# NURSES' KNOWLEDGE REGARDING ADMINISTRATION AND REGULATION OF HIGH ALERT MEDICATIONS

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***ABSTRACT***

***OBJECTIVES***

*This study aimed to determine the knowledge of nurse personnel related to administration and regulation of high alert medicines.*

***METHODOLOGY***

*A cross sectional study design was used. Non-probability convenient sampling technique was used to select study participants and standardized and structured questionnaire adopted related to high alert medications administration and regulation was used for data collection.*

***RESULTS***

*Two hundred and three (203) nurses participated in this study, among which the maximum number (57.1%) nurses' education level was Post RN. The data was organized and analyzed through SPSS. The mean scores of High alert drugs administration and regulation were 5.4 ±2.4 and 5.6 ±2.35 respectively. Study findings showed that 70% of nurses had unsatisfactory level of knowledge while 30% had satisfactory level of knowledge.*

***CONCLUSION***

*Study findings reveals that nurses need knowledge and advanced training to update their pharmacology knowledge. It also highlighted the significance of appropriate awareness regarding perilous drug handling and administration will prevent the potential medication administration error with quantifiable returns of patient's health along with organization' image and efficiency.*

***KEYWORDS:*** *Medicine, Nurses, Knowledge, Drug Administration, High Alert Medications*

## INTRODUCTION

Medication administration errors are inevitable failures in the drug treatment process occur during medicine prescription, preparation, storing, dispensing and administering to the patients. High-alert medications (HAMs) means the drugs that have a high risk of fatal consequences to the patient, if used improperly in wrong drug, wrong dose, wrong route.[1] These errors are preventable and under control of health personnel to vigilantly practicing the treatment process in Intensive care units and critical care units especially in using the high alert medicines. To ensure patient safety and induced preventable patient harm is a great concern worldwide. The high incidence of medication errors, prompted the WHO to launch the third global patient safety challenge with the theme "Medication without Harm" in 2017, whose goal is to improve institutional and professional planning for safe practice and reducing medication errors.[2,3] According to statistics 2-5 % admissions in hospital is due to medication errors worldwide, medication errors is the third leading cause of death in United State with 98,000 deaths per annum according to Centers for Disease Control and Prevention report.[4] According to the American Pharmaceutical Association HAMs are classified into the following list: anticoagulants (e.g., warfarin and heparin), chemotherapeutic agents (oral and parenteral), narcotics (e.g., fentanyl or morphine), electrolytes (e.g., 15% potassium chloride (KCl)), neuromuscular blocking agents (e.g., succinylcholine or rocuronium), cardiovascular medications (e.g., adrenergic drugs) and benzodiazepines (e.g., midazolam).[5] High-Alert Medications (HAMs) have risk of significant harm if used in error and have narrow therapeutic index. The narrow therapeutic index drugs are dangerous because minute changes in blood drug levels and dosage can lead to blood concentration and dose related adverse drug events or critical therapeutic failures. The issue of high alert medication errors in Pakistan highlighted because of 9-month-old child deaths in Karachi at a private sector hospital due to IV push of 15% KCl injection.[6,7] The high risk of medications error is due to inadequate dose calculation, storage of drug, nurse education and experience in administration. High alert medications are category of medications that can harm the patients seriously if prescribed or administered improperly. Institute for Safe Medications Practices (ISMP) is a nonprofitable institute that works for promoting safe usage of medications. It classifies high alert medications in to benzodiazepines, drugs that block neuromuscular

junctions, anticancer drugs, drugs used in cardiac arrhythmia, cardiovascular drugs, thrombolytic agents, opioids, narcotics, Insulin, sympathetic agonists, sympathetic antagonists and some electrolytes.[8,9] Any error in administration and regulation of high alert medications can have serious consequences for the patient's health. Nurses are the health care professionals who administer these medications to the patients. Previous literature highlighted that the significant proportion of nurses had not enough knowledge about high alert medications knowledge.[10,11] Moreover, few comprehensive literatures also illuminated the occurrence of preventable errors induced by negligence or lack of understanding and knowledge of treatment process, which mainly comprises of drug or medicine administration by the health personnel. As a member of multidisciplinary team, nurse plays a pivotal role in provision of patients care, specialty-oriented care and critical care units as well. However, multitasking nature of the nursing field, heavy workload and specialty care to the dependent patients is intimidating for nurses.[12] Nurses are responsible for administration and infusion of HAMs, and incorrect medication process may have significant as well as fatal outcomes. A considerable literature existed to assess the pharmacology knowledge of nurses in HAMs administration and regulation. However, very few comprehensive literatures available regarding nurses knowledge of pharmacology from Pakistan. Therefore, nurses need to have enough knowledge regarding administration and regulation of high alert medications. The findings from this study will guide the policy makers to design new strategies for nurses in teaching, training and practice about high alert medications while sustaining the patient safety and their own professional integrity.

