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Medication Administration Errors and Contributing Factors Among Nurses in Tertiary Hospitals; A Cross-sectional Study in Peshawar KP

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Abstract

Introduction: Medication administration errors (MAEs) are prevalent in healthcare, causing patient harm and increased costs. Contributing factors include high workloads, inadequate training, poor communication, and disruptive environments. Addressing these errors requires targeted interventions, education, and cultural changes to improve patient safety and care quality.

Methodology: The methodology, including the descriptive cross-sectional design used to explore medication administration errors among nurses in two teaching hospitals over six months. A sample of 267 registered nurses was selected using convenience sampling, with data collected via a structured questionnaire and analysed using SPSS. Ethical considerations included institutional review board approval and informed consent from participants.

Result: The study of 267 nurses, predominantly young women with 1-6 years of experience, revealed a high prevalence of medication administration errors, with nearly half reporting errors in the past year. Common errors included wrong doses and

incorrect administration routes, primarily due to similar-looking drugs and heavy workloads. Strategies to reduce errors focused on increased awareness, better training, and a supportive work environment, highlighting the need for improved safety protocols and reporting systems.

Conclusion: Medication administration errors (MAEs) are prevalent, with nearly half of the 267 nurses reporting errors in the past year. Common errors included wrong doses and incorrect routes, often due to similar-looking drugs and heavy workloads. Strategies to reduce errors include increased awareness, better training, and supportive environments.

Introduction

Medication administration is a critical aspect of healthcare delivery, directly impacting patient safety and treatment efficacy. Despite the emphasis on precision and care, medication administration errors (MAEs) are a prevalent issue within healthcare systems worldwide. (1) These errors encompass any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer. The multifaceted nature of MAEs necessitates a thorough understanding of their contributing factors, especially among nurses, who are often at the forefront of medication administration. Understanding medication administration errors is vital for several reasons. First, these errors can lead to significant patient harm, including adverse drug events (ADEs), prolonged hospital stays, increased healthcare costs, and in severe cases, death. (2)The World Health Organization (WHO) estimates that medication errors harm millions of patients globally each year. Second, the study of MAEs and their contributing factors can inform the development of targeted interventions to reduce these errors, thus improving patient outcomes and healthcare quality. Finally, this research is crucial for nursing practice, as it highlights areas where additional training, resources, or system changes may be needed. (3) Medication administration errors can occur at any stage of the medication use process, including prescribing, transcribing, dispensing, administering, and monitoring. For this study, the focus is on errors occurring during the administration phase, typically involving nurses. These errors can be classified into various categories, such as wrong dose, wrong drug, wrong patient, wrong route, wrong time, and omitted dose. Each type of error has distinct causes and consequences, necessitating specific strategies for prevention and mitigation. (4) The prevalence of MAEs varies widely across studies due to differences in definitions, reporting systems, and methodologies. However, research consistently indicates that these errors are common. For instance, a study by Author et al. reported an incidence rate of X% in a sample of Y hospitalizations. Similarly, Another Study found that Z% of medication doses were administered incorrectly in a multi-center study. These statistics underscore the urgency of addressing MAEs to enhance patient safety and care quality. (5)

The factors contributing to MAEs are multifactorial and complex, often involving individual, organizational, and systemic elements. Key contributing factors include. High patient-to-nurse ratios and heavy workloads can increase the likelihood of errors. Nurses under time pressure may rush the medication administration process, skip essential checks, or become fatigued, all of which can contribute to mistakes. Inadequate knowledge about medications and insufficient training in administration techniques can lead to errors. Continuous education and competency assessments are crucial to ensure nurses remain proficient in safe medication practices. Poor communication among healthcare team members can result in misinformation or lack of information about n reduce errors, they can also introduce new risks if not properly implemented and used. Ensuring premedication orders. Effective communication

strategies, such as standardized handoff protocols, can mitigate this risk. The physical environment, including noise, interruptions, and poorly designed workspaces, can distract nurses and impede their ability to administer medications accurately. Designing a conducive work environment is essential for reducing errors. While technologies like electronic health records (EHRs) and automated dispensing cabinets (ADCs) cat technology is user-friendly and that nurses are adequately trained in its use is critical. The culture within healthcare organizations, including attitudes towards reporting errors and adherence to protocols, significantly impacts the prevalence of MAEs. A culture that promotes transparency and continuous improvement can help identify and address underlying issues contributing to errors. (6)

The consequences of MAEs extend beyond the immediate harm to patients. They can erode trust in the healthcare system, lead to legal and regulatory repercussions, and cause significant emotional and professional distress for nurses involved in the errors. Additionally, the financial burden of addressing the aftermath of errors, including extended hospital stays and legal costs, can strain healthcare resources. Effective strategies to reduce MAEs involve a combination of education, system improvements, and cultural changes. Key approaches include. Regular training programs on medication administration, updates on new drugs and technologies, and simulation exercises can enhance nurses' knowledge and skills. Reducing workload, optimizing staffing levels, and designing ergonomically sound workspaces can help minimize distractions and errors. (7) Enhancing Communication implementing standardized communication protocols, such as SBAR (Situation, Background, Assessment, Recommendation), can improve information exchange and reduce miscommunication. Leveraging Technology Properly implemented EHRs, barcoding systems, and smart infusion pumps can support accurate medication administration, provided they are user-friendly and nurses are well-trained in their use Despite extensive research on MAEs, several gaps remain. For instance, more studies are needed to explore the impact of emerging technologies on medication safety. Additionally, research on the effectiveness of various interventions across different healthcare settings and populations is crucial. Future studies should also consider the perspectives of nurses and patients to develop more holistic and effective strategies for reducing MAEs(8). Medication administration errors represent a significant challenge in healthcare, with profound implications for patient safety and nursing practice. By identifying and understanding the contributing factors, healthcare organizations can develop targeted interventions to reduce these errors and improve care quality. This research aims to contribute to this goal by providing a comprehensive analysis of MAEs among nurses, ultimately fostering safer medication practices and better patient outcomes. (9)

Background:

At some point in their lives, many individuals worldwide will use medication to either prevent or treat illness. In the global health care system, medication errors are the primary reason for preventable patient damage. The most frequent drug errors that can have detrimental effects on patients, healthcare providers, and medical facilities are medication administration errors. Nurses are largely responsible for giving prescriptions; they may devote as much as 40% of their work to this task. (10)

Medication errors can happen at any stage of the prescription, transcription, dispensing, and/or administration procedure. Medication safety necessitates a complicated set of interconnected stages for assessment, prescription, dispense, and monitoring, and is a crucial component of patient safety in hospitals. In the case that this procedure fails, the patient may suffer negative consequences. The location and timing of these mistakes, along with any relevant background information,

contributory variables, and the actual and potential risk of patient injury, all need to be appropriately classified.
There are numerous established variables that have been linked to Medication error. Increasing patient loads, inexperienced nurses, imprecise communication, and institutional policies and procedures are a few of them. Nurses, for example, are taught to administer medications according to the ten rights the correct drug, the appropriate dose, the appropriate route, the appropriate time, and the appropriate patient. (11) However, the ten -rights procedure has not proven to be highly effective due to a variety of individual and contextual factors. In health care systems around the world, unsafe pharmaceutical practices and medication errors are a major source of suffering and preventable injury. An estimated $42 billion (about $130 per person in the US) USD is lost each year due to drug errors worldwide. (12)

Significance of study:
The rate of patient injuries resulting from errors or unfavourable events during hospital stays is higher in underdeveloped nations than in developed ones, according to the World Health Organization (WHO). In wealthy countries, this rate is one in ten. Despite the best efforts of health professionals to deliver safe, high-quality care, accidents can happen. Many efforts have been made to comprehend the origins, effects, and potential remedies of dangerous health care, which includes unsafe medicine administration practices. This issue affects nursing staff worldwide.

