ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF NURSING AND MIDWIFERY
POST GRAGUATE PROGRAM

ASSESSMENTS OF MAGNITUDE AND CONTRIBUTING FACTORS OF MEDICATION ADMINISTRATION ERROR AMONG NURSES IN TERTIARY HOSPITALS, ADDIS ABABA, ETHIOPIA, 2018.

BY: ADAM WONDMIENEH (BSc)

A RESEARCH THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES SCHOOL OF NURSING AND MIDWIFERY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTERS OF SCIENCE IN ADULT HEALTH NURSING

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LIST OF ACRONYMS AND ABBREVIATIONS

AAU-IRB	Addis Ababa University Institutional Review Board
AIDS	Acquired Immuno-Deficiency Syndrome
AOR	Adjusted Odds Ratio
CI	Confidence Interval
COR	Crude Odd Ratio
ICU	Intensive Care Unit
IV	Intravenous
MAE	Medication Administration Error
ME	Medication Error
RMA	Rights of Medication Administration
SAQ	Self-Administered Questionnaire
SD	Standard Deviation
SPMMC	St. Paul's Millennium Medical College
SPSS	Statistical Program for Social Sciences
TASH	Tikur Anbesa Specialized Hospital
US	United States
WHO	World Health Organization

ABSTRACT

Background: Unsafe medication practices are the leading causes of avoidable patient harm in healthcare systems across the world. Errors made during medication administration are the commonest one. Nurses play a significant role in the occurrence as well as in the preventions of medication administration errors. However, only a few relevant studies were conducted in Ethiopia to assess this problem.

Objective: To assess the magnitude and contributing factors of medication administration error among nurses in tertiary care hospitals, Addis Ababa, Ethiopia, 2018.

Methods: A hospital-based, cross-sectional study design was conducted in Addis Ababa tertiary hospitals. A simple random sampling method was used to select 303 study participants. The data were collected using structured and pre-tested self-administered questionnaire; and semi-structured and pre-tested observational checklist from February to March 2018. The nurses were observed while administering medications continuously for 48 hours. The data were analyzed using descriptive and analytical statistics and binary logistic regression was done to identify factors associated with medication administration errors. P-value < 0.05 was considered statistically significant. The study findings were presented by using tables, figures, and charts.

Result: A total of 298 nurses participated in this study with a 98.3 % response rate. From those respondents 203 (68.1%) nurses made medication administration error in the last 12 months. There is a significant association between medication administration errors and lack of training [AOR=3.16; 95% CI (1.67,6)], unavailability of guideline [AOR=2.07; 95% CI (1.06,4.06)], work experience [AOR = 6.48; 95% CI (1.32,31.78)], interruption during medication administration [AOR = 2.42, 95 % CI (1.3,4.49)] and night duty shift [AOR = 5, 95 % CI (1.82, 13.78)] at p-value <0.05.

Conclusion and recommendation: Medication administration error in Addis Ababa tertiary hospitals was highly prevalent. This study showed that there is a significant association between medication administration error and factors such as work experience, night shift, lack of training, unavailability of guideline and interruption during medication administration. Develop appropriate guidelines for safe medication administration, providing continuous training, minimizing distracters during medication administration and retaining experienced nurses would be helpful for minimizing medication administration errors.

Keywords: Medication errors, Magnitude, Nurses, administration

1. INTRODUCTION

1.1 Background

Every person around the world will take medications at some point in their life to prevent or treat illness. However, medicines do sometimes cause severe harm, disability, and even death if taken incorrectly, as a result of an error (1). Medication errors are the leading causes of avoidable patient harm in the health care system across the world. In African health care setting medication errors are common health problems (1, 2). Medication administration errors are the most common types of medication errors affecting patient safety and posing dangerous consequences for patients (2, 3). The administrations of medication are primarily the nurse's responsibility, and they spend up to 40% of their time through administering medications (4). Nurses represent the last safety check in the chain of events in the medication administration process and they are the last safeguard of patient wellbeing (5).

The United States (US) National Coordinating Council for medication error reporting and prevention defines a medication error as follows: "A medication error is 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. Such events may be related to professional practice, healthcare products, procedures, and systems, including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use" (6).

Medication errors can occur at any phase of the medication process from writing the prescription to the administrations of the medication to the patient. Based on the findings of previous studies, medication errors most often occur during the administrations of medications (1, 2, 7). Most of the medications are administered by nurses, so most of the medication administration errors are made by nurses (8). The frequently perpetrated types of medication administration errors are wrong dose, wrong time, wrong drug, wrong route, the omission of doses, documentation errors, wrong patient and technical errors (9-12).

The six rights of medication administrations are: Right route: the route of medication is specified in the written order and nurses should identify the correct route. The nurses should consult health professionals if the route is not identified or a route indicated differ from the recommended.

Right dose: The nurse must know how to reduce the risk of error by correctly calculating doses and having them double checked before administration. Right drug: Before administering any medication the nurse compares the medications listed on the medication administration record with the health professional's order. Right time: medications are ordered on a schedule. Nurses' should know the medication schedule and follow the schedule. A drug should not be given more than a half-hour before or after the scheduled time. Right patient: the nurse should identify the patient by asking his full name and by checking the patient's identification armband if available. Right documentation: A complete and legible documentation must be done at the time that the medication is administered (13, 14).

To improve patient safety and reduce the incidence of medication errors (ME) nurses should interrupt medication errors before reaching the patient by adhering to the six rights of medication administration (6RMA) and reporting the MAEs (5, 12, 15). Moreover, nursing and hospital managers should reduce the nursing staff workload, provide periodic training courses on the proper and safe administrations of medication and create conducive environment for error reporting (11, 12).

From the findings of the previous studies factors contributing to medication errors are lack of knowledge, policy violation, unfamiliarity with the drug, advanced drug preparation and administration without re-checking, miscommunication among clinicians, failure to be alert while checking prescription, heavy workload, interruption during medication administration, illegible handwritings of physicians, failure to document and lack of experience (5, 9, 16).

The prevalence of MAE among nurses is an actual problem and a real threat to patient safety. Several studies and systematic reviews around the world in different countries have been carried out and the result shows the magnitude of MAE among nurses is still high (2, 7, 12, 16). Identifying the contributing factors of MAE is one of the important strategies to improve patient safety and reduce the magnitude of MAEs. Those factors are commonly identified through medication error reporting. However, nurses are reluctant to report medication errors either to supervisors or to patients (9, 11, 17).

1.2 Statements of the problem

Medication errors are the most common type of medical errors that occurred in hospitals and the eighth leading cause of death higher than car accidents, breast cancer, and AIDS combined (18, 19). Medication errors, specially made during the administration of medications were highly prevalent. Each medication and each patient had at least one type of MAEs (10).

Medication errors are undoubtedly costly to patients, their families, their employers, and to hospitals, healthcare providers, and insurance companies. Patients are the primary victims of medication errors and MAE has a significant impact on patients in terms of morbidity, mortality, adverse drug event, additional cost and increased the length of hospital stay (16). Medication errors are remaining a serious health problem in the developing and developed countries. In the United States between 44000 and 98000 hospitalized patients die annually from preventable medical errors, with more than 7000 deaths ensuing from medication errors (20). In England, approximately 4.8 million medication errors cause severe harm to the patient annually. Moreover, the cost associated with medication error in England is 98.5 million pounds annually (3). In Finland between 700 and 1700 people die each year from medication-related errors in the hospital (21).

Patients living in low-income countries experience twice as many disabilities due to medication related harm than those living in high-income countries (1). A systematic review of adverse drug events and medication errors in African hospitals indicated that 8.4% of patients reported having experienced any suspected adverse drug event at hospital admission, while 2.8% of patients admitted to hospital due to adverse drug events. Similarly, the mortality rate attributed to adverse drug events was 0.1% (2). A direct observational study conducted in Egypt indicated that 0.77% of the patient was harmed by medication administration errors and needed either extended hospitalization or intervention (22). Furthermore, in Ethiopia, 1.5% of patients experienced actual adverse drug events associated with medication errors (23).

As a second victim, the healthcare professionals suffer from medication errors, especially nurses who give the wrong medication to patients, or experience omissions of medication can suffer emotional distress, lack of confidence, manslaughter, punitive actions and even face legal action,

especially when the error results in substantial patient harm. Patients and relatives of patients who suffer from medication errors may lose trust in health care providers (16, 18).

The health institutions as a third victim suffer from medication errors through the increased cost of unplanned prolonged hospitalization and treatment of the patients. According to WHO 2017 report globally, the cost associated with medication errors has been estimated at 42 billion US Dollars annually (1, 18).

In the Middle East countries, the MAE is common and the error rate ranges from 9.4% to 80% of all medication administrations (7). The prevalence of medication administration error in Iran was between 14.3%-70.0% (24). The MAE rate in tertiary hospitals of Ghana was 27.2% (25). In Ethiopia, MAE is a common health problem and its magnitude ranges from 51.8% to 90.8% (10, 12, 26, 27). Reporting MAE is one of the essential measures that the nurses have to utilize to ensure patient safety and reduce medication error. However, in our country, the findings of previous studies showed that the degree of reporting of MAEs by nurses was low (10, 12, 28).

The WHO third global patient safety challenge program develops a strategy to reduce severely, avoidable medication harms by 50% in the next five years from 2017 to 2022, especially by addressing harm results from errors due to weakness in the health system and by making improvement in the medication administration practices (1). Medication errors are costly to patients and hospitals, yet when supported, nursing staffs play a significant role in interrupting those errors before they reach the patient (15).

Generally, there are only a few relevant data on medication administration errors in developing and transitional countries, especially in Africa. In developing countries like Ethiopia with educational, economic, and trained manpower problems, the issue is primarily one of the least investigated and neglected health problems. Hence; this study finding could provide input in drawing the attention of the policymakers, healthcare managers, health care professionals, especially nurses, thus stimulate them; to take appropriate measures to reduce the problems and pointing researchers to view it as one of the area of investigation.

2. LITERATURE REVIEW

In this literature review, medication administration error is explored from the nurse's perspectives to understand the magnitude and its contributing factors. This literature review is used as in purpose of gathering data from the numerous previously done researches concerning the topic of medication administration error. Those findings may be useful for nursing students, nurses and other health professionals who are likely interested to be exploring about medication errors.

2.1 Magnitude of medication administration errors

The WHO, 2017 report indicates that medication errors occur when weak medication systems and/or human factors such as fatigue, poor environmental conditions or staff shortages affect medication process from prescription to administration of medications. Medication errors occur most frequently during the administration of medications (1). According to a systematic review of 91 direct observational studies, the overall prevalence of medication administration errors (MAEs) was 19.6% or interquartile range between 8.6% and 28.3% of total opportunities for error in healthcare settings worldwide (29).

Medication administration errors are prevalent both in developed and developing countries. In high-income countries like England, seven hospitals of South Korea, Turkey and three teaching hospitals of South Korea it was highly prevalent 54.4%, 63.6%, 61.7% and 69.6% respectively (3, 30-32); Whereas, in France, drug administration error rate was relatively low (27.6%) (30). On the other hand in Iran a cross-sectional survey of 500 nurses' in7 teaching hospitals carried out to examine the prevalence and types of medication errors indicated that the prevalence of MAE among nurses within the past 3 months was 17.0% (11). However, an observational study conducted in the emergency department of southern Iran tertiary hospital showed that 68.5% medication errors recorded (33). A prospective study conducted on six wards in two urban public hospitals in Vietnam to determine the prevalence and potential clinical outcome of medication preparation and administration errors, and to identify factors associated with errors indicated that the medication administration error rate was 39.1% (34). A similar study conducted in Indian tertiary care hospital showed that medication error rate was 68.5% (35).