## METHODOLOGY

A cross sectional study was conducted in a province of Pakistan. The study population included in Registered Nurses of Hayatabad Medical Complex Peshawar. The four areas of hospital i.e., ER, ICU's, CCU and Wards were used for data collection from both males and females registered nurses of Hayatabad Medical Complex Peshawar. The collection of samples from the study population was based on the following inclusion and exclusion criteria. Registered Nurses working in Emergency, ICU, SICU, CCU, Medical wards and pediatric wards were included in the study. Those registered Nurses who had attended any seminar or sessions regarding high alert medication in the last three months, not willing to participate, working experience of less than six months were also excluded. A sample size of 203 Registered nurses was taken from Hayatabad Medial Complex Peshawar Khyber Pakhtunkhwa Provinces working at different units of the hospital (HMC). Non-probability Convenience sampling technique was used for recruitment of sample. For ethical considerations permission were sought from the Ethical Review Board of Khyber Medical University, and institutional review Board (HMC). Written informed consent was taken from the study participants. Standardized structured questionnaire includes demographic information and items on knowledge regarding high alert medications administration and regulation was filled. In order to ensure the quality of data, each of the filled questionnaires was manually checked before it was coded into SPSS. The data was analyzed by using the Statistical Package for Social Sciences SPSS-22. In addition, pie charts were used for the presentation of analyzed data. For descriptive statistics mean and standard deviation for continues variables were calculated and for categorical variables frequencies and percentages were calculated. ANOVA inferential statistical test was applied to analyze association between level of knowledge and demographic variables.

## RESULTS

A total of 203 nurses were approached from different units like, ICU's, CCU and emergency department of Hayatabad Medical Complex Peshawar. Off the total 52 (25.6%) nurses were males; while 151 (74.4%) of nurses were female. The majority of the nurses age were 28 (12.8%). The most of nurses (116; 57.1%) education level was Post RN. Twenty-two (10.8%) of the nurses included in the study were from the ICU, eight (3.9%) were from CCU, 15 (7.4%) were from the ER, 158 (77.8%) were from the different wards. Thirty nurses (14.8%) had less than two years of experience, while the majority of nurses (84; 41.4%) had 3-5 years' experience (Table 1). Administration of HAMs, the overall correct response rate was 30%; while 70% were incorrect. The total score for knowledge related to administration of high alert medication were 10. The mean scores obtained by participants regarding administration of HAM were 5.4 with standard deviation of ±2.4. Item number 3 -10% calcium gluconate and 10% CaCl2 are the same drug and are interchangeable" got the lowest score and 75.4% of the participants responded incorrectly to this question. In contrast, question number 7, -15% KCl is better be added to Ringer's solution for rapid infusion", received the highest score and 86.2% of the participants responded correctly to this question. Those nurses who scored more than or equal to 70% were categorized as

having satisfactory level of knowledge while those scored less than 70% were categorized as unsatisfactory level knowledge. The findings of this study showed that 70% of nurses had unsatisfactory level of knowledge while 30% had. The mean scores regarding the knowledge about the regulation of HAM were 5.6 with standard deviation of ±2.35. Nurses who scored more than or equal to 70% (7 out of 10 total score) were categorized as satisfactory level of knowledge while those score less than 70 were categorized as unsatisfactory. 67.5% of the participants scored less than 70% (7) regarding the regulation of HAM. While 32.5% of the nurses scored more than or equal to 70%.[7] Item number 4 For convenience heparin and insulin should be stored together in the refrigerator' and 8 For pediatric dose, use teaspoon for dose expression' obtained the highest correct response with correct response rate of 74%. While the item number 1 -It is right to use U' instead of unit for dose expression" obtained the lowest correct response with correct response rate of 45.8% (Table 02).

**Table 1: Shows Socio-Demographic Characteristics of Study Participants**

| Profile | Category | Frequency | %Age |
|---|---|---|---|
| **Age (years)** | 21-25 | 43 | 21.2 |
| | 26-30 | 103 | 50.7 |
| | 31-35 | 31 | 15.8 |
| | 36-40 | 22 | 10.8 |
| | 41-445 | 4 | 02 |
| **Gender of respondent** | Male | 52 | 25.6 |
| | Female | 151 | 74.4 |
| **Education** | General nursing diploma | 41 | 20.2 |
| | Post RN | 116 | 57.1 |
| | BSN | 46 | 22.7 |
| | MSN | 00 | 00 |
| **Work experience** | Less than 2 years | 30 | 14.8 |
| | 3 to 5 years | 84 | 41.4 |
| | 6 to 10 years | 70 | 34.5 |
| | More than 10 years | 19 | 9.4 |
| **Place of work** | Ward | 158 | 77.8 |
| | ICU | 22 | 10.8 |
| | CCU | 08 | 3.9 |
| | Emergency department | 15 | 7.4 |