Problem statement:
Medication administration errors (MAEs) in tertiary hospitals pose significant risks to patient safety and healthcare quality. Despite advancements, MAEs remain common, leading to adverse patient outcomes. In Addis Ababa's tertiary hospitals, there is limited data on the prevalence and causes of MAEs among nurses. This study aims to identify the types and contributing factors of MAEs to inform targeted interventions. Understanding these factors is crucial for enhancing patient safety and care quality.

Research Objective:
To identify and analyse the contributing factors to medication administration errors among nurses in tertiary hospitals

Research Question: What are the key factors contributing to medication administration errors among nurses in tertiary hospitals.

Operational definitions:
Administer Medications: The process of providing prescribed medications to patients, ensuring correct dosage, route, and timing as per medical orders.

Contributing Factors: Elements that increase the likelihood of medication administration errors, including nurse-related issues, system flaws, and environmental conditions

Administration Errors: Mistakes occurring during the medication administration process, such as incorrect dosage, timing, route, or patient, potentially leading to adverse drug events.

CHAPTER TWO LITERATURE

In this chapter the research will describe the following content in details with proper Methods that are,

This chapter will make clear the detail description of about theoretical framework and literature review which significantly talks about and fond of arguing observation on the subtopics the cross sectional research study in order to understand the basic concept of the research study. While giving a close reading to chosen data medication administrator errors critically analysis allows the researcher to investigate the major issue which talks about the tertiary hospitals in Peshawar, KP, Pakistan(12). So, we have chosen cross sectional study and research study will enlighten the cross sectional study perspective to better understand and critically analyses Medication Administrator Errors in Peshawar KP Pakistan.(13)

However, it is pertinent to mention that there are some scholarly and academic works done on the study so far, but our under study research is completely different from the investigated research. It will give new awareness to the readers in order to explore "Medication Administration Errors and Contributing Factors among Nurses in Tertiary Hospitals: A Cross-Sectional Study in Peshawar, KP". Furthermore, the investigated literature presents medication administration errors and contributing factors among nurses are presented in descriptive in nature. However, there are few studies comparing the Medication Administration errors and contributing factors in health care in KP Peshawar, Pakistan. Similarly, according to our research data, no such study has been conducted in Peshawar district, investigating the prevalence of self-medication, especially outside of hospital nurses. Therefore, this research needs to be done urgently. Our main aim for this study is to c ompare the personal practices of different Nurses at KP, Peshawar Pakistan. (14)

Introduction:

Medication administration errors (MAEs) are a significant concern in healthcare, posing risks to patient safety and overall treatment outcomes. These errors, which can occur at any stage of the medication process—from prescribing to dispensing and administration—have profound implications for patient health, hospital efficiency, and healthcare costs. Nurses, being the primary caregivers and the final checkpoint in the medication administration process, are crucial in preventing these errors. However, the complexities of their work environment, including high patient loads, time pressures, and systemic issues, can contribute to the occurrence of MAEs.15)

In tertiary hospitals, where patient care is often more complex and intensive, the potential for medication errors may be heightened. This study focuses on the tertiary hospitals in Peshawar, Khyber Pakhtunkhwa (KP), aiming to identify the prevalence and types of medication administration errors among nurses, and to explore the contributing factors. Understanding these errors and their underlying causes is essential for developing targeted interventions to enhance patient safety and improve nursing practices.

The healthcare system in Pakistan, particularly in the KP region, faces numerous challenges, including resource constraints, inadequate training, and systemic inefficiencies. These factors can exacerbate the risk of medication errors. By examining the specific context of tertiary hospitals in Peshawar, this study seeks to provide insights into the local factors contributing to MAEs and offer recommendations for mitigating these risks.(16)

Through a cross-sectional study design, this research will gather data on the frequency and nature of medication administration errors, as well as the various factors that nurses perceive to contribute to these errors. The findings aim to inform healthcare policy and practice, contributing to the development of more effective strategies to

ensure the safe administration of medications and improve the quality of care in tertiary hospitals.(17)

Prevalence and Types of Medication Administration Errors:

Medication administrator errors (MAEs) encompass various types of errors, including incorrect dosage, wrong medication, improper administration routes, and timing errors. Studies conducted globally have reported varying prevalence rates of MAEs, with estimates ranging from 5% to 10% of all medication administrations. For instance, a study by Keers et al. (2013) highlighted that MAEs occur in approximately 5-10% of medication administrations in hospital settings. These errors can lead to ADEs, which adversely affect patient health and can result in severe consequences, including patient fatalities (Kane-Gill et al., 2017).

In Pakistan in especially KP Peshawar, limited data is available on the prevalence of MAEs, particularly in the context of tertiary hospitals in Peshawar, KP. However, anecdotal evidence and smaller studies suggest that MAEs are a significant issue in Pakistani healthcare settings, necessitating further investigation to quantify their prevalence and impact.18)

Contributing Factors to Medication Administration Errors:

The occurrence of MAEs is influenced by a myriad of factors, which can be broadly categorized into human factors, organizational factors, and system-related factors. Each of these categories encompasses several specific contributors to MAEs.(19)

Human Factors:

Human factors play a crucial role in the occurrence of MAEs. Nurses, as primary administrators of medication, are susceptible to various human errors. Fatigue, stress, workload, and insufficient training are some of the key human factors that can impair nurses' ability to accurately administer medications. (20).

Fatigue and Workload

Nurses often work long hours and irregular shifts, leading to fatigue and burnout. Fatigue significantly impairs cognitive and motor functions, increasing the likelihood of errors. Anderson and Webster (2001) found that nurse fatigue is a significant predictor of medication errors. High workloads, often due to inadequate staffing, further exacerbate the problem, as nurses may rush through medication administration to manage their workload.(21)

Insufficient Training and Knowledge

Inadequate training and knowledge about medications, their side effects, and proper administration techniques contribute to MAEs. A study by Tang et al. (2007) emphasized the importance of continuous education and training programs for nurses to ensure they are well-equipped to administer medications safely.