In Nigeria, 63.5% of the nurses made ME 1-2 times in a month (5). A descriptive direct-observational study of drug administration errors carried out at medical wards of Ain Shams University hospital of Egypt indicated that the overall medication error rate was 37.8% (22). A similar study done in Ghana tertiary care hospital adult emergency department showed that MAE rate was 27.2% (25).

The prevalence of MAE in the intensive care unit (ICU) and pediatric ward of Jimma University, Ethiopia was 51.8 and 90.8 %, respectively (26, 27). A cross-sectional study done at the Felege Hiwot Referral Hospital showed that out of 360 medication administration interventions, the majority (98.1 %) of medications had at least one type of medication administration error. Among this, 42 (11.9 %) had perpetrated only one type medication administration error, 112 (31.7 %) had perpetrated two type of errors, 168 (47.6 %) had perpetrated three types of errors and the rest 31 (8.8 %) had perpetrated more than three types of medication administration error. From the total medication administration intervention, more than half (56.4 %) were labeled as medication administration errors. (10). A prospective observational study conducted in western Ethiopia indicated that 75.1% of patients exposed to medication errors (23). An institution-based, cross-sectional study conducted in two public hospitals in Southern Ethiopia indicated that 71% of nurses made MAE in the previous 12 months. 46% of the respondents perpetrated MAE at least four times while (35%) of the participants made MAE two or three times during the specified period. From the observed doses (0.7%) of medications were administered without any breach in any of the six rights of medication administration (12).

2.2. Types of medication administration errors

1.2.1. Wrong time medication administration

Administration of medication at the wrong time is frequently made type of medication error. According to a prospective observational study conducted in France it is most frequently perpetrated type of MAE (72.6%) (30). Another similar study was done in Iran, South Korea and UAS indicated that nurses administer medications in a wrong time (24%), (18.3%) and (37.6%), respectively (9, 11, 36). A descriptive quantitative study done at tertiary care university hospital in Karachi, Pakistan showed that 17% of medication doses are administered in a wrong time (37). On the other hand, a prospective cross-sectional study conducted in Ghana and Egypt indicated that administering medications in a wrong time was commonly perpetrated type of

medication errors (36.7%) and (16%), respectively (22, 25). In Ethiopia failure to administer medications at the right time was a commonly made type of medication error. According to a cross-sectional study conducted in Felegehiwot referral hospital, Jimma University ICU unit, Jimma university pediatrics ward and two southern Ethiopia hospitals wrong time error was 53.6%, 30.3%, 27% & and 58.5%, respectively (10, 12, 26, 27).

1.2.2. Wrong route medication administration

A prospective cross-sectional study conducted in Vietnam and South Korea indicated that medication errors occurred frequently during intravenous administration of medications, (67.2%) and (73.2%), respectively (9, 34). Similarly, a cross-sectional study conducted in Ghana and Egypt indicated that the highest error rate was detected during intravenous administrations of medications 13.8% and 39.58%, respectively (22, 25). On the other hand in Egypt, the administrations of medication through a wrong route were 19.57% (22). In Ethiopia, a cross-sectional study conducted in two southern hospitals indicated that administration of a medication through a wrong route was (40%). From the observed doses, 10.1% of the medications were administered in the wrong route (12).

1.2.3. Wrong dose medication administration

According to a cross-sectional study conducted in South Korea, Iran, and Vietnam 26.8%, 16.8%, and 1.8%, of nurses doesn't give the recommended doses of medication to the patents, respectively (9, 11, 34). An administration of medications with a wrong dosage was also common in Egypt (37.7%). Whereas, in Ghana 1.7% of nurses administered the wrong dose to their patients (22, 25). In Nigeria, the most frequent type of errors nurses had experienced in the last ten years was giving drug overdose (30%) and administering underdose (13.8%) (5). Similarly, in Jimma University pediatrics ward and ICU ward 27.5% and 3.9% of nurses administer the wrong dose of medication to the patients, respectively (26, 27).

1.2.4. Administration of medication to the wrong patient

A prospective observational study conducted in Turkey and Iran showed that 24.7% and 13.8% of nurses were given medication to the wrong patient (11, 31). On the other hand in Egypt, 0.05% of nurses gave medication to the wrong patient (22).

1.2.5. Administrations of the wrong medication

In South Korea, 19.9% of nurses gave wrong medication to the patient. Whereas, in Egypt 0.77% of nurses gave wrong medication to the patients (9, 22).

1.2.6. Wrong documentation

According to a cross-sectional study conducted in Egypt, documentation error was the major type of medication error made by nurses (90.6%) (22). Similarly, a prospective cross-sectional study conducted in Felege Hiwot Referral hospital and two southern hospitals of Ethiopia revealed that documentation error was the most frequently perpetrated type of medication error (87.5%) and (85.4%), respectively (10, 12).

1.2.7. Other types of medication administration errors

The omission of the medication was common medication error in studies done in France (14.0%), Vietnam (2.3%) and Ghana (77.6%) respectively (25, 30, 34). Similarly, unauthorized drug errors were common MAE in France (3.7%) and Ghana (1.9%) respectively (25, 30). On the other hand in Turkey, approximately three-fourths of the nurses (72%) administer some medication to the patient without the order of a physician and (55.3%) of the nurses had administered medication prepared by another nurse (31). A study done in Vietnam and Ghana indicated that nurses prepare medication wrongly to the patient (15.7%) and (0.3%) respectively (25, 34). According to a cross-sectional study conducted in the ICU of Jimma university school of health science, the common types of MAE was omission due to unavailability of the drug (29.0%) and missed doses (18.3%) (27).

2.3. The contributing factors to errors in medication administration

A descriptive cross-sectional study conducted in Turkey aimed to assess factors contributing to medication errors indicated that the primary factor contributing to medication errors was the nurses' having to write an order in place of a physician (70%). The second most frequent factor was an oral order being given to the nurse in a non-emergency situation (53.1%). Following these were physicians not writing the order for medication in time (46.9%), physicians not writing an order for medication (45.3%), physicians not updating medication orders (43.2%) and most physicians writing orders for medication illegibly (40.7%). Medication orders that did not specify the route of administration of the drug were responsible for 34.2% of the contributing factors. Additionally not specifying the time period for the administration of an intravenous fluid contributed to 35.4% of frequently encountered errors. Also, interruption by telephone and a question being asked during medication administration time contribute MAE. While preparing a medication was responsible for 31.3% of errors (31). Another observational study conducted in France showed that medication errors were significantly associated with administration route

(error was higher for administrations by injection (OR versus the oral route: 3.30 [95% CI: 2.01 to 5.44], $p < 0.001$)) and number of patients at OR 1.22 [95% CI: 1.04 to 1.42], $p = 0.013$ under the nurse's care (30).

A cross-sectional study conducted in South Korea to assess factors contributing to medication errors found that, about half (45.5%) of the participants answered the contributing factors of medication administration error is unfamiliarity with the drug. Participants ranked advanced drug preparation and administration without rechecking (45.0%), heavy workload (40.9%), miscommunication while conveying verbal orders (38.2%), miscommunication among clinicians (34.1%), and failure to be alert while checking prescription (33.6%), respectively contributing factors for medication errors (9). A similar study conducted in Iran showed that fatigue caused by excessive work hours and type of shift work were the two most important factors causing MEs among nurses. Being male AOR, 2.16 CI, (1.63, 2.87) and fixed shift work AOR 2.18 CI (1.33, 3.54) were significantly associated with an increased number of MEs made by nurses (11). A prospective study conducted on six wards in two urban public hospitals in Vietnam to determine the prevalence and potential clinical outcome of medication preparation and administration errors, and to identify factors associated with errors indicated that factors associated with medication administration errors were drug characteristics (administration route, complexity of preparation, drug class), and administration time (drug round, day of the week). Nurse experience was not significant (34).

A systematic review to investigate the extent of medication errors and adverse drug events in African Hospitals showed that the major contributing factors for medication errors were individual practitioner factors (fatigue and inadequate knowledge/ training) and environmental factors, such as workplace distraction and high workload (2). A descriptive direct observational study conducted in Egypt indicated that 85% of the observations had at least one error, and the overall MAE rate was 37.68%. All nurses had no training courses on medication administration techniques, and no policies and procedures were made available for them (22).

A cross-sectional study conducted in Nigeria aimed To identify the causes of medication administration errors among nurses showed that exhaustion due to work pressure ($x = 3.38 \pm 0.8$) was the most common cause of MAEs followed by wrong dose calculation with $x = 3.29 \pm 0.8$. Other causes of MAEs mentioned by respondents include poor labeling and packaging, illegible

physician's prescription, distraction, misinterpretation of prescription, confusion between two similar drug names and poor knowledge of drugs (5). A cross-sectional study conducted in Egypt showed that time of shift (day or night), days of the week (weekends or regular work days), the number of shifts per month, elderly and illiterate patients are significantly associated with medication administration error (22). Cross-sectional nonparticipant observational study conducted at Ghana tertiary care hospital adult emergency department aimed to determine the incidence, types, clinical significance, and potential causes of medication administration errors shows that occurrence of MAE was significantly associated with number of patients under the nurse's care ($\chi2 = 26.6$; df = 14; P = 0.022) and patient age ($\chi2 = 0.013$; df = 72; P < 0.001) (25).

A prospective, observation-based, cross-sectional study conducted at the Felege Hiwot Referral Hospital inpatient department showed that the factors found to be significantly associated with medication administration errors were, age of the nurses [AOR = 2.9, 95 % CI (1.65, 6.38)], age of the patient [AOR = 2.3, 95 % CI (1.17, 4.62)], nurse's working experience [AOR = 1.7, 95 % CI (1.33, 4.99)], interruption of the nurses at the time of medication administration [AOR = 1.5, 95 % CI (1.14, 3.21)], shift of medication administration [AOR = 3.1, 95 % CI (1.38, 9.66)], nurse to patient ratio of 7–10 [AOR = 1.6, 95 % CI (1.44, 3.19)] and nurse to patient ratio greater than 10 [AOR = 1.5, 95 % CI (1.38, 3.89)] were found to be significantly associated with medication administration error at p-value of ≤0.05 (10).

An institution-based, cross-sectional study conducted in two public hospitals in Southern Ethiopia indicated that lack of sufficient training (68.5%), inadequate staffing (66.9%), and distraction (50.8%) were the three most common factors for the MAEs mentioned by nurses. Factors like looking-like drugs (AOR= 10.661, 95% CI: 1.808, 62.869) and distraction (AOR = 5.615, 95% CI: 1.713, 18.403) were significantly associated with the MAEs at a p-value of ≤0.05 (12).

2.4. Medication administration error reporting

A study conducted in Turkey indicates that majority of the nurses (88.9%) stated that they had not made medication errors in the past 6 months, but 11.1% of nurses stated that they had made such errors. Two-thirds of the nurses 66.7% who stated that they had made medication errors in the previous 6 months said that they had not reported a medication error that they had made in

the past 6 months, 29.6% said that they did not know how such an error should be reported, and only one nurse 3.7% stated that she had reported an error (31).