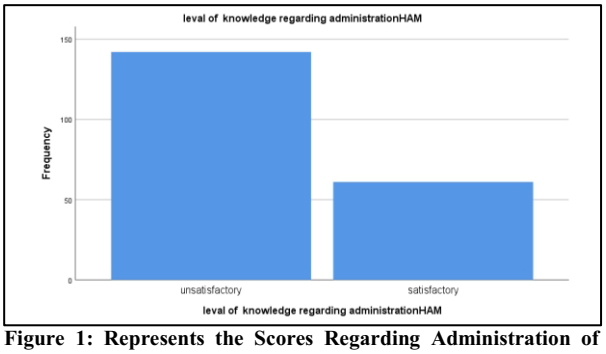


**Figure 1: Represents the Scores Regarding Administration of High Alert Medication**

**Table 2: Display the Nurses' Knowledge Regarding the Regulation of High Alert Medications**

| Items | Correct response n(%) | Incorrect Response n(%) |
|---|---|---|
| It is right to use 'Amp' or 'Vial' for dose expression instead of 'mg' or 'gm' | 93 (45.8) | 110 (54.2) |
| Distinctive labeling should be used on look-alike drugs | 123 (60.6) | 80 (39.4) |
| It is right to use 'U' instead of unit for dose expression" | 95 (46.85) | 108 (53.2) |
| For convenience, heparin and insulin should be stored together in the refrigerator | 150 (73.9) | 53 (26.1) |
| Each drug better have multiple concentrations for nurse to choose | 149 (73.4) | 54 (26.6) |
| If a patient can tolerate, potassium can be administered orally instead of IV route | 121 (59.6) | 82 (40.4) |
| 15% KCl is frequently used, so it should be easily and freely accessed by nurses | 112 (55.2) | 91 (44.8) |
| For pediatric dose, use teaspoon for dose expression | 150 (73.9) | 53 (26.1) |
| Fentanyl skin patch is a controlled medicine (regulated narcotic) | 123 (60.6) | 80 (39.4) |
| If a ward stores Atracurium for tracheal intubation, the drug should be stored with other drugs and easily accessed by nurses | 104 (51.2) | 99 (48.8) |

## DISCUSSION

Current study objective was to assess the knowledge of nurses related to administration and regulation of high alert medications was assessed, who are working on bed side, critical care units and providing the partial or complete dependent patients regarding have been assessed. Overall, the study findings revealed that nurses reported insufficient or lack of pharmacology knowledge especially High Alert Medicines. First of all, the majority (70%) of nursing working on clinical side had unsatisfactory knowledge, whereas only 30% of nurse had satisfactory knowledge. Another descriptive study conducted in Palestine and Turkey also reported that nurses involved in direct administration and regulation of high alert medications had unsatisfactory knowledge regarding HAMs.[13,14] Current study reported that -15% KCl is better be added to Ringer's solution for rapid infusion", received the highest score and 86.2% of the participants responded correctly to this question, comparable to a study conducted in Brazil.[15] Literature illuminated those significant mortalities linked with medications errors in Pakistan, but there is lack of proper mechanism to report it. It has been reported that recently a nine months old child lost her life because of fast iv push of 15% potassium chloride injection without dilution.[16] Current study highlighted that, -10% calcium gluconate and 10% $CaCl_2$ are the same

drug and are interchangeable". Only 24.6% participants responded correctly to this question and hence it was the item which got the lowest correct scores out of total 10 items and found no significant association between knowledge level and any demographic variable. Similarly, the findings of this study showed that majority of the nurses had unsatisfactory knowledge regarding the regulation of high alert medications. Only 32.5% had satisfactory knowledge while 67.5% had unsatisfactory knowledge regarding the regulation of HAMs. This finding was more in align with a descriptive study conducted in Ethiopia, in which 68.1% had insufficient knowledge regulation of high alert medications and committing medication errors in one year.[17] In congruent with current findings, a descriptive study conducted in Punjab Pakistan also reported that 84% of the nurses had unsatisfactory knowledge regarding the regulation of HAMs.[7,18] Moreover, Item number 4 about regulation of HAMs 'For convenience heparin and insulin should be stored together in the refrigerator' and item-8 'For pediatric dose, use teaspoon for dose expression noted that obtained highest correct response rate was 74%, no significant association were found between level of knowledge and demographic variables. On the contrary, study reported, revealed that there was a significant relation between the knowledge of the nurses regarding high alert medications to their practice. Secondly a positive association was found between education level and knowledge of the nurses regarding HAM.[19]

## LIMITATIONS

The article may suffer from limitations related to the sample size of the study. If the sample is too small or specific to a certain demographic or geographical area, the findings may not be easily applicable to a broader population of nurses.

## CONCLUSIONS

The current study suggests inadequacies in HAMs knowledge among nurses working at Hayatabad Medical Complex which can cause medication errors and fatal outcomes to the patients' health. Correspondingly, highlighted the significance of appropriate awareness regarding perilous drug handling and administration will prevent the potential medication administration error with quantifiable returns of patient's health along with organization' image and efficiency. Therefore, there should be a proper education and training sessions regarding high alert medications not only in educational institutes but also in hospitals to update the nurses' pharmacology knowledge, consequently reduction in preventable error and mortalities.

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