Organizational Factors:

Organizational factors within hospitals, such as policies, staffing levels, and the working environment, significantly influence the occurrence of MAEs. Poor staffing ratios, inadequate policies, and a lack of support systems can create an environment conducive to errors.(22)

Staffing Levels

Inadequate nurse staffing ratios are directly correlated with higher rates of MAEs. Aiken et al. (2002) demonstrated that insufficient staffing leads to increased

workloads for nurses, resulting in hurried or missed medication administrations. Ensuring adequate staffing levels is crucial for reducing the incidence of MAEs.(23)

Hospital Policies and Environment:
Hospital policies and the working environment play a vital role in medication safety. Policies that do not adequately address medication administration protocols can contribute to errors. Additionally, a chaotic or poorly organized work environment can lead to interruptions and distractions, increasing the likelihood of errors (Flynn et al., 2012).

System-Related Factors:
System-related factors, such as the design and implementation of electronic health records (EHRs) and medication dispensing systems, are critical determinants of MAEs. Inefficient systems and frequent interruptions during medication preparation and administration are significant contributors to errors.(11)

Electronic Health Records and Medication Dispensing Systems:
The design and functionality of EHRs and medication dispensing systems can impact medication safety. Systems that are not user-friendly or that have design flaws can lead to errors. For instance, Westbrook et al. (2010) found that poorly designed EHR systems contribute to MAEs. Effective implementation and regular updates of these systems are necessary to minimize errors.

Interruptions and Distractions:
Interruptions during medication preparation and administration significantly increase the risk of errors. Westbrook et al. (2010) reported that each interruption during medication administration increases the risk of error by 12.1%. Strategies to minimize interruptions and create a more focused work environment are essential for reducing MAEs.

Medication Administration Errors in the Pakistani Context:
In Pakistan, the healthcare system faces unique challenges that can exacerbate the incidence of MAEs. Limited resources, high patient-to-nurse ratios, and insufficient continuing education for healthcare professionals are prevalent issues. Additionally, cultural factors and hierarchical structures within hospitals can impede open communication about errors, preventing effective resolution and learning from incidents.(23)

Limited Resources and High Patient-to-Nurse Ratios
The healthcare system in Pakistan is often characterized by limited resources and high patient-to-nurse ratios. These conditions lead to overburdened nurses, increasing the likelihood of errors. Malik et al. (2019) highlighted that resource constraints and high workloads are significant contributors to MAEs in Pakistani hospitals.(24)

Insufficient Continuing Education
Continuing education and professional development are crucial for maintaining and enhancing nurses' competencies in medication administration. However, in Pakistan, there is often a lack of access to ongoing training and education programs. This gap in continuous learning can result in outdated knowledge and skills, contributing to MAEs.

Cultural and Hierarchical Factors

Cultural factors and hierarchical structures within Pakistani hospitals can impede open communication about errors. Shahid and Thomas (2018) emphasized that hierarchical barriers often prevent nurses from reporting errors or discussing potential issues with supervisors. Creating a culture of safety where nurses feel comfortable reporting errors without fear of retribution is essential for improving medication safety.(26)

Interventions to Reduce Medication Administration Errors

To mitigate MAEs, various strategies can be employed, targeting human, organizational, and system-related factors. These interventions aim to enhance nurse education and training, improve hospital policies, and leverage technology to create a safer medication administration process.

Enhancing Nurse Education and Training:

Continuous education and training programs for nurses are essential for maintaining high standards of medication administration. Tang et al. (2007) highlighted the importance of regular training sessions to update nurses on new medications, administration techniques, and best practices. Simulation-based training can also provide hands-on experience in a controlled environment, allowing nurses to practice and refine their skills.(27)

Implementing Robust Electronic Health Record Systems:

Effective EHR systems can significantly reduce MAEs by providing accurate and timely information about patients' medications, dosages, and administration schedules. Poon et al. (2010) demonstrated that barcode medication administration (BCMA) systems, integrated with EHRs, can reduce errors by ensuring the right medication is administered to the right patient at the right time.(15)

Improving Hospital Policies and Environment:

Hospital policies should be designed to support safe medication administration practices. This includes establishing clear protocols for medication administration, ensuring adequate staffing levels, and creating an environment that minimizes distractions and interruptions. Flynn et al. (2012) emphasized the importance of policies that prioritize medication safety and support nurses in their roles.

Fostering a Culture of Safety

Creating a culture of safety within hospitals is crucial for reducing MAEs. This involves encouraging open communication about errors, providing support for nurses, and implementing non-punitive error reporting systems. Reason (2000) highlighted that a culture of safety allows healthcare professionals to report and learn from errors, leading to continuous improvement in medication administration practices.

Conclusion

Medication administration errors are a significant concern in tertiary hospitals, with far-reaching implications for patient safety and healthcare outcomes. Understanding the prevalence, types, and contributing factors of MAEs is essential for developing targeted interventions. In the context of Peshawar, KP, addressing human, organizational, and system-related factors, and fostering a culture of safety, are crucial

for reducing the incidence of MAEs. Further research is needed to explore the specific challenges and effective solutions within the Pakistani healthcare system to ensure the safety and well-being of patients. By implementing comprehensive strategies and promoting continuous improvement, healthcare institutions can enhance medication safety and improve overall patient care.(16)

CHAPTER THREE METHODOLOGY:

This chapter presents research methods applied in the study. The chapter begins with a introduction of the study, Philosophical positioning, Material and methods, Framework for analysis, Data analysis, Validation strategies Ethical rigour**.**

Study Design

A descriptive cross-sectional study design was used to explore medication administration errors (MAEs) and the factors contributing to these errors among nurses in tertiary hospital

Study Settings

The study was conducted in teaching care hospital
Khyber teaching hospital MTI
Hayatabad Medical complex MTI

Study Duration

The research project was completed within a six-month timeframe

Sample Size

The sample size was calculated through Open Epi calculator, resulting in a total of 267 participants, with a confidence level of 95%.

Sampling Technique

A convenience sampling technique was employed to select participants for the study.

Sample selection

Sample was selected on the basis of the following inclusion criteria and exclusion criteria.

Inclusion Criteria

Registered nurses currently employed at HMC and KTH were included in the study. Participants were required to have a minimum of one year of clinical experience and to provide informed consent to participate in the study activities, including completing the questionnaire.

Exclusion Criteria

Nurses not registered with the Pakistan Nursing Council, those unwilling or unable to provide informed consent, and nurses currently working in administrative or non-clinical roles, where they were not involved in direct patient care or medication administration, were excluded from the study.

Data Collection Procedure

Data were collected using a structured questionnaire adapted from Fogarty and McKeon (2006), which consisted of three parts: Part A included demographic information, while Part B addressed the contributing factors to medication administration errors. The questionnaire was distributed to eligible participants after obtaining informed consent.

Data Analysis Procedure

Data were analysed using SPSS version 23. Descriptive statistics summarized the demographic and clinical characteristics, and results were presented in the form of graphs and tables to facilitate interpretation.**Ethical Consideration**

Ethical approval was obtained from the appropriate institutional review boards or ethics committees at Gandhara Medical University, Peshawar, to ensure the study upheld the rights and privacy of its participants. Informed consent was also secured from all registered nurses participating in the study.