A cross-sectional study conducted in Iran showed that 55% of nurses reported their MEs. The most important barrier to reporting MEs was a heavy workload due to a high number of patients (3.57±1.03), followed by concerns about the consequence of MEs for patients (3.56±1.04) and concerns about the reaction of the nurse manager to MEs (3.42±1.08) (11). A cross-sectional study conducted in South Korea indicates the Participants reported most of the medication errors resulted in no adverse effects (67.7%), or minimal adverse effect (29.3%). Among respondents who experienced medication errors, approximately half of the participants (47.8%) did not disclose the errors to patients or their families while some participants (38.7%) occasionally informed and only a few participants (13.5%) always informed. The most frequent reasons for failure to report medication errors were fear of being troublemaker (46.7%), lack of awareness of the importance of reporting even minor errors (25.0%), and to cover up for the colleague involved (10.9%) (9).

A quantitative nonexperimental study carried out at University College Hospital Ibadan in Nigeria showed that the most common barrier to reporting MAEs perceived by the nurses was fear of being recognized as incompetent (87.2%) followed by fear of reprimand from those in authority (66.8%) (5).

An institution-based, cross-sectional study conducted in two public hospitals in Southern Ethiopia indicated that only (24.7%) of the respondents reported MAE in the previous 12 months. (12). According to a study conducted in University of Gonder referral hospital, the medication administration error reported by nurses was found to be 29.1 %. Education status, disagreement over time - error definition, administrative reason and fear were factors statistically significant for the refusal of reporting medication administration errors at p-value <0.05. (28).

In summary different literature findings showed that incidents during medication administration are high and the degree of error reporting is low. Most of the literature recommended that attention should be given to patient safety by the national health policy and emphasis should be given to reduce medication administration error and improve patient safety.

2.5. Conceptual framework

Concepts that are directly and indirectly related to the major variables of the study adapted from the literature reviews (2, 4, 5, 9-12, 25, 30, 31).

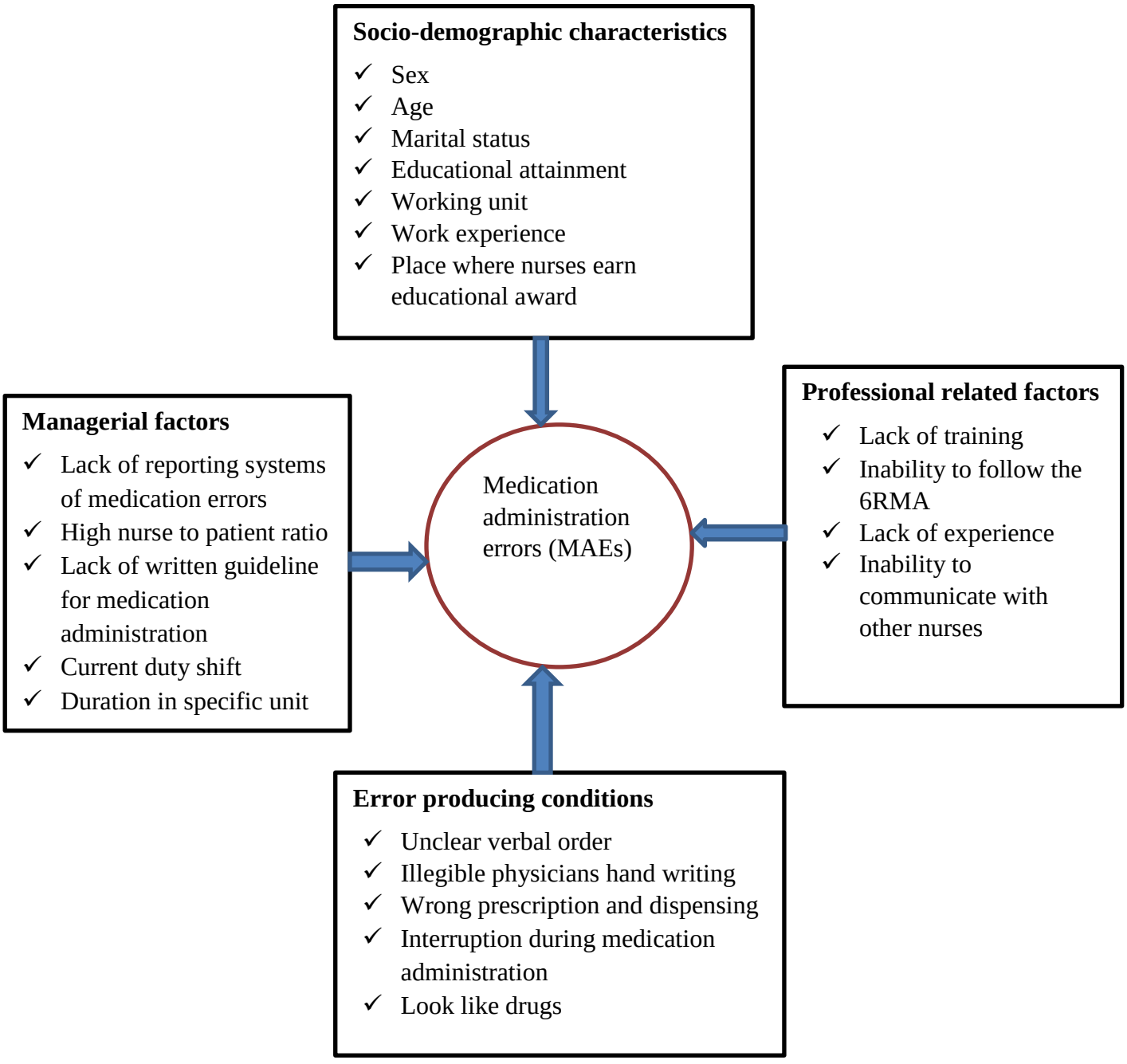

Figure 1: Diagrammatic representation developed to show interactions between the dependent and independent variables

3. JUSTIFICATION OF THE STUDY

Medication errors are accounted to be the most common cause of disability and death throughout the world. Medication administration errors can prolong patient's hospital stay resulting in increased healthcare cost for the patients, families, and health professional. Nurses play a pivotal role in the reduction and interruption of the occurrence of medication administration errors.

There are two studies conducted in Felege Hiwot referral hospital and two southern public hospitals in Ethiopia to assess the magnitude and contributing factors of MAE similar with this title (10, 12). However, this study was conducted in Addis Ababa tertiary care hospitals. These hospitals have a high number of patient flows with complicated health problems and health professionals prescribe multiple drugs. Hence; nurses are prone to medication administration errors because of administering those multiple drugs in a single patient.

As far as the researcher's knowledge the magnitude of medication administration error and contributing factors in Addis Ababa tertiary care hospitals is unknown. Therefore this study assessed the prevalence, types and contributing factors of medication administration errors in Addis Ababa tertiary care hospitals. Understandings of the magnitude and contributing factors to medication errors are important to improve patient safety, stimulate improvements in medication administration practice, and to identify areas where the medication administration is practiced and required improvement to reduce the incidence of medication errors.

4. SIGNIFICANCE OF THE STUDY

Medication errors especially the administration phase errors reveal weaknesses in the process of nursing care. Provision of quality services at all times is one of the core values of the nursing profession, therefore understanding the prevalence and contributing factors of MAEs among nurses is an essential first step to ensure patient safety and administer medications appropriately. The finding might be alarming for nurses to put their effort into updating the existed knowledge and skills of medication administration through reading or taking training.

The individual patient and the community might be benefited from improved quality of nursing care. When nurses administer medication based on the standards the patient's hospital stay and cost associated with MAEs would be minimized.

The findings of this study may benefit the policy makers to develop appropriate policies, plans and intervention programs for the minimizations of medication errors through understandings of the root causes of MAEs. The finding of this study will also help to influence the higher educational institutions to revise nursing curriculum in order to give emphasis on safe medication administration.

Lastly, the findings of this study could serve as a reference and guide for other researchers who want to study about on medication administration errors and contributing factors.

5. OBJECTIVES OF THE STUDY

5.1. General objective:

To assess the magnitude and contributing factors of medication administration error among nurses in Addis Ababa tertiary care hospitals, Addis Ababa, Ethiopia, 2018.

5.2. Specific objectives:

- ✓ To assess the magnitude of medication administration error in Addis Ababa tertiary hospitals
- ✓ To identify the factors associated with medication administration errors in Addis Ababa tertiary hospitals

6. METHODS AND MATERIALS

6.1. Study area and period

This study was conducted in tertiary care hospitals from February to March 2018 in Addis Ababa, Ethiopia. The tertiary hospital is a hospital that provides tertiary care, which is health care from specialists in a large hospital after referral from primary and secondary care hospitals (38). Addis Ababa is the capital city of Ethiopia, which holds 13 government hospitals (5 federal, 6 under Addis Ababa health bureau, 1 owned by the police force and 1owened by armed force) distributed throughout 10 sub-cities. According to food, medicine and healthcare administration and control (FMHACA), 2017 report three hospitals namely Tikur Anbesa specialized hospital (TASH), St. Paul's millennium medical college (SPMMC) and Torhayiloch comprehensive specialized hospital provide tertiary care. TASH is the largest referral and teaching hospital in Ethiopia and sees approximately 370,000 –400,000 patients per year. It has 986 Nurses with different qualification (39). SPMMC is the second largest referral and teaching hospital in Ethiopia with an inpatient capacity of more than 700 beds and sees an average of 1200 emergency and outpatient clients daily. The college has 903 nurses with different qualifications (40). Torhayiloch specialized and comprehensive hospital is owned by defense force and has been providing specialized service with 180 nurses (41).

6.2. Study design

A quantitative hospital-based cross-sectional study design was employed.

6.3. Population

6.3.1 Target population: All nurses working in Addis Ababa tertiary care hospitals.

6.3.2 Study population: those randomly selected nurses.

6.4. Eligibility criteria

6.4.1 Inclusion criteria: All nurses who have a minimum of diploma qualifications in nursing, a minimum of one-year work experience and provide direct patient care were involved in the study.

6.4.2 Exclusion criteria: All nurses who were on annual leave, maternal leave and seriously ill at the time of the study. Attending external training courses off-site during the period of the study.

6.5. Sample Size Determination

The single population proportion formula was used to determine the sample size with the following assumptions: The estimated proportion of medication administration error among nurses is 71% (12), the margin of error 5%, confidence interval 95% and non-response rate 10%. The required sample size (n) was calculated as follows:

$$n = \frac{z\left(\frac{\alpha}{2}\right) 2 * P(1-p)}{d^2}$$

Where

n- Minimum sample size

P-Estimated proportion of medication administration error (71%)

d-the margin of sampling error tolerated (5%)

$Z_{\alpha/2}$- is the standard normal distribution at 1-α% confidence level (95%=1.96)

$$\mathbf{n} = \frac{(\mathbf{1.96})^2 * \mathbf{0.71}(\mathbf{1}-\mathbf{0.71})}{\mathbf{0.05^2}} = \mathbf{317}$$

Using correction formula

- Correction for finite population <10,000, N=2069

$$nf = \frac{no}{1 + no/N}$$

$$nf = \frac{317}{1 + 317/2069} = \mathbf{275}$$

By adding the 10% non-response rate the total sample size was **303.**

6.6. Sampling procedure

To select 303 nurses from the total three Addis Ababa tertiary care hospitals, all hospitals were listed down with their respective nurse number, and then the number of nurses in each hospital were proportionally allocated to sample size; then the sampling frame was prepared for each hospital by having lists of nurses from the hospital nursing directors and the human resource management and finally the study subjects of each hospital were selected by using simple random sampling technique.

