 (3.6)
12	When an emergency such as ventricular fibrillation happens, push fast 15% KCl.	9 (16.1)	45 (80.4)	2 (3.6)
13	15% KCl is frequently used, so it should be easily and freely accessed by nurses.	16 (28.6)	39 (69.6)	1 (1.8)
14	15% KCl better added to Ringer's solution for rapid infusion	19 (33.9)	37 (66.1)	0 (0)
15	Fast IV infusion of 3% NaCl 500 mL for patient who has low sodium level	27 (48.2)	26 (46.4)	3 (5.4)
16	Do you follow any precautions while administering high-alert medication?	55 (98.2)	1 (1.8)	0 (0)
17	Use distinctive labeling on look-alike drugs.	49 (87.5)	5 (8.9)	2 (3.6)
18	Use 'U' instead of 'unit' for dose expression.	33 (58.9)	21 (37.5)	2 (3.6)
19	Use 'Amp' or 'Vial' for dose expression instead of 'mg' or 'gm'	29 (51.8)	26 (46.4)	1 (1.8)
20	For pediatric doses, a use teaspoon for dose expression.	33 (58.9)	21 (37.5)	2 (3.6)

DISCUSSION

High Alert Medications (HAMs) are drugs that have the potential to cause significant harm if misused. Nurses play a crucial role in ensuring safe medication administration, including the proper use of HAMs [9]. Present study findings revealed that 17 participants (30.4%) were 23-30 years old, 25 participants (44.6%) were 31-40) years old, 12 participants (21.4%) were 41-50 years old, and only 2 participants (3.6%) was over 50 years old. Moreover, a higher proportion of participants were male (57.1%), and (42.9%) were female participants. In Contrast, a study from Saudi Arabia reveals that most of the participants (84.4%) were between 30 to 40 years old, and a higher proportion of participants were female (68.9%) [15]. These differences may be due to age and gender distribution and likely stem from a combination of factors including cultural disparities, variations in sample characteristics, and study

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designs. Moreover, in this study, the qualification of most participants' had a Post-RN BSN (62.5%), (21.4%) participants had a Diploma in General nursing and (16.1%) participants had a Generic BSN. Furthermore, the clinical experience of most of the participants was above 6 years (73.2%), the area of practice of most of the participants was a critical area which was (51.8%), and (48.2%) of participants were from non-critical areas. On the other hand, a study from Saudi Arabia study's finding shows that the qualification of most of the participants was Generic BSN (68.4%), and they were from non-critical areas [15]. Medication mistakes are a leading source of morbidity and death in the critical care and medical fields [16]. The differences in qualifications, clinical experience, and practice areas may be due to variations in educational systems, healthcare infrastructure, and job market demands. In the current study (73.2%) of nurses had good knowledge, whereas (64.3%) had a positive attitude toward high-alert medications. In contrast, another study finding shows that (97%) of nurses had sufficient knowledge, and (50%) of participants demonstrated a positive attitude toward medication errors [15-20]. The findings were different from other study carried out in Pakistan by Salman *et al.*, 2020, results showed that around 84% of the study participants achieved scores less than 70% indicating that the majority of Pakistani nurses have poor knowledge of HAMs administration as well as regulation [21]. The results of the current study demonstrate that using an ampoule or vial to convey dosage rather than milligrams or grams is incorrect since a documented definition of the unit must be used when prescribing high alert medications.53.6% of participants did not know about this regulation. In contrast, in another study from Palestine around 20% of nurses were unaware of the use of ampoules or vials for dosage expression instead of milligrams or grams [9, 14]. Around 57.1 % of nurses gave incorrect responses regarding this question. In contrast, another study finding shows that 22% of nurses gave incorrect responses regarding this question [9.17, 14]. However, in the present study, 55.4% of our nurses gave correct responses regarding the question 'for pediatric dose, a used teaspoon for dose expression and only 43.7% of our nurses gave incorrect responses regarding pediatric dose expression. In contrast, another study's findings show that most of the nurses (81%) were unaware of the measurement of pediatric dose which was significantly higher than the findings of a previous study [9, 14]. Moreover, heparin and insulin should not be stored together in refrigerator due to mix up. Around 57.1 % of nurses gave incorrect response regarding this question. In contrast, another study finding shows that 22% of nurses who gave incorrect response regarding this question [9, 11, 21]. Concentrated electrolyte solutions like KCl (15%), calcium chloride (CaCl2), and hypertonic saline should not be administering via IV push due to greater risk of complications. Incorrect IV administration of KCl (15%) causes adverse events like arrhythmias and cardiac arrest leading to patient's death. Similarly, inappropriate administration of hypertonic saline cause's phlebitis, extravasations injuries, and Hypernatremia resulting in hypertensive emergencies especially in cardiac patients Administration of calcium salts via fast IV push is also associated with significant adverse event. The current study revealed that 69.6% and 64.6%the study population gives correct response regarding 15% KCl and 10% CaCl2 administration, which was contrast to the findings of a study conducted in Pakistani nurses in which one third of nurses give incorrect response regarding these questions [21]. Around 69.6% of the study participants gave correct response about the dose calculation in children and cancerous patients. In contrast, another study finding shows that 39% of nurses gave incorrect responses regarding this question [21]. Likewise, Lan *et al.*, also reported that knowledge of Taiwanese nurses about the dose calculation in aforementioned diseased population was poor [22]. The inadequacies in knowledge regarding the regulation and administration of high-alert medications can be attributed to the lack of extensive training in this area[3, 19, 20].

CONCLUSIONS

Based on the study findings, most of the participants had a positive attitude (64.3%) and high level of knowledge (73.2%) regarding high-alert medications and few had a negative attitude (35.7%) and moderate level of knowledge (19.6%)regarding high alert medications.

Authors Contribution

Conceptualization: AA
Methodology: DK
Formal analysis: DK, AB
Writing, review and editing: MIK, MK, Q, Z, MH, MI, SU

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

The authors declare no conflict of interest.

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