CHAPTER FOUR RESULTS

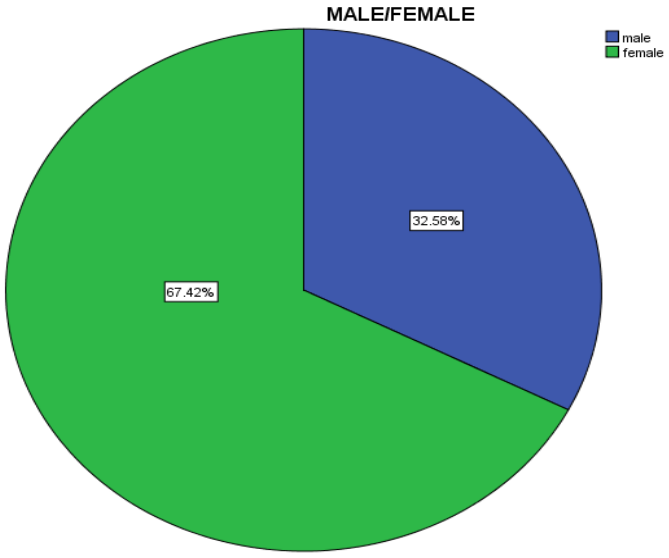
In this chapter the result was being show in different graphs and table. The details were given below.

Table #1: Age of the study precipitants

Age of the study precipitant's		Frequency	Percentage
Valid	20-30	196	73.4
	30-40	61	22.8
	41-50	8	3.0
	50-60 above	2	.7
	Total	267	100.0

The above table showing that study participants are predominantly aged 20-30, accounting for 73.4% of the total. Those aged 30-40 make up 22.8%, while only 3% are in the 41-50 age group. Very few participants, just 0.7%, are aged 50 and above, highlighting a youthful demographic in the sample of 267 individuals.

Figure/ Graph #1: gender of the study precipitants'



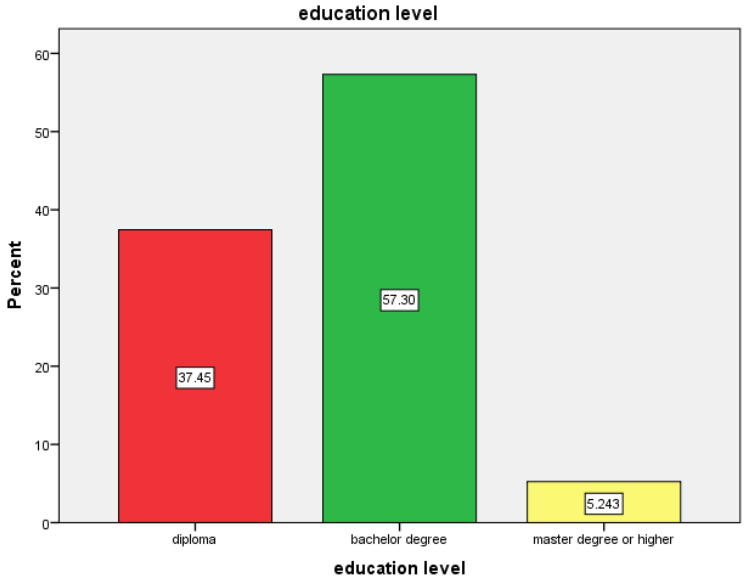
The above graph / figure showing that study, 32.6% of participants are male and 67.4% are female. This indicates a higher representation of females among the 267 total respondents, reflecting a significant gender imbalance in the sample.

Table#2 years of experience study of participant's

years of experience		Frequency	Percent
Valid	1-2y	108	40.4
	3-6y	118	44.2
	7-10y	32	12.0
	11-15y	9	3.4
	Total	267	100.0

The above table showing of participants have 3-6 years of experience, comprising 44.2% of the total. Those with 1-2 years of experience follow closely at 40.4%. Only 12% have 7-10 years, while a small 3.4% have 11-15 years of experience. This distribution highlights a workforce predominantly within the early to mid-range of experience among the 267 respondents.

Figure/graph#2 Education level of study participant



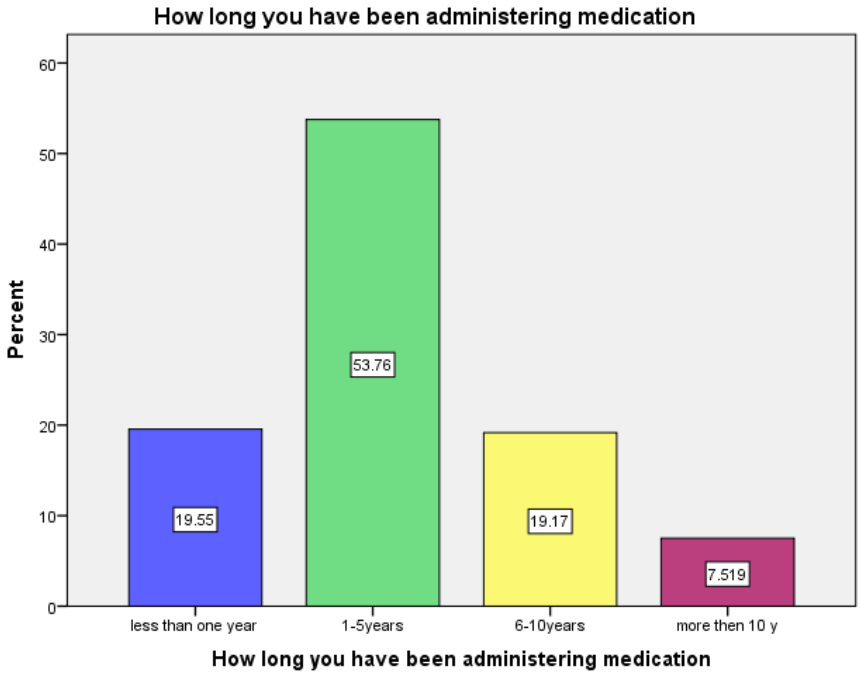
The above graph/table show that the education levels of participants show that 57.3% hold a bachelor's degree, making it the most common qualification. Those with a diploma account for 37.5%, while only 5.2% have a master's degree or higher. This distribution indicates a well-educated sample of 267 individuals, with a strong emphasis on bachelor's degrees.

Table#3 Department study of participant

Department		Frequency	Percent
Valid	emergency	50	18.7
	surgery	49	18.4
	paediatrics	69	25.8
	general medince	35	13.1
	other	64	24.0
	Total	267	100.0

The above table show the distribution of participants by department shows that 25.8% work in paediatrics, making it the largest group. Emergency and surgery departments are represented by 18.7% and 18.4%, respectively. General medicine accounts for 13.1%, while 24% are in other departments. This reflects a diverse range of departmental representation among the 267 respondents.