Based on proportional allocation formula the total sample sizes (303) were allocated to the three tertiary hospitals.

$$nj = \frac{nxNj}{N}$$

Where

nj=is the sample size of the j^{th} hospital

Nj=is population size of the j^{th} hospital

n= n1+ n2+n3 is the total sample size (303)

N=N1+N2+N3 is total population size of hospitals (2069)

Tikur Anbesa Specialized hospital =303*986/2069 = **145**

St. Paul's medical millennium college = 303*903/2069 = **132**

Torhayiloch comprehensive specialized hospital = 303*180/2069 = **26**

The observational data were collected by observing nurses continuously for 48 hours during medication administration to the patients in medical, surgical and emergency department.

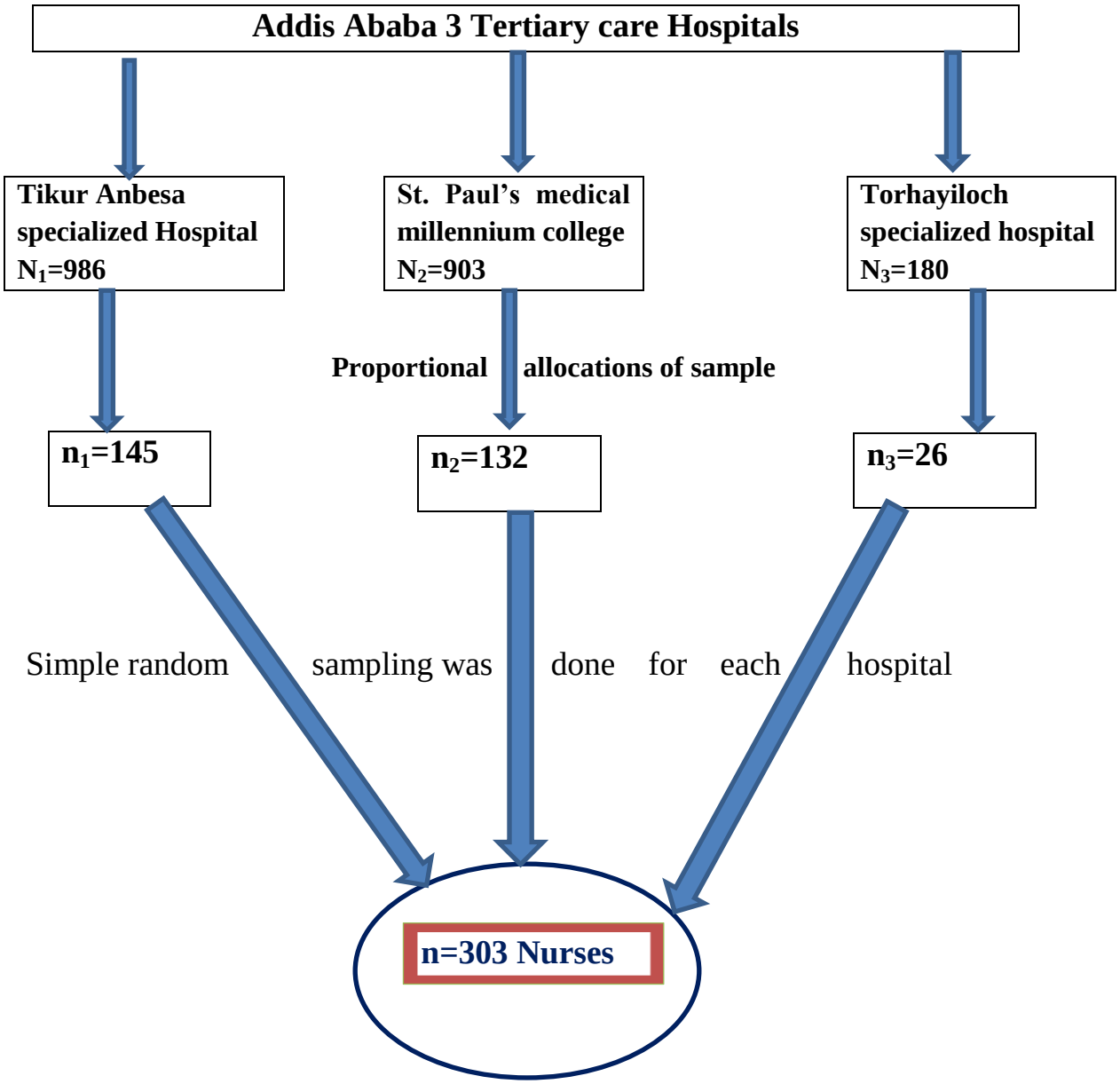

Figure 2: Schematic representation of sampling procedure in Addis Ababa tertiary care hospitals, 2018.

6.7. Study variables

6.7.1. Independent variable

- ✓ **Socio-demographic characteristics**: sex, age, marital status, educational status, working unit, year of experience and place where nurse earn educational award.
- ✓ **Managerial factors:** shortage of nurses, lack of written guideline for medication administration, lack of reporting mechanism to medication errors, duration in specific unit and current duty shift.
- ✓ **Error producing conditions:** unclear verbal order, illegible physicians hand writing, wrong prescription and dispensing, interruption during medication administration and look like drugs.
- ✓ **Professional related factors:** lack of adequate training inability to follow the six rights of medication administration, lack of experience and inability to communicate with other nurses

6.7.2. Dependent variable

- ✓ Medication administration error

6.8. Operational definition

Medication administration Error: A medication error (time, patient, medication, dose, route, and documentation errors) that occurs at the time of administering medication to the patient by the nurse.

Wrong medication: Medication administered to the patients that were not on the patient's medication chart.

Wrong dose error: Medication dose or quantity different from that of the standard dose.

Wrong time error: Administration of medications 30 minutes earlier or later from its scheduled administration time.

Wrong route error: The actual route of medication administration differs from the recommended route of medication administration.

Wrong patient: Patient misidentification during medication administration.

Wrong drug preparation: Drug product incorrectly formulated or manipulated before administration.

Documentation error: Medication that is administered to the patient but incorrectly and incompletely documented in medication administration record sheet, and there is a mismatch between what is being documented and administered (10, 25).

6.9. Data collection instruments, procedures, and personnel

Data were collected using a self-administered structured questionnaire that is adopted from a questionnaire developed by a previous study (12). The questionnaire contains 43 questions arranged into five sections; the first section contains five questions regarding the socio-demographic characteristics of the participants, the second section contains nine questions regarding the work-related questions of nurses. The third section contains seven questions regarding the prevalence of MAE and medication error reporting trends of nurses, the fourth section contains ten questions regarding the types of MAEs, and the final section contains twelve questions regarding contributing factors of MAEs.

An observational checklist was adopted from the previous studies (10, 12). It contained eight components. The observational checklist was used to gather data by observing nurses while medicating patients to assess whether they follow the six rights of medication administration or not. The questions were designed to elicit a 'yes' or 'no' response depending on the degree of nurses' adherence to the six rights of medication administration during the process of a medication administration.

The self-administered questionnaire and observational checklist were tested with pretest by taking 5% of the sample size and 20 doses prior to main data collection time at Yekatit 12 hospital, which is not included in the study. Amendments on the instrument, such as unclear questions, and ambiguous words were made accordingly. The pretest was also used to see how much time it takes to administer the entire questionnaire.

The self-administered questionnaire was collected with the help of five trained Diploma nurse data collectors and three BSc Nurse Supervisors. The written guideline was given to administrator of the questionnaire to assure that every nurse received the same directions and information. The anonymity of the participant was kept by informing them not to write their name. The instruments were distributed among the study population, after guarantying their willingness to take part in the study, and then it was collected by the data collectors after

completion. The observational data were collected using the observational checklist by the eight Diploma nurses' data collectors and three BSc nurse supervisors. Data collectors filled the observational checklist by directly observing the nurses during medication administration. It includes all routes of medication administration and the observation was conducted continuously for 48 hours.

6.10. Data Quality Assurance

In order to assure the quality of data, the following measures were undertaken. The questionnaire was adopted from the previous study. Cronbach's alpha coefficient of the questionnaire was 0.84. The content validity index of the questionnaire was 0.86 (12). The observational checklist was also adopted from the previous studies (10, 12). Furthermore, the tools were revised by four experts (two clinical nurses and two nurse academics) to check for their validity.

Two weeks before the actual data collection the questionnaire and the observational checklist were tested at Yekatit 12 hospital. Data collectors and supervisors were recruited based on their experience in research and trained for one day on the objective of the study, instrument and data collection procedures by the principal investigator. Data collectors were instructed to check the completeness of the instrument just after its completion. The supervisors were checking the questionnaire for completeness and closely supervise data collectors. Moreover, the collected data were coded, cleaned and explored before analysis.

To avoid bias the data collectors never informed the nurse medicating patients that he or she was under observation. The observers were recruited from hospitals other than those under study; the observers did not take part in the self- administered questionnaire. Data collectors checked the completeness of the checklist immediately after observation and finally, it was checked by the principal investigator and supervisors. Two times revisiting were done if the respondents are not found in the first and second visit. The other means ensure the quality of data was data collection method triangulation: the data were collected using different approaches (i.e. by self-administered questionnaire and by observation).

6.11. Data entry, analysis, and presentation

Data were checked for its completeness every day. The collected data were coded and entered into Epi Data version 4.2 and exported to SPSS Version 24 statistical software package for cleaning and analysis. To explain the study population in relation to relevant variables, descriptive statistics such as frequencies, and percentages were calculated. In addition, the cross-tabulation was computed using dependent and independent variables. To see the relative effect of independent variable on the dependent variable, bivariate and multivariate logistic regression analysis was carried out. The adjusted odds ratio was used to interpret the strength of association at 95% CI. A statistical test of association was considered significant at a p-value of <0.05. The result was presented in the form of figures, tables, graphs, and charts.

6.12. Ethical consideration

A formal letter of ethical clearance and approval was obtained from an institutional review board of Addis Ababa University (IRB-AAU), college of health sciences, school of nursing and midwifery research committee and other responsible bodies. The official letter was submitted to respective hospitals. Then a letter of permission was secured from administrative bodies of the area to communicate with relevant bodies at the hospital. All of the study participants were informed about the purpose of the survey, about their right to participate or to terminate at any time if they want and respondents were ensured about the confidentiality of information obtained. Verbal consent of respondent was obtained by asking whether they participate or not. The respondents were not requested to write their name, to answer the questions alone and by assuring individual response were not reported. The observational study was conducted after the administrators of the hospitals give their consent to do so.

6.13. Dissemination plan

The study findings will be disseminated to Addis Ababa University College of Health Sciences library and those hospitals included in the study. Finally, efforts will be made to be reviewed in a reputable national and international journal for dissemination worldwide and also be presented in different conferences.

7. RESULT

7.1. Nurses' socio-demographic characteristics

A total of 298 nurses participated in this study, with 98.3% response rate. The socio-demographic profile of nurse population showed that majority 198 (66.4%) of respondents were female. On the other hand, 217 (72.8%) of respondents were single. The mean age of the respondent was 27.2 ±5.1 SD years (range from 20 to 56). With regard to the educational level majority of the respondents, 260 (87.2%) were BSc nurse and 25 (8.4%) were diploma nurses (Table 1). A total of 225 doses of medications were also observed over a period of 48 hours (Table 3).