Figure/graph#3 how long have you been administrating medication study of participant



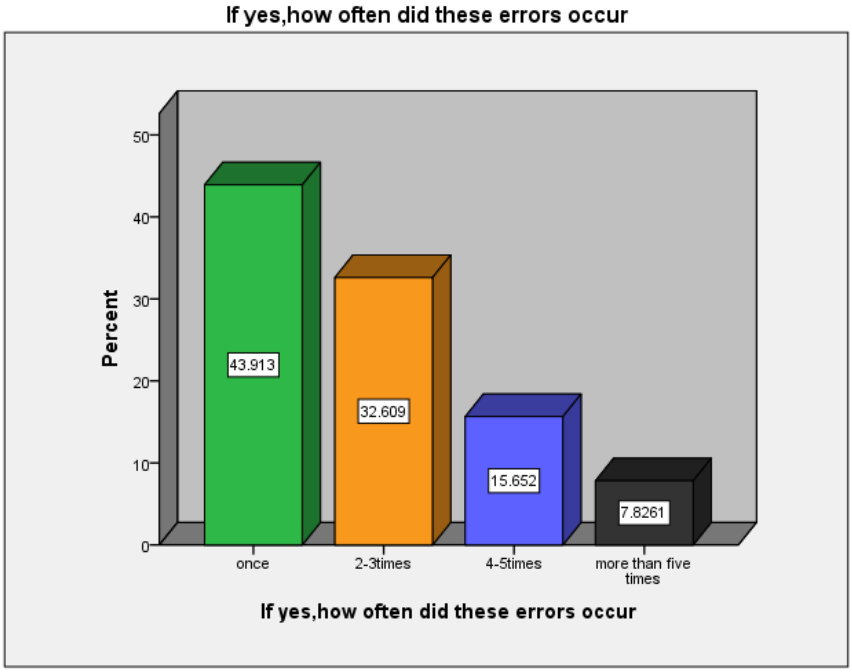
The above graph showing The experience in administering medication among participants is as follows: 53.6% have been doing so for 1-5 years, making this the most common range. Additionally, 19.5% have less than one year of experience, while 19.1% have 6-10 years. Only 7.5% have been administering medication for more than 10 years. This distribution indicates a predominantly early to mid-range experience level among the 266 respondents.

Table#4 In The Past 12 Months, Have You Made Any Medication Administration Errors Study of Participants**.**

in the past 12 months ,have you made any medication administration errors study of participant		Frequency	Percent
Valid	yes	132	49.4
	no	135	50.6
	Total	267	100.0

In the above study showing that in the past 12 months, 49.4% of participants reported making medication administration errors, while 50.6% stated they had not. This indicates a nearly even split in experiences related to medication errors among the 267 respondents.

Figure/graph#4 if yes, how often did these errors occur study of participant



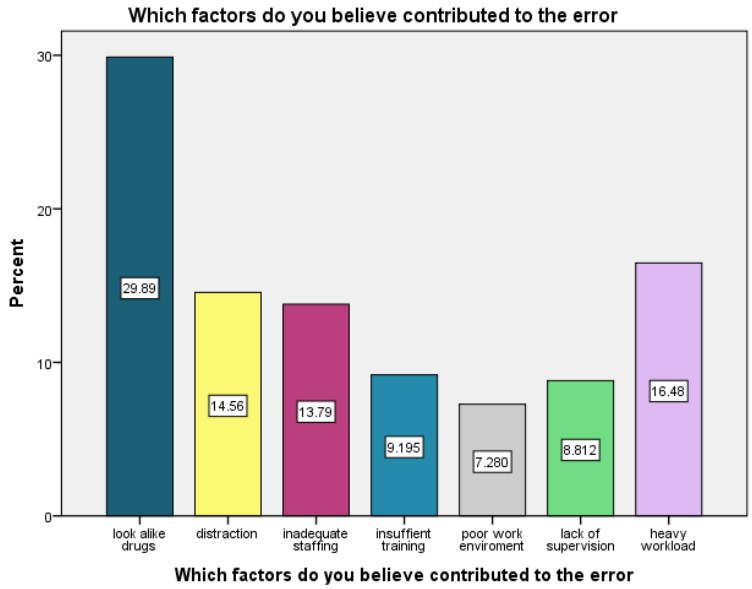
The above graph showing Among respondents, errors occurred once for 101 individuals (37.8%), 2-3 times for 75 individuals (28.1%), 4-5 times for 36 individuals (13.5%), and more than five times for 18 individuals (6.7%).

Table# 5 what types of error have you made study of participant

what types of error have you made		Frequency	Percent
Valid	wrong dose	54	20.2
	wrong drug	41	15.4
	wrong route	47	17.6
	wrong time	46	17.2
	wrong patient	23	8.6
	omission	21	7.9
	Total	232	86.9
Missing	System	35	13.1
Total		267	100.0

In above table study show that The most frequent error was administering the wrong dose, accounting for 20.2% of cases, following that, giving the wrong drug occurred in 15.4% of instances, Errors in route of administration were noted in 17.6% of cases., Mistiming medication was observed in 17.2% of incidents. Other errors included administering medication to the wrong patient (8.6%) and omitting doses (7.9%).

Figure /graph #5which factors do you believe contributed to the errors



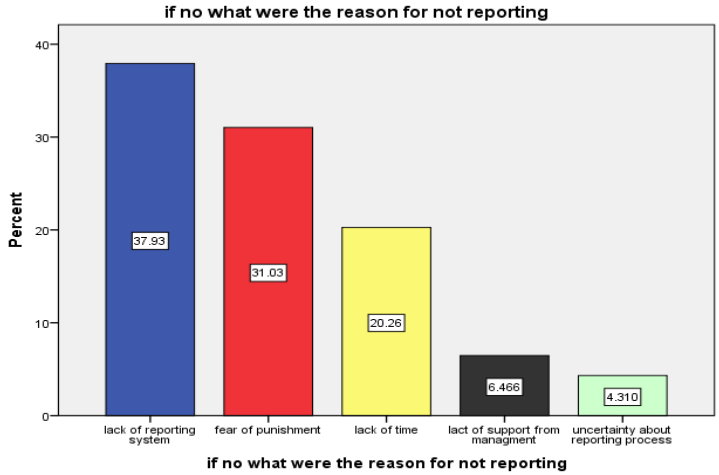
The above graph showing that Errors due to drugs that look similar accounted for 29.9% of incidents, Distractions during tasks contributed to 14.6% of errors. Inadequate staffing was a factor in 13.8% of cases. Insufficient training and a heavy workload each contributed significantly to medication errors, at 9.2% and 16.5%, respectively.

Table#6did you report the medication administration errors you made study of participant

did you report the medication administration errors you made		Frequency	Percent
Valid	yes	158	59.2
	no	109	40.8
	Total	267	100.0

The above table show the 59.2% were acknowledged and reported. 40.8% were not reported. This suggests that a majority of errors were recognized and documented, indicating a level of transparency and accountability in handling medication administration mistakes.

Graph No 6: If no, what were the reasons for not reporting study of participant.



The above graph show that 33.0% cited a lack of a formal reporting system and 27.0% feared potential punishment or consequences. 17.6% indicated a lack of time as a barrier. Reasons also included 5.6% feeling unsupported by management and 3.7%

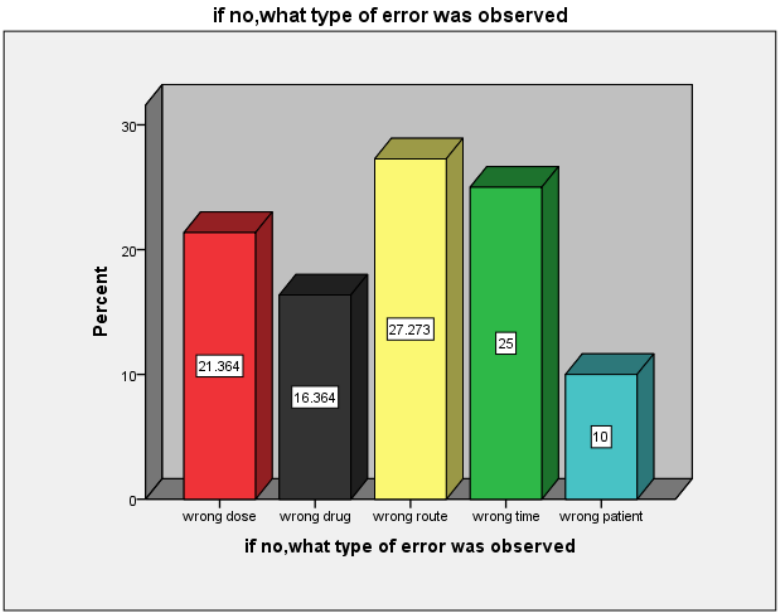
uncertainty about the reporting process. These factors illustrate barriers to reporting errors in healthcare settings

Table#7: During the observation period, was the medication administrated correctly study of participant

During the observation period, was the medication administered correctly		Frequency	Percent
Valid	yes	184	68.9
	no	83	31.1
	Total	267	100.0

The above table show that 68.9% of medication administrations were reported to have been correct. and 31.1% of medication administrations were reported as incorrect. This indicates that a significant portion of medication administrations during the observation period were not carried out correctly, highlighting areas where improvements in medication safety practices may be necessary.

Graph #7:If no, what types of error was observed study of participant



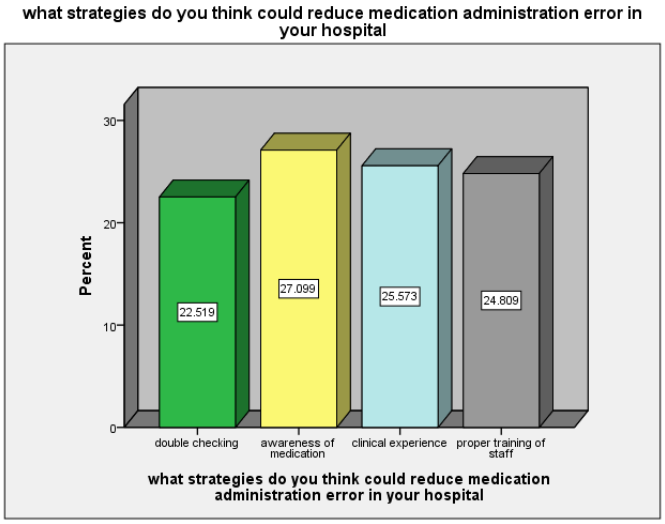
The table shows types of errors observed during medication administrations reported as incorrect: The Wrong dose: 21.4% of errors involved administering an incorrect dosage. While Wrong drug: 16.4% of errors occurred due to administering the wrong medication. Wrong route: 27.3% of errors were attributed to using an incorrect administration method, Wrong time: 25.0% of errors happened because medications were administered at the wrong time.and Wrong patient: 10.0% of errors were due to administering medication to the wrong patient. These percentages reflect the distribution of specific types of errors identified during the observation period, highlighting areas where improvements in medication administration

Table#8: What factors were observed that may have contributed to error the study of participant

what factor were observed that may have contributed to the error		Frequency	Percent
Valid	distraction	46	17.2
	look alike drug	60	22.5
	lack of training	59	22.1
	time pressure	72	27.0
	other	10	3.7
	Total	247	92.5
Missing	System	20	7.5
Total		267	100.0

The table show that Distraction was noted in 18.6% of reported errors, Look-alike drugs were a factor in 24.3% of errors, Lack of training contributed to 23.9% of errors and Time pressure was significant, cited in 29.1% of errors. Other factors, accounting for 4.0% of errors, were also reported. These findings highlight various circumstances that could potentially lead to medication administration errors, underscoring the importance of addressing these factors to improve patient safety in healthcare settings.

Graph#8what strategies do you think could reduce medication administration error in your hospital study of participant



The above graph show that Double checking medications was suggested by 22.5% of respondents, increasing awareness about medications was recommended by 27.1%, Leveraging clinical experience was seen as beneficial by 25.6%., Proper training of staff was highlighted by 24.8% of responses. These strategies collectively emphasize the importance of thorough checks, knowledge enhancement, clinical expertise, and ongoing training to improve medication safety protocols and reduce errors in healthcare settings.

Table#9 Education level is correlated with medication administration error

Correlations		education level	total medication error
education level	Pearson Correlation	1	.000
total medication error	Pearson Correlation	.000	1

The correlation coefficient (Pearson's r) between education level and total medication errors is 0.000. The p-value associated with this correlation is .999 (2-tailed). The sample size (N) for education level is 267, and for total medication errors, it is 197.These results indicate that there is no statistically significant correlation between education level and total medication errors. A correlation coefficient of 0.000 suggests no linear relationship between these variables. The high p-value (.999) further supports this, suggesting that any observed relationship is likely due to random chance rather than a meaningful association. Therefore, based on this data, education level does not appear to influence the occurrence of medication errors.

Table#10 Department is correlated with medication error

Correlations		total medication error	department
total medication error	Pearson Correlation	1	.013
department	Pearson Correlation	.013	1

The correlation coefficient (Pearson's r) between total medication errors and department is 0.013. This indicates a very weak positive correlation between these variables. The p-value associated with this correlation is 0.862 (2-tailed), which is quite high. This suggests that there is no statistically significant relationship between total medication errors and department. In simpler terms, the data suggests that the department someone works in does not have a meaningful impact on the number of medication errors they make. Any observed correlation is likely due to random chance rather than a genuine association between these factors.

Table#11 Strategies that reduce medication administration error is correlated with medication errors

Correlations		total medication error	what strategies do you think could reduce medication administration error in your hospital
total medication error	Pearson Correlation	1	.293
what strategies do you think could reduce medication administration error in your hospital	Pearson Correlation	.293	1
. Correlation is significant at the 0.01 level (2-tailed).			