Table 1: Socio-demographic characteristics of nurses in tertiary hospitals, Addis Ababa, Ethiopia, 2018

No.	Variables	Response	Frequency (n=298)	Percentage (100)
1	Age	20-24 years	98	32.9
		25-29 years	146	49
		30-34 years	28	9.4
		≥35 years	26	8.7
		Mean =27.2 years, SD =5.1		
2	Sex	Female	198	66.4
		Male	100	33.6
3	Marital status	Single	217	72.8
		Married	79	26.5
		Others*	2	0.7
4	Educational status	Diploma nurse	25	8.4
		BSc nurse	260	87.2
		MSc nurse	13	4.4
5	Educational award from	Government institution	168	56.4
		Private institution	130	43.6

Others* = divorced and separated

7.2 Work-related nurse characteristics

The median work experience of respondent was 2 (ranges from 1 to 33). And most of them were working in inpatient department. Concerning to duty shift, 114 (38.3%) of the respondents were working in the day duty shift and majority 244 (81.9%) of nurses working more than five months in their Unit. Regarding the use of guideline 166 (55.7%) of nurses had medication administration guidelines. Among the respondents, 185(62.1%) doesn't took training on safe medication administration practice. Majority 250 (83.9%) of the participants communicate with other nurses when faced doubt during medication administration and 161(54%) of nurses faced interruption during medication administration (Table 2).

Table 2 Work-related characteristics of nurses in tertiary hospitals, Addis Ababa, Ethiopia, 2018

No.	Variables	Response	Frequency (n=298)	Percentage (100%)
1	Work experience	< 10 years	269	90.3
		≥ 10 years	29	9.7
		Median= 2		
2	Working unit	Medical ward	73	24.5
		Surgical ward	58	19.5
		Pediatrics ward	45	15.1
		Oby/gyni ward	21	7.0
		Emergency	40	13.4
		ICU	45	15.1
		OPD	11	3.7
		Others*	5	1.7
3	Duration in the present unit	≤ 3 month	28	9.4
		4-5 month	26	8.7
		≥ 6 month	244	81.9
4	Duty shift	Day shift	114	38.3
		Night shift	79	26.5
		Alternative shift	105	35.2
5	Nurse to patient ratio	1-6	72	24.2
		7-10	106	35.6
		>10	120	40.3
6	Take training in MA practice	Yes	113	37.9
		No	185	62.1
7	Have guideline for MA	Yes	166	55.7
		No	132	44.3
8	Faced interruption during MA	Yes	161	54
		No	137	46
9	Communicate with another nurse when faced doubt	Yes	250	83.9
		No	48	16.1

Others* = Oncology ward

7.3. Prevalence and types of medication administration error

From the total 298 study participants, 203 (68.1%) nurses made MAE in the last 12 months. Among this 119 (58.6%) of participants made it two or three times during the specified period, while 77 (37.9%) of them made it only one time (Figure 3). The majority (83.6%) of the participants did not report MAE in the last 12 months (Figure 4).

Regarding on the type of MAEs wrong time (57.8%) was the most frequent one, followed by wrong documentation (24.8%), wrong dose (22.5%), wrong route (18.5%), wrong drug (11.7%), and wrong patient (8.7%) respectively (Figure 5). From the total dosage errors overdose accounts 34 (50.7%) (Figure 6).

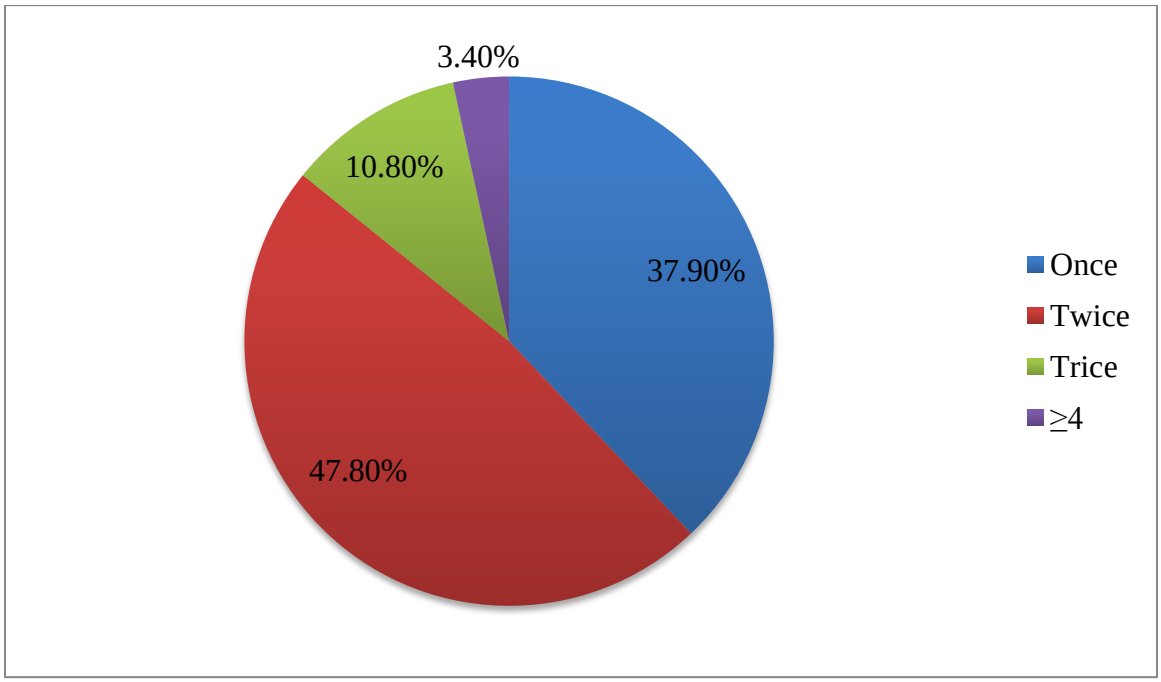

Figure 3: Frequency of medication administration errors in tertiary hospitals, Addis Ababa, Ethiopia, 2018 (n =203).

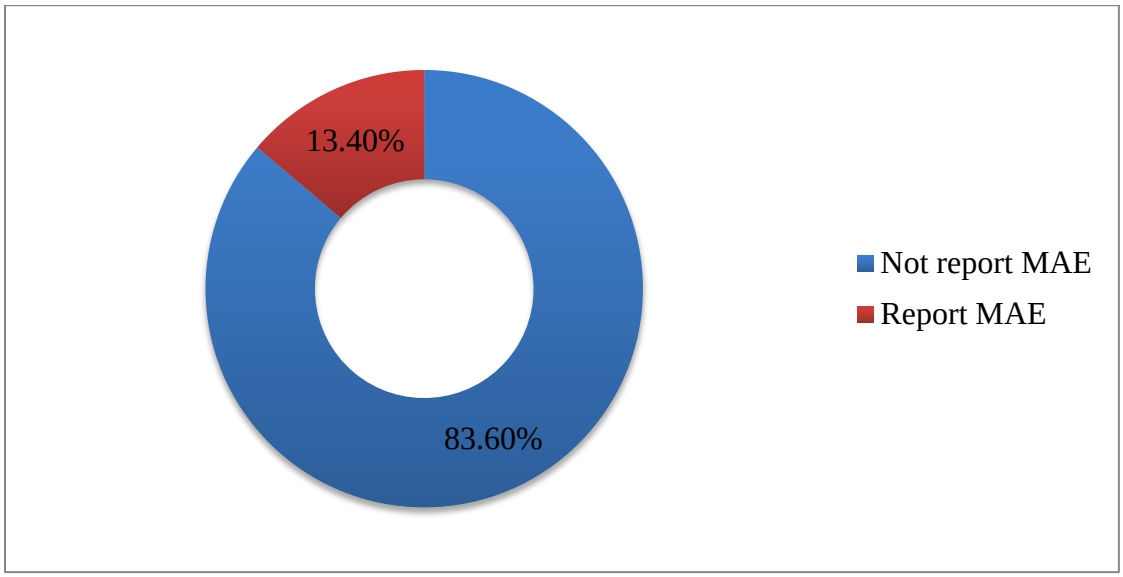

Figure 4: Medication administration error reporting in tertiary hospitals Addis Ababa Ethiopia, 2018. (n=298)

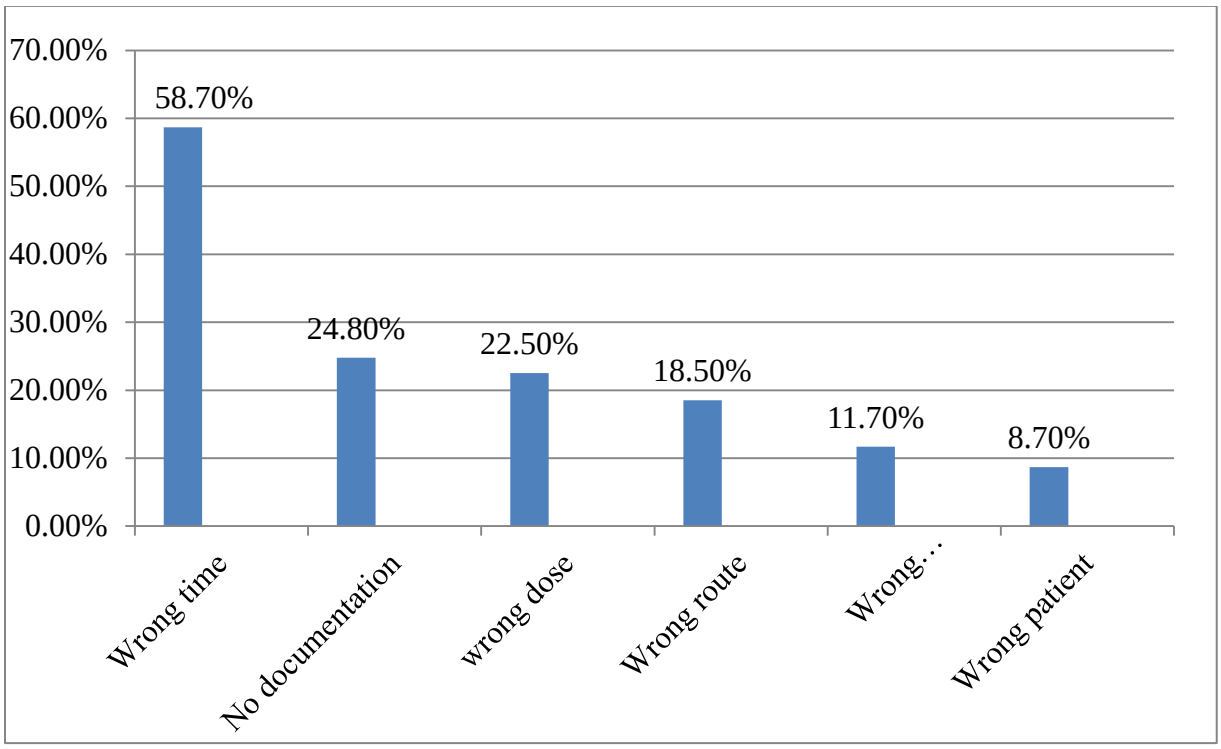

Figure 5: Types of medication administration errors in tertiary hospitals, Addis Ababa, Ethiopia, 2018 (n = 298).