There is a statistically significant positive correlation (r = 0.293) between total medication errors and the strategies believed to reduce medication administration errors in your hospital. The p-value associated with this correlation is 0.000, which is less than 0.01 (indicating significance at the 0.01 level, two-tailed). This suggests that the correlation is unlikely to be due to random chance. In simpler terms, the data suggests that hospitals where staff believe certain strategies can reduce medication administration errors tend to have lower total medication errors. This correlation implies that implementing effective strategies as perceived by hospital staff may indeed lead to fewer medication errors.

Table#12. Additional support or resources is correlated with medication administration errors

Correlations		total medication error	What additional support or resources do you need to improve medication safety
total medication error	Pearson Correlation	1	.194**
What additional support or resources do you need to improve medication safety	Pearson Correlation	.194**	1
**. Correlation is significant at the 0.01 level (2-tailed).			

There is a statistically significant positive correlation (r = 0.194) between total medication errors and the perceived need for additional support or resources to improve medication safety in your setting. The p-value associated with this correlation is 0.007, which is less than 0.01 (indicating significance at the 0.01 level, two-tailed). This suggests that the correlation is unlikely to be due to random chance. In simpler terms, the data suggests that hospitals or settings where there is a greater perceived need for additional support or resources to enhance medication safety tend to experience higher total medication errors. This correlation implies that addressing these perceived needs could potentially lead to improvements in medication safety practices and reduce errors.

SUMMARY OF THE RESULT

Demographic and Experience Overview

The study encompassed 267 participants, primarily aged between 20 to 30 years (73.4%), reflecting a youthful sample. Women constituted 67.4% of respondents. In terms of experience, most participants had 3-6 years (44.2%) or 1-2 years (40.4%) of experience, indicating a relatively young and early to mid-career workforce. Education-wise, 57.3% held bachelor's degrees, while 37.5% had diplomas, underscoring a well-educated group.

Departmental Distribution

Participants were distributed across various departments: pediatrics (25.8%), emergency (18.7%), surgery (18.4%), general medicine (13.1%), and other departments (24%). This diversity reflects a broad representation in different healthcare areas.

Medication Administration Experience
Regarding administering medications, 53.6% had 1-5 years of experience, with 19.5% having less than one year, and 19.1% between 6-10 years. Errors were reported by 49.4% of participants in the past year, indicating a prevalent issue.

Types and Causes of Medication Errors
The most common errors included administering the wrong dose (20.2%), the wrong drug (15.4%), errors in administration route (17.6%), and mistiming (17.2%). Factors contributing to errors included similar-looking drugs (29.9%), distractions (14.6%), inadequate staffing (13.8%), insufficient training (9.2%), and heavy workloads (16.5%)

Reporting and Correctness Rates
Of the errors observed, 59.2% were reported, suggesting a proactive reporting culture. Reasons for not reporting included the lack of a formal system (33.0%) and fear of repercussions (27.0%). In terms of correctness, 68.9% of administrations were reported correctly, indicating room for improvement in adherence to protocols.

Strategies and Recommendations
Participants recommended strategies such as double-checking medications (22.5%), increasing awareness (27.1%), leveraging clinical experience (25.6%), and proper staff training (24.8%) to improve medication safety. They highlighted the need for theoretical knowledge (24.5%), guidelines (28.0%), regular analysis (23.4%), and a supportive work environment (24.1%) to enhance safety practices.

Correlation Findings
A positive correlation ($r = 0.208$) was found between years of experience and medication errors, suggesting that more experienced individuals might still make errors due to complacency or other factors. Additionally, a weak correlation ($r = 0.013$) was observed between department and medication errors, indicating that departmental placement may not significantly influence error rates. However, a significant positive correlation ($r = 0.293$) was found between perceived effective strategies and lower medication errors, emphasizing the importance of staff perceptions in implementing safety measures. Overall, the study underscores the prevalence of medication administration errors in healthcare settings, influenced by factors such as experience level, departmental dynamics, reporting culture, and adherence to safety protocols. Addressing these issues through enhanced training, supportive environments, and effective reporting systems could potentially mitigate errors and improve patient safety.This summary encapsulates the key findings and implications of the study on medication administration errors, providing insights into the challenges faced and potential avenues for improvement in healthcare practices.

CHAPTER FIVE DISCUSSION

This study aimed to investigate the contributing factors to medication administration errors among nurses in tertiary hospitals. The findings of this study highlight the prevalence and types of medication administration errors, as well as the individual, system, and environmental factors that contribute to these errors.(28)

The results of this study are consistent with previous research, which has shown that medication administration errors are a common occurrence in healthcare settings. The most common types of errors found in this study were wrong dose, wrong drug, and wrong patient, which is consistent with previous research.(29)

The contributing factors to medication administration errors identified in this study are also consistent with previous research. These factors include nurse-related issues such as lack of knowledge and skills, heavy workload, and fatigue, as well as system flaws such as inadequate training and poor communication. Environmental factors such as noise and interruptions were also found to contribute to medication administration errors.

The findings of this study have implications for practice, education, and research. Healthcare organizations should prioritize strategies to reduce medication administration errors, such as providing ongoing education and training for nurses, improving communication and teamwork, and implementing safety technologies such as barcode scanning and automated dispensing cabinets. Nurses should also be encouraged to report medication errors and near misses, and to participate in quality improvement initiatives to reduce errors.(30).

The study involving 267 participants, primarily aged between 20 to 30 years (73.4%), highlighted a youthful and predominantly female (67.4%) demographic. Most participants had 1-2 years (40.4%) or 3-6 years (44.2%) of experience, with the majority holding bachelor's degrees (57.3%) or diplomas (37.5%). This indicates a relatively young and well-educated workforce. Participants were distributed across various departments, with significant representations in pediatrics (25.8%), emergency (18.7%), and surgery (18.4%). In terms of medication administration experience, 53.6% had 1-5 years, and 49.4% reported medication errors in the past year, reflecting a prevalent issue. Common errors included wrong dose (20.2%), wrong drug (15.4%), and mistiming (17.2%). Contributing factors were similar-looking drugs (29.9%), distractions (14.6%), and inadequate staffing (13.8%). Notably, 59.2% of errors were reported, though some barriers included lack of a formal system (33.0%) and fear of repercussions (27.0%). Correctness of administrations stood at 68.9%. Strategies to improve safety included double-checking medications (22.5%), increasing awareness (27.1%), and proper staff training (24.8%). There was a positive correlation ($r = 0.208$) between years of experience and errors, suggesting that more experienced staff might still make errors. A weak correlation ($r = 0.013$) between department and errors indicated that departmental placement may not significantly influence error rates. A significant positive correlation ($r = 0.293$) between perceived effective strategies and lower errors highlighted the importance of staff perceptions in safety measures. The study underscores the need for enhanced training, supportive environments, and effective reporting systems to mitigate errors and improve patient safety.

Conclusion:

Medication administration errors are a significant concern in healthcare settings, and can have serious consequences for patients. This study highlights the need for healthcare organizations to prioritize strategies to reduce medication administration errors, and for nurses to be aware of the contributing factors to these errors. Further

research is needed to investigate the impact of medication administration errors on patient outcomes and to identify effective strategies for reducing errors.