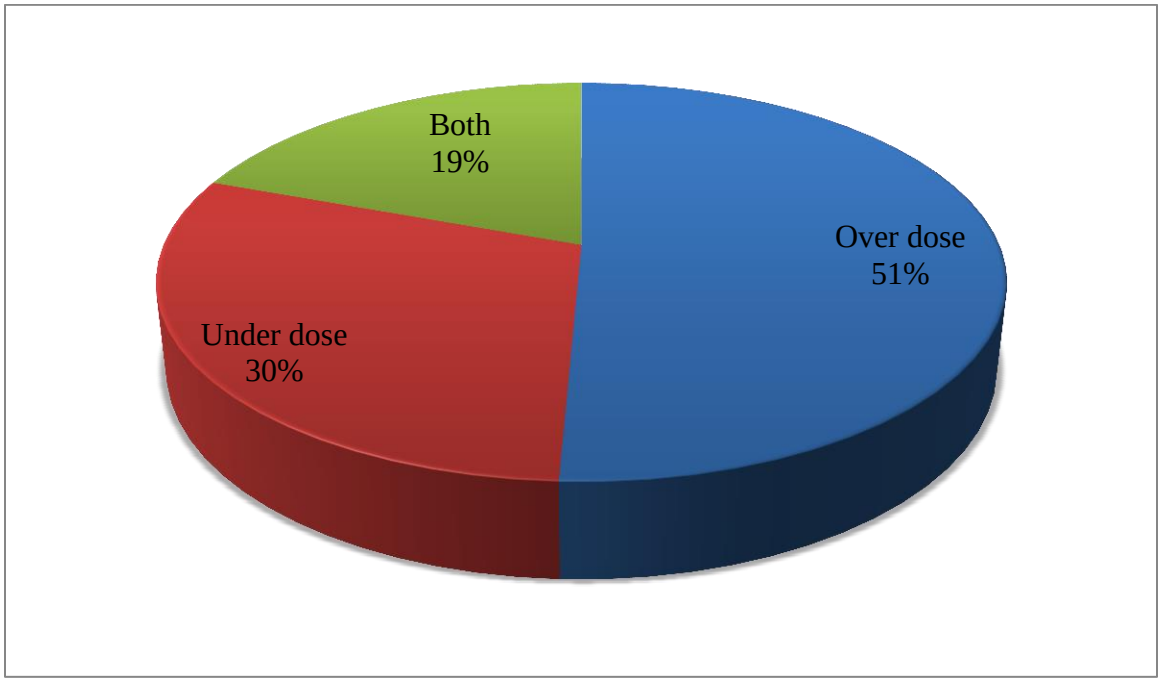

Figure 6: types of dose errors in tertiary hospitals, Addis Ababa, Ethiopia, 2018 (n=67)

7.4. Observational checklist result

To triangulate the result of self-administered questionnaire, observational data were collected by observing nurses during medication administration continuously for 48 hours. The single medication administered by a nurse was considered as a single dose and totally 225 doses of medications were observed. The result showed that only nine (4%) of the 225 directly observed doses of medication were administered without any breach in any of the six rights of medication administration. Additionally more than half of the administered medications and patient's condition were not documented on the patient chart (48%) (Table 3).

Table 3: Through direct observation the level of adherence to the six rights of medication administration in tertiary hospitals, Addis Ababa, Ethiopia, 2018 (n =225 doses).

No.	Variable	Response	Frequency (n=225)	Percentage (100%)
1	Wash hands/ hand rub before the procedure	Yes	54	24.0
		No	171	76.0
2	Wear/ change glove	Yes	131	58.2
		No	94	41.8
3	Give medication to the right patient	Yes	191	84.9
		No	34	15.1
4	Administer the right medication	Yes	188	83.6
		No	37	16.4
5	Administer the right dose	Yes	173	76.9
		No	52	23.1
6	Administer through right route	Yes	193	85.8
		No	32	14.2
7	Administer medication at the right time	Yes	147	65.3
		No	78	34.7
8	Document necessary information	Yes	108	48
		No	117	52
9	Distractors	Yes	60	26.7
		No	165	73.3

7.5. Factors contributing to medication administration error

The participants were asked to list their perceived possible contributing factors to the MAEs. Accordingly, inadequate staffing (84.9%), a lack of sufficient training (81.9%), and interruption during medication administration (68.8%) were the three most commonly listed contributing factors for the MAEs (Table 4).

Table 4: Factors contributing to medication administration errors in tertiary hospitals, Addis Ababa, Ethiopia, 2018 (n = 298).

No.	Variable	Response	Frequency (n=298)	Percentage (100%)
1	Lack of sufficient training	Yes	244	81.9
		No	54	18.1
2	Lack of experience	Yes	200	67.1
		No	98	32.9
3	Insufficient staffing (work load)	Yes	253	84.9
		No	45	15.1
4	Failure to follow the 6RMAs	Yes	183	61.4
		No	115	38.6
5	Look like/ sound like drugs	Yes	152	51.0
		No	146	49.0
6	Wrong prescription	Yes	132	44.3
		No	166	55.7
7	Unclear verbal order	Yes	148	49.7
		No	150	50.3
8	Illegible handwriting by prescribers	Yes	193	64.8
		No	105	35.2
9	Wrong dispensing	Yes	144	48.3
		No	154	51.7
10	Interruption during medication administration	Yes	205	68.8
		No	93	31.2
11	Nurses write a prescription in place of physicians	Yes	58	19.5
		No	240	80.5

7.6. Factors associated with medication administration error

Binary logistic regression was done to identify factors associated with medication administration errors. Nurses work experiences, age, availability of guideline, take training, faced interruption during MA, duty shift and Educational award had an association with medication administration error in bivariate logistic regression analysis. All variables that have an association with the outcome variables in bivariate logistic regression analyses were included in the multivariate logistic regression analysis models. In multivariable logistic regression analysis factors that were significantly associated with MAEs were work experiences, availability of guideline for MA, take training, interruption during MA and Night shift.

The odds of MAE are two times higher among nurses without guideline for MA than among nurses with guideline for MA [AOR=2.07; 95% CI (1.06, 4.06)]. Similarly, the odds of MAE are three times higher among nurses who hadn't taking training on safe medication administration than among nurses who had taking training on safe medication administration [AOR=3.16; 95% CI (1.67, 6)]. Additionally nurses interrupted during medication administration were doing MAE 2.4 odds than those nurses who doesn't interrupted during medication administration [AOR = 2.42, 95 % CI (1.3, 4.49)]. Nurses work experience was also one of the strong predictors of MAEs. Nurses with work experiences below 10 years were doing MAE with 6.48 odds than those nurses who have greater than nine years work experiences [AOR = 6.48; 95 % CI (1.32, 31.78)]. Finally, the odds of MAE are five times higher among nurses administering medication during night time than among nurses administering medication during the day time [AOR = 5, 95 % CI (1.82, 13.78)] (Table 5).

Table 5: Bivariate and multivariable logistic regression analysis of factors associated with MAE in tertiary hospitals, Addis Ababa, Ethiopia, 2018

Variables	Medication administration error		Bivariate logistic regression	Multivariate logistic Regression
	Yes	No	COR [95%CI]	AOR [95%CI]
Age				
20-24 years	77(37.9%)	21(22.1%)	5[2-12.49]	0.57[0.1-3.3]
25-29 years	99(48.8%)	47(49.5%)	2.87[1.22-6.73]	0.35[0.06-1.95]
30-34 years	16(7.9%)	12(12.6%)	1.8[0.62-5.35]	0.41[0.08-2.09]
≥ 35 years	11(5.4%)	15(15.8%)	1.000	1.000
Educational award from				
Gov't institution	106(52.2%)	62(65.3%)	1.000	1.000
Private institution	97 (47.8%)	33(34.7%)	1.7[1.04-2.85]	1.37[0.73-2.6]
Work experience				
<10 years	193(95.1%)	76(80%)	4.8[2.15-10.85]	**6.48[1.32-31.78]***
≥10 years	10(4.9%)	19(20%)	1.000	1.000
Duration in the specific unit				
≤3 month	22(10.8%)	6(6.3%)	1.7[0.66-4.34]	1.57[0.55-4.54]
4-5 month	14(6.9%)	12(12.6%)	0.54[0.24-1.22]	0.54[0.2-1.48]
≥6 month	167(82.3%)	77(81.1%)	1.000	1.000
Duty shift				
Day shift	56(27.6%)	48(50.5%)	1.000	
Night shift	73(36%)	6(6.3%)	10.4[4.17-26.1]	**5[1.82-13.78]****
Alternate shift	74(36.4%)	41(43.2%)	1.54[0.9-2.66]	1.47[0.78-2.76]
Took training				
Yes	56(27.6%)	57(60%)	1.000	1.000
No	147(72.4%)	38(40%)	3.9[2.35-6.57]	**3.16[1.67-6]*****
Have guideline				
Yes	96(47.3%)	70(73.7%)	1.000	1.000
No	107(52.7%)	25(26.3%)	3.1[1.83-5.32]	**2.07[1.06-4.06]***
Faced interruption				
Yes	124(61.1%)	37(39%)	2.46[1.49-4.05]	**2.42[1.3-4.49]****
No	79(38.9%)	58(61%)	1.000	1.000
Communicate				
Yes	165(81.3%)	85(89.5%)	1.000	1.000
No	38(18.7%)	10(10.5%)	1.96[0.93-4.12]	1.85[0.72-4.77]
Report error				
Yes	38(18.7%)	11(11.6%)	1.000	1.000
No	165(81.3%)	84(88.4%)	0.57[0.27-1.67]	0.68[0.29-1.57]

NB: variables having a P value ≤0.2 in bivariate analysis included in the multivariable analysis.

*Statistically significant at p-value <0.05

** Significant at p-value < 0.01

*** Significant at p-value <0.001

8. DISCUSSION

One of the strategies to safeguard patient's safety and improve the quality of nursing care is the proper administration of medications. However, the finding of this study showed that the magnitude of medication administration error was high in Addis Ababa tertiary hospitals, which was 68.1%. More than half of medication errors occurred during administrations of medication and nurses are the front line for the administrations of medication (36).

The prevalence of MAE in this self-reported study is relatively consistent with studies conducted in Iran teaching hospital (68.5%), Indian tertiary hospital (68.5%), three university hospitals of South Korea (69.6%), and a study review conducted in Iran (70%) (24, 32, 33, 35). On the other hand, the result of this finding was higher than those studies conducted in Turkey state hospital (61.7%) and a systematic review conducted in England (54.4%) (3, 31). This difference might be due to a difference in the number of hospitals and number of researched clinical departments, in which some of the above studies were conducted in a single hospital and some studies were conducted in the single department. Furthermore, the above studies were conducted in developed countries, in which computerized prescribing and recording system, high quality of health care institutions, voluntary error reporting and follow up are conducted.

The result of this study is higher than a study conducted in Felege Hiwot referral hospital inpatient department, which was 56.4% (10). The plausible justification for the difference might be the variation in the number of hospitals and researched clinical units. The above study was conducted in a single hospital inpatient department only. Additionally, the previous study used convenient sampling technique. However, the finding of this study is slightly lower than a study done in two public hospitals of southern Ethiopia (71%) (12). The possible explanation for this difference might be due to variation in the number and type of hospitals. The previous study was conducted in the two southern Ethiopia public hospitals. Additionally, there is a difference in sample size.

In this study, a total of 225 doses of medication administrations were observed. From those, 96% of the administered medication experienced at least one MAE. This finding is relatively consistent with studies conducted in Felege Hiwot referral hospital (98.1%) and two public hospitals in southern Ethiopia (99.7%) (10, 12). On the other hand, the result of this study is

three folds higher than a study conducted in the emergency department of Accra tertiary hospital (27.2%) and more than two folds higher than a study conducted in the medical ward of Ain Shames university hospital of Egypt (37.8%) (22, 25). The difference might be due to variation in the study settings, in which the above studies conducted in a single hospital and in a single department. However, this study was conducted in three hospitals of the entire ward.

This study revealed that magnitude of MAEs was considerably high in Addis Ababa tertiary hospitals. This indicates that the quality of nursing care in relation to medication administration did not appear to be up to the standard. The safety of the patient during medication administration was poorly maintained. This increased magnitude of medication administration errors are likely to result in harming the patient and may erode public trust in nursing care. Several studies and systematic reviews around the world in different countries reported likewise high magnitude of MAEs (2, 3, 7, 23).

The findings of both types of study showed that MAEs were a common health problem in the hospitals under study. The magnitude of MAE in self-reported study and observational study was 68.1% and 96% respectively. This result indicated that some participants made MAE but not report in the self-reported questionnaire. Similarly in this self-reported study 83.6% of nurses were not report medication errors to the concerned body. Furthermore different literatures also showed that majority of the medication errors were not reported (12, 28, 31)

Wrong time error (58.7%) was the most frequent type of MAE detected in this study. This finding indicates that more than half of the medications were not administered at their regular scheduled time. When medications are not administered at the regularly scheduled time the patient may develop toxicities or resistance to the drugs. The finding of this study was similar to a study done in two southern Ethiopia hospitals (58.5%) (12). However, it was much lower than a study conducted in France (72.6%) (30). The difference likely to be due to the difference in the study setting (the previous study was conducted in a specified ward, while this study was conducted in all clinical departments of three hospitals). Additionally, there was a difference in data collection method. (The above study was collect data only by the observational method. whereas, this study used both observational and self-administered questionnaire).

Participants were asked to list their perceived possible contributing factors to MAEs. Accordingly, Inadequate stuffing (84.9%), lack of sufficient training (81.9%) and interruption during medication administration (68.8%) were the most common contributing factors to MAEs. This result is supported by a systematic review of adverse drug event and medication errors in African hospitals (2). A study conducted in seven hospitals of South Korea reinforce these findings and suggested that keeping up nurses with medication administration training, continuous replenishing of nursing staff and avoid distractors during medication preparation and administration would reduce medication error and improve patient safety (9). Similarly, a study conducted in Nigeria suggested that providing continuous training to nurses on medication preparation and administration could minimize medication errors (5).

Interruption during medication administration, lack of work experience and unavailability of the guideline for medication administration were significantly associated with MAEs. These findings were supported by studies conducted in Ethiopia Felege Hiwot Referral hospital and two public hospitals in southern Ethiopia (10, 12). Similarly a study conducted in Turkey indicated that interruption by telephone and questions being asked during medication administration also contribute to MAEs (31). Medication preparation and administration need concentration. Interruption occurs when a nurse is performing an intervention and before finishing it leads to error. Interruption of these activities may lead to cognitive failure in relation to working memory and attentiveness. Moreover making the environment conducive for nurses prior to preparation and administrations of medication may reduce medication errors. The finding of this study showed that work experiences of nurses were significantly associated with MAEs. Studies conducted in Felege Hiwot Referral hospital and emergency department of southern Iran hospital indicated that there is a significant association between work experience and MAEs (10, 33). Medication administration is one of the nursing practices and improved through experience. When nurses with experience can improve their skill and gain greater knowledge on safe medication administration practice. Moreover experienced nurses are familiar with different medications and procedures.

Lack of training and unavailability of guideline for safe medication administration practice were also significantly associated with medication administration errors. This finding is supported by WHO 2017 medication without harm strategies. In 2017 WHO develops strategies to improve

patient safety through reductions of medication error up to 50% in the next five years (1). From these strategies provide a guideline and strengthen health professionals capacity through skill building are the major ones. On the other hand, a study done in Egypt showed that MAEs was highly prevalent and all nurses had not taken training courses on safe medication administration practices and they haven't policies and procedures for medication administration procedures (22). Providing training is mandatory for medication error reduction because there is the discovery of the new disease, new medication, and new administration techniques. So to combine nursing practice with evidence training may serve as a bridge. Additionally, availability of guideline for medication administration may improve the quality of nursing care and reduce MAEs.

This study showed that medication administration time was significantly associated with MAEs. The odds of MAE are five times higher among nurses administering medication during night time than among nurses administering medication during the day time [AOR = 5, 95 % CI (1.82, 13.78)]. This finding is supported by studies conducted in Felege Hiwot referral hospital of Ethiopia and Ain Shams University hospital of Egypt (10, 22). Nurses during night time may experience sleep deprivation, loss of concentration and exhaustion. Nurses use different strategies like Exercise for 30 minutes, moderate caffeine consumption before night and taking nap to decrease sleep disturbance and increase attention during the night shift.

Reporting medication administration errors are just a tip of the iceberg to reduce medication administration errors. However, the findings of this study indicated that 16.4% of participants reported MAEs. The result of this study is lower than studies conducted in Iran (55%), two public hospitals in southern Ethiopia (24.7%) and University of Gonder referral hospital (29.1%) (11, 12, 28). The difference might be due to fear of blame for the reported errors in the working unit, variation in the administration support and encouragement, a variation of nurses willingness to report errors and variations in the nurse to patient ratio. Additionally, there is a difference in the study setting.

9. STRENGHT AND LIMITATION OF THE STUDY

Strength of the study

- High response rate of study participants (98.3%).
- The data were collected by trained data collectors.
- Simple random sampling method was used to select study participants.
- The data collection tools were standardized from similar previous studies.
- The data were collected by using both self-administered questionnaire and observational checklist (data triangulation).

Limitation of the study

- This study was limited to only tertiary hospitals found in Addis Ababa due to constraints of time and fund. More hospitals were needed for proper generalization with a bigger sample size.
- The other limitation of this study was the cross-sectional nature of the study design does not confirm definitive cause and effect relationship between the variables.
- Finally the study was based on self-reported information and observation that may be prone to reporting bias and observer bias because of the respondent's interpretation of the questionnaire or desire to report their feeling.

10. CONCLUSION AND RECOMMENDATION

10.1. Conclusion

Medication administration error was highly prevalent in Addis Ababa tertiary care hospitals. Administering medication in a wrong time was the most common type of error followed by documentation and dose errors respectively. Distractors, lack of work experience, night shift, unavailability of the guideline and lack of training were significantly associated with MAEs.

10.2. Recommendation

Based on the result of this study more than half of the study participants made MAEs. So the following recommendations are forwarded by the author:

To Ministry of health (MOH):

- In collaboration with hospital managers develop guideline for safe medication administration practice.
- Provide training for nurses on safe medication administration.

To Ethiopian nursing association (ENA):

- The association should regulate and alarm the nursing professionals to practice based on the principles of medication administration.

To Hospital administrator:

- Should retain experienced nursing staff and provide training for newly graduated nurses.
- In collaboration with nurses head should develop strategies to minimize distractors during medication administration; like no talk, make phone switch off, instruct attendants to leave the room etc.
- Should develops guideline for safe medication administration and distribute to all departments.
- Encourage nurses to report when errors are happened and create a system for error reporting.
- Prepares the opportunity for senior nurses to couch and supervise newly graduated nurses during medication administration in a regular interval.
- Strengthening the hospital demonstration room that already initiated by ministry of health, to have a functioning demonstration room in every hospital to provide opportunity of medication administration procedure before going to real patient.

To nurses:

- Should improve their medication administration practice through training and read recent evidence.

To future researchers:

- Further studies are recommended to identify factors that contribute medication administration errors.

11. REFERENCES

1. World health organization global patient saftey. Medication Without Harm. WHO, 2017.
2. Mekonnen AB, Alhawassi TM, McLachlan AJ, Jo-anne EB. Adverse Drug Events and Medication Errors in African Hospitals: A Systematic Review. Drugs-Real World Outcomes. 2017:1-24.
3. Elliott R, Camacho E, Campbell F, Jankovic D, Martyn St James M, Kaltenthaler E, et al. Prevalence and economic burden of medication errors in the NHS in England. Rapid evidence synthesis and economic analysis of the prevalence and burden of medication error in the UK. 2018.
4. Dumo AMB. Factors affecting medication errors among staff nurses: basis in the formulation of medication information guide. IAMURE International Journal Of Health Education. 2012;1(1):88-149.
5. Ojerinde AC, Adejumo P. Factors associated with medication errors among health workers in University College Hospital, Nigeria. Journal of Nursing and Health Science. 2014;3(3):22-23.
6. MERP N. National Coordinating Council for Medication Error Reporting and Prevention (NCC-MERP). Taxonomy of Medication Errors. avilable at: http://wwwnccmerporg/about-medication-errors. october 12, 2017.
7. Alsulami Z, Conroy S, Choonara I. Medication errors in the Middle East countries: a systematic review of the literature. European journal of clinical pharmacology. 2013;69(4):995-1008.
8. Karna K, Sharma S, Inamdar S, Bhandari A. Study and evaluation of medication errors in a tertiary care teaching hospital–a baseline study. Int J Pharm Sci. 2012;4(5):587-593.
9. Kim KS, KWON SH, KIM JA, Cho S. Nurses' perceptions of medication errors and their contributing factors in South Korea. Journal of nursing management. 2011;19(3):346-353.
10. Feleke SA, Mulatu MA, Yesmaw YS. Medication administration error: magnitude and associated factors among nurses in Ethiopia. BMC nursing. 2015;14(1):53.
11. Fathi A, Hajizadeh M, Moradi K, Zandian H, Dezhkameh M, Kazemzadeh S, et al. Medication errors among nurses in teaching hospitals in the west of Iran: what we need to know about prevalence, types, and barriers to reporting. Epidemiology and health. 2017;39.

12. Alemu W, Belachew T, Yimam I. Medication administration errors and contributing factors: A cross sectional study in two public hospitals in Southern Ethiopia. International Journal of Africa Nursing Sciences. 2017;7:68-74.
13. Kozier B. Fundamentals of nursing: concepts, process and practice: Pearson Education; 2010.
14. SERVICES ODOH. Six Rights of Safe Medication Administration. DHS/Safety, health and independence for all Oregonians. 2017.
15. Flynn L, Liang Y, Dickson GL, Xie M, Suh DC. Nurses' practice environments, error interception practices, and inpatient medication errors. Journal of Nursing Scholarship. 2012;44(2):180-186.
16. Ayuk Agbor G. A Literature Review of Medication Errors in the United States of America. 2016.
17. Lee E. Reporting of medication administration errors by nurses in South Korean hospitals. International Journal for Quality in Health Care. 2017;29(5):728-734.
18. Mahajan RP. Medication errors: can we prevent them? British Journal of Anaesthesia 107 (1): 3–5. 2011.
19. SHEET. F. Medical errors: Not just a headline: National partnership for women and families. 2009:1.
20. Cohen. MR. Preventing Medication Errors. The new england journal of medicine. 2007.
21. Yle. Medication errors becoming an epidemic. Available from: http:// ylefi/ uutiset/ medical_errors_becoming_epidemic/6438319Yle. 2013.
22. al Tehewy M, Fahim H, Gad NI, El Gafary M, Rahman SA. Medication Administration Errors in a University Hospital. Journal of patient safety. 2016;12(1):34-39.
23. Dedefo MG, Mitike AH, Angamo MT. Incidence and determinants of medication errors and adverse drug events among hospitalized children in West Ethiopia. BMC pediatrics. 2016;16(1):81.
24. Mansouri A, Ahmadvand A, Hadjibabaie M, Kargar M, Javadi M, Gholami K. Types and severity of medication errors in Iran; a review of the current literature. DARU Journal of Pharmaceutical Sciences. 2013;21(1):49.
25. Franklin Acheampong ARTaBPA. Medication Administration Errors in an Adult Emergency Department of a Tertiary Health Care Facility in Ghana. patient saf. 2015.