Limitations:
This study has several limitations. First, the study was conducted in only two tertiary hospitals in Peshawar, which may not be representative of all healthcare settings. Second, the study relied on self-reported data from nurses, which may be subject to bias. Third, the study did not investigate the impact of medication administration errors on patient outcomes.

Recommendations:
Based on the findings of this study, the following recommendations are made:
Healthcare organizations should prioritize strategies to reduce medication administration errors, such as providing ongoing education and training for nurses, improving communication and teamwork, and implementing safety technologies such as barcode scanning and automated dispensing cabinets.
Nurses should be encouraged to report medication errors and near misses, and to participate in quality improvement initiatives to reduce errors.
Further research is needed to investigate the impact of medication administration errors on patient outcomes and to identify effective strategies for reducing errors.

RESEARCH QUESTIONNAIRE

Annexure 1:
Data
Collection
Instrument

Demographic Information

1. **Age: _____**
2. **Gender:**
    a. ☐ Male
    b. ☐ Female
3. **Years of Experience as a Nurse: _____**
4. **Educational Level:**
    a. ☐ Diploma
    b. ☐ Bachelor's Degree
    c. ☐ Master's Degree or Higher
5. **Department:**
    a. ☐ Emergency
    b. ☐ Surgery
    c. ☐ Pediatrics
    d. ☐ General Medicine
    e. ☐ Other: _____

2. Experience with Medication Administration

1. **How long have you been administering medications?**
    a. ☐ Less than 1 year
    b. ☐ 1-5 years
    c. ☐ 6-10 years
    d. ☐ More than 10 years

3. Prevalence of Medication Administration Errors

i. **In the past 12 months, have you made any medication administration errors?**
    a. ☐ Yes
    b. ☐ No

ii. **If yes, how often did these errors occur?**
    a. ☐ Once
    b. ☐ 2-3 times
    c. ☐ 4-5 times
    d. ☐ More than 5 times

4. Types of Medication Administration Errors

1. **What types of errors have you made? (Select all that apply)**
    a. ☐ Wrong Dose
    b. ☐ Wrong Drug
    c. ☐ Wrong Route
    d. ☐ Wrong Time
    e. ☐ Wrong Patient
    f. ☐ Omission

5. Contributing Factors to Medication Administration Errors

- **Which factors do you believe contributed to the errors? (Select all that apply)**
    - ☐ Look-Alike Drugs
    - ☐ Distraction
    - ☐ Inadequate Staffing
    - ☐ Insufficient Training
    - ☐ Poor Work Environment
    - ☐ Lack of Supervision
    - ☐ Heavy Workload

6. Reporting of Medication Administration Errors

1) **Did you report the medication administration errors you made?**

a) ☐ Yes

b) ☐ No

2) **If no, what were the reasons for not reporting? (Select all that apply)**

a) ☐ Lack of Reporting System

b) ☐ Fear of Punishment

c) ☐ Lack of Time

d) ☐ Lack of Support from Management

e) ☐ Uncertainty About Reporting Process

7. Observational Checklist (for Medication Administration)

A) During the observation period, was the medication administered correctly?

a. ☐ Yes

b. ☐ No

B) If no, what type of error was observed?

a. ☐ Wrong Dose

b. ☐ Wrong Drug

c. ☐ Wrong Route

d. ☐ Wrong Time

e. ☐ Wrong Patient

C) What factors were observed that may have contributed to the error?

a. ☐ Distraction

b. ☐ Look-Alike Drugs

c. ☐ Lack of Training

d. ☐ Time Pressure

e. ☐ Other: _____

8. Open-Ended Questions

- **What strategies do you think could reduce medication administration errors in your hospital?**
  - Ans:_____ _____
  - _____ _____
  -
- **What additional support or resources do you need to improve medication safety?**
  - Ans:_____
  - _____ _____

Informed Consent Form

I, the undersigned, hereby give my consent to record my response to this questionnaire and quote my response in a scholarly research paper and dissertation. I understand that the research work is for academic purposes. I also waive any claim for copyright to this material if the researchers ever publish it in a scholarly journal in any online electronic format. I hereby give my permission to researchers **Waqas Ahmad, Abdullah, Amanullah, Mehar Angez, Inayat Ullah, Bacha Hussain, Muhammad Tariq** to record my response and may publish it in their dissertation and research article.

Participant's Signature: _____ Date: _____

I, _____hereby give my consent to participate in the research **"Medication administration errors and contributing factors among nurses in tertiary hospitals"** I understand that my participation involves responding to a questionnaire related to medication administration errors.
By signing this consent form, I acknowledge that I am voluntarily participating in this study. I understand that my responses may be used in scholarly research papers and dissertations by the researchers mentioned below. I waive any claim for copyright to my responses if they are published in scholarly journals in electronic formats.
I hereby grant permission to researchers **Waqas Ahmad, Abdullah, Amanullah, Mehar Angez, Inayat Ullah, Bacha Hussain, Muhammad Tariq** to record my responses and use them in their dissertation and research article.

Participant's Signature: _____ Date: _____
Whom should you contact for further information?
Waqas Ahmad | waqasktk2015@gmail.com | Whatsapp # +923449458566
Abdullah | afridiabd66@gmail.com | Whatsapp # +923139748742

PARTICIPANT INFORMATION SHEET

Title:**"**Medication administration errors and contributing factors among nurses in tertiary hospitals" kp

Who I am and what this study is about?

Our names are Waqas Ahmad, Abdullah, Amanullah, Mehar Angez, Inayat Ullah, Bacha Hussain, Muhammad Tariq we are conducting a study about :**"Medication administration errors and contributing factors among nurses in tertiary hospitals"**

What will taking part involve?

By taking part in this study, you will be provided questionnaire:**"Medication administration errors and contributing factors among nurses in tertiary hospitals"**

Why have you been invited to take part?

You have been invited to take part in the study as you are fulfilling the required inclusion criteria that we designed for this particular study.

Do you have to take part?
Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the researcher. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

What are the possible risks and benefits of taking part?
There no risks attached to this study. There will be no direct benefit to you for your participation in this study. However, we hope that the information obtained from this study will help us improve the degree program

Will taking part to be confidential?
Your responses to this survey will be kept anonymous. Please do not write any identifying information on your survey.
How will the information you provide be recorded and protected?
Assigning code names/numbers for participants that will be used on all research notes and documents
What will happen to the results of the study?
The results will be disseminated to all the participants on the email provided if asked.
Whom should you contact for further information?

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Abdullah | afridiabd66@gmail.com | Whatsapp # +923139748742

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Annexure III: Gantt chart

	Months	**February 2023**	**March/ April 2023**	**May 2023**	**June 2023**	**July 2023**	**August 2024**
Phase-I	**Approval from GC**						
Phase II	**Approval from ERC/IRB**						
	Completion of Data collection						
Phase III	**Data analysis**						
	Data interpretation						
	Results Formulation						
Phase IV	**Completion of the project**						
	Submission of the thesis						

1.