26. Feleke Y, Girma B. Medication administration errors involving paediatric in-patients in a hospital in Ethiopia. Tropical Journal of Pharmaceutical Research. 2010;9(4).
27. Agalu A, Ayele Y, Bedada W, Woldie M. Medication administration errors in an intensive care unit in Ethiopia. International archives of medicine. 2012;5(1):15.
28. Bifftu BB, Dachew BA, Tiruneh BT, Beshah DT. Medication administration error reporting and associated factors among nurses working at the University of Gondar referral hospital, Northwest Ethiopia, 2015. BMC nursing. 2016;15(1):43.
29. Keers RN, Williams SD, Cooke J, Ashcroft DM. Prevalence and nature of medication administration errors in health care settings: a systematic review of direct observational evidence. Annals of Pharmacotherapy. 2013;47(2):237-256.
30. Berdot S, Sabatier B, Gillaizeau F, Caruba T, Prognon P, Durieux P. Evaluation of drug administration errors in a teaching hospital. BMC health services research. 2012;12(1):60.
31. Güneş ÜY, Gürlek Ö, Sönmez M. Factors contributing to medication errors in Turkey: nurses' perspectives. Journal of nursing management. 2014;22(3):295-303.
32. You MA, Choe MH, Park GO, Kim SH, Son YJ. Perceptions regarding medication administration errors among hospital staff nurses of South Korea. International Journal for Quality in Health Care. 2015;27(4):276-283.
33. Vazin A, Zamani Z, Hatam N. Frequency of medication errors in an emergency department of a large teaching hospital in southern Iran. Drug, healthcare and patient safety. 2014;6:179.
34. Nguyen HT, Nguyen TD, van den Heuvel ER, Haaijer-Ruskamp FM, Taxis K. Medication errors in Vietnamese hospitals: prevalence, potential outcome and associated factors. PloS one. 2015;10(9):e0138284.
35. Parihar M, Passi GR. Medical errors in pediatric practice. Indian pediatrics. 2008;45(7):586.
36. Pearl C. Kim JJS, Alona D. Angosta, Kaitlyn Frakes, Casey Li. Errors Associated with the Rights of Medication Administration at Hospital Settings. Journal of Hospital and Healthcare Administration. 2018;2018(01).
37. Taufiq S. Prevalence and Causes of Wrong Time Medication Administration Errors: Experience at a Tertiary Care Hospital in Pakistan. Canadian Journal of Nursing Informatics. 2015;10(1-2).

38. WIKIPEDIA. Tertiary referral hospital. Avilable at: https:// enwikipedia org/wiki/ Tertiary_referral_hospital. 2017.
39. Tikur Anbesa specialized Hospital human resource 2017 report. accessed 12/24/2017.
40. st. Paul's hospital medical millenium college. avilable at https; // wwwsphmmceduet. 2017.
41. Torhayiloch specialized and comprehensive hospital nursing director 2017 report. acessed 12/27/2017.

12. ANNEXES

Annex 1. SELF ADMINISTERED QUESTIONNAIRE

ADDIS ABABA UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF NURSING AND MIDWIFERY

Questionnaire prepared to assess the magnitude and contributing factors of medication administration errors among nurses of Addis Ababa tertiary care hospitals, Addis Ababa, Ethiopia.

To the data collector facilitators: Please inform the respondents the aim of the study as described below:

Dear respondents:

There is a study to be conducted in this hospital to assess the magnitude and contributing factors of Medication Administration Errors. Hence there is a need to gather data from professional nurses of this hospital using questionnaire. This questionnaire is only for research purpose. I assure you that confidentiality and anonymity will be fully maintained. To strengthen this you are not expected to write anything such as name, ID, address… that may lead to your identification.

Your participation is purely voluntary, and you can withdraw at any time after you get involved in the study without compromising your right. However, we hope that you will participate in this study since your responses are quite important. If you are willing to take part in the study, you are kindly requested to respond to all questions honestly!

Now, do you agree to participate in the study? Yes _____ No _____.

If you have questions or concerns please contact the principal investigator:

Adam Wondmieneh (BSc nurse)

Tell phone: +251960818824

E-mail: wondmienehadam@gmail.com

Thank you very much for your co-operation!

Data collector name _____ signature _____Date_____

Supervisor name _____ signature _____ Date_____

Hospital Name _____ Questionnaire code _____

Please indicate your response by circling your choice or by writing the appropriate information on the space provided!

1. Socio-demographic characteristics of the nurses

1.1. Age _____in years

1.2. Sex: 1. Female 2. Male

1.3. Marital status: 1. Single 2. Married 3. Widowed 4. Divorced 5. Separated

1.4. Educational status: 1. Diploma Nurse 2. BSc Nurse 3. MSc Nurse

1.5. From where did you earn your educational award?

1. From government institutions 2. From private institutions

2. Work-related questions

2.1. Working experience of the nurse _____ in years.

2.2. Working unit:

1. Medical ward
2. Surgical ward
3. Pediatrics Ward
4. Oby/ Gyne ward
5. Emergency
6. ICU
7. OPD
8. Others (specify_____

2.3. Duration in the specific/present unit _____ in month

2.4. Current duty shift: 1. Day shift 2. Night shift 3. Alternate shift

2.5. On average how many patients do you care per shift? (in number) _____

2.6. Do you take training in medication administration practice? 1. Yes 2. No

2.7. Do you have a guideline for medication administration procedures? 1. Yes 2. No

2.8. Have you ever faced interruption during medication administration? 1. Yes 2. No

2.9. Do you communicate with another nurse when you faced doubt during medication administration? 1. Yes 2. No

3. Prevalence of errors in medication administration and nurses reporting trends of medication administration errors.

3.1. Do you know the six rights of medication administration? 1. Yes 2. No

3.2. Do you think following the 6 Rights in medication administration would avoid errors in medication administration? 1. Yes 2. No

3.3. Have you made any medication administration errors in the last 12 months?

1. Yes 2. No

3.4. If your answer to Question 3.3 is yes how many times?

1. Once 2. Twice 3. Thrice 4. More than three times

3.5. Is there a system for reporting medication administration errors in your hospital?

1. Yes 2. No

3.6. Have you reported medication administration errors in the last 12 months?

1. Yes 2. No

3.7. If your response to question 3.6 is No, what was the reason for not reporting?

1. Fear of reporting 3. Unavailability of a system for reporting
2. Work load 4. Others (specify)_____

4. Types of errors in medication administration

4.1. Have you administered a wrong medication to patients in the last 12 months?

1. Yes 2. No

4.2. Have you administered the wrong dose to patients in the last 12 months? 1. Yes 2. No

4.3. If yes to Question 4.2, its type was/were: 1. Overdose 2. Underdose 3. Both

4.4. Have you administered a medication to wrong patients in the last 12 months?

1. Yes 2. No

4.5. Have you made any error regarding the route of medication administration in the last 12 months? 1. Yes 2. No

4.6. If yes to Question 4.5, which route?

1. Enteral route
2. Parenteral route
3. Topical route
4. Others (specify) _____

4.7. Have you administered medication 30 minutes before or after the ordered time in the last 12 months? 1. Yes 2. No

4.8. Have you document all medications given and conditions of the patient in the last 12 months? 1. Yes 2. No

4.9. Have you made errors during the preparation of medications for administration in the last 12 months? 1. Yes 2. No

4.10. Have you been checking the expiry date of a medication before administration? 1. Yes 2. No

5	**Based on your perception what are the contributing factors for errors in medication administration? (More than one answer is possible.) Is it due to:**	**1. Yes**	**2. No**
	5.1. Lack of sufficient training?		
	5.2. Lack of experience?		
	5.3. Insufficient staffing (workload)?		
	5.4. Failure to follow the 6RMAs?		
	5.5. Look like/ sound like drugs?		
	5.6. Wrong prescription?		
	5.7. Unclear verbal order?		
	5.8. Illegible handwriting by prescribers?		
	5.9. Wrong dispensing?		
	5.10. Interruption during medication administration?		
	5.11. Nurses write a prescription in place of physicians?		
	5.12. Others, specify_____?		

Thank you very much for taking your time to answer this questionnaire!!

Annex2. OBSERVATIONAL CHECKLIST

ADDIS ABABA UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DEPARTMENTS OF NURSING AND MIDWIFERY

A written consent form to be filled by the hospital administrators

There is a study to be conducted in this hospital to assess the magnitude and contributing factors of medication administration errors. The study may have an input on improving the quality of care being given to patients. Hence there is a need to gather data from professional nurses of this hospital through observing while they are administering medications to their patients. The observation is to be conducted for a period of 48 hours for all routes of medication administration. The observation is only for research purpose. I assure you that confidentiality and anonymity will be fully maintained. To strengthen this nurse administering medication to patients are not expected to give any information such as name, ID, address… that may lead to their identification.

Therefore we kindly request your permission to go ahead with the study as it is vital for data collection process! Would you allow the data collection procedure to go ahead?

Yes____ No____

Name _____ Signature_____

Date _____

Thank you for your cooperation!!

Observational checklist for single medication administration

Data collector name _____ signature _____Date_____

Supervisor name _____ signature _____ Date_____

Name of the hospital _____

Ward of Administration _____ Checklist code_____

Shift of medication administration: 1. Day time 2. Night time

S. No	Observation item		Response	
			Yes	No
1	Right patient	Check patient's name with treatment chart and verbally		
		Give medication to the right patient		
2	Right technique	Wash hands/hand rub before the procedure		
		Wear/change gloves		
3	Right Medication	Check the medication label		
		Check the order		
		Check the expiry date		
4	Right Dose	Check the order		
		Calculate the dose and have another nurse calculate the dose as well		
		The right dose administered as ordered		
5	Right route	Check the order and appropriateness of the route ordered		
		Confirm that the patient can take or receive the medication by the ordered route		
		Administer through an appropriate route		
6	Right time	Check the frequency of the ordered medication		
		Double check correctness of the time		
		Confirm when the last dose was given		
		The drug is administered at the right time, that is not ≥ 30 minutes earlier or later		

7	Right documentation	Chart the time, route and any other specific information as necessary		
		Document state of the patient		
8	Distracters	Interruption during drug preparation		
		Interruption during drug administration		

*1. Antibiotics 2. Analgesics 3. Others (specify)_____

**1. IV 2. IM 3. Others(specify)_____