COLLEGE OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF NURSING

ASSESSMENT OF MAGNITUDE AND CONTIRBUTING FACTORS OF MEDICATION ADMINSTRATION ERRORS AMONG NURSES IN GURAGE ZONE SELECTED HOSPITALS, SOUTH, ETHIOPIA, IN, 2020

A RESEARCH THESIS SUBMITTED TO WOLKITE UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCES DEPARTMENT OF NURSING IN PARTIAL FULFILLMENT FOR THE REQUIREMENT OF BACHELOR OF SCIENCES DEGREE IN NURSING

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DECEMBER, 2020

GURAGE,ETHIOPIA

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WOLKITE UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCES DEPARTMENT OF NURSING APPROVAL BY ADVISOR AND DECLARATION BY STUDENTS

By our signature below we declared that the thesis entitled**,** Assessment of Magnitude and Contributing Factors of Medication Administration Errors among Nurses in Gurage zone Selected Hospitals In 2020 submitted in partial fulfillment of the requirements of bachelor of sciences degree in Nursing has been carried out by us, we cite for an article which we use, and a put great effort to avoid pilajarism.

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Under my supervision; I recommend that the students has fulfilled the requirements and hence they can submit the thesis to the department

Name of advisor_____

Signature_____

Date_____

APPROVAL BY THE EXAMINERS

This thesis by Getnet Debalikie, Gemechu Tesfaye, and Kokeb Shiferaw is accepted in its present form by the examiners as satisfying thesis requirement for the bachelor of sciences degree in Nursing.

Examiners

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ABBREVATIONS AND ACRONYMS

AJNS=American Journal of nursing science

AOR=Adjusted odd ratio

BSC=Bachelor of Science

IM =Intramuscular

IV=Intravenous

MAE=Medication administration error

MAER=Medication administration error reporting

ME=Medication error

Po=Per os

SC=Subcutaneous

SNNPR=South nation nationality people's region

SPSS=statistical product service solution

WHO=World health organization

ABSTRACT

Background: inappropriate medication administration practice is the most and preventable cause of patient harm globally; which results in a significant morbidity and mortality to users. Medication administration error is not only affects the health of individual, but also causes them to face extra hospital stay, and extra healthcare costs. As nurses are involved in medication administration they have a great role both in prevention and occurrence of medication administration error.

Objective: To determine the magnitude of medication administration errors and to identify contributing factors among Nurses in Gurage zone Hospitals, in, 2020

Methodology: An institutional based cross sectional study was conducted in Gurage zone Hospitals from December 5 up to December 11 in 2020 on sample of 362 nurses. Study participants were selected using simple random sampling method, and structured self-administered questionnaire was used to collect data. The obtained data was entered into SPSS software version 25, and was analyzed. Binary and multiple logistic regressions were used to determine association independent variables with the outcome variable. Odd ratio with 95% CI was computed to assess the strength of the association, and significant level of association will be declared at a "p" value<0.05.

Result: The magnitude(prevalence) of medication administration error In this study was 81.8% with wrong time 69.6% which is the most prevalent encountered type of medication administration error, and followed by documentation error 35.9%(130), wrong medication 20.2 %(73), wrong route 16%,(58), wrong dose 15.2%((55), and wrong patient 13.3 %(48) in a decreasing order respectively. Variables that were associated with medication were lack

of training AOR 2.97, 95% CI (1.67-5.28), and interruption during medication administration with AOR 2.79, 95% CI (1.57-5.00).

Conclusion and recommendation; The magnitude (prevalence) of medication administration error is high in this study (Gurage zone selected hospitals) which is 81.8% with wrong time is the most type of error occurrence accounting 69.9%.
Lack of training and interruption are the variables which are associated with medication administration error and with AOR 2.97, 95% CI (1.67-5.28), And AOR 2.79, 95% CI (1.57-5.00).

- We recommend Gurage zone health office and hospital administrators to provide training programs, and establish reporting system of MAEs with collaboration of ministry of health.

Key words: Medication administration error, nurse, Gurage zone, Medication administration error reporting

1. INTRODUCTION

1.1. Background

Medication errors (MES) are the most common type of patient harm incident that has a serious emotional impact of being a nurse, who is responsible to provide safe care and prevent harm. MEs pose serious direct and indirect consequences, and mostly result in inefficient health care services (1).

In scientific literature many definition is existed about medication administration error (MAE).

MAE defined by most medical doctor's studies as any amount of medication given to the Patient, that differs from the physician's medication order as written on the patient's chart or as violation from policies, procedures, or effective practices for medication administration (2).

Nurses are in the last hierarchy in safeguarding of patient and are responsible in medication administration, and they use 40% of their time in administering medication. As nurses mostly involved in medication administration most of the MAE attributed by nurses. The common and frequently encountered types of medication administration errors are "wrong dose, wrong time, wrong drug, wrong route, dose omission, documentation error, wrong patient, and technical error (3).

Every activity in providing of nursing care for a patient is a risk for error with some degree of threat to patient safety. The intercollaborative and complex nature of medication administration which makes an error to appear at one, some, or even at all the phases between prescription, and administration. In fact, the frequency of error happening during medication preparation process is 13.4%, and a high of 86.6% observed during the phase of giving medications to patients, however, most of the errors that is happening at the bedside, when the medication is incorrectly administered (4).

Throughout time scientists and health professionals have established guiding principles in order to prevent medication administration errors, and to make it safe. From the widely used principles, are the "six rights" of medication administration, identifying the right patient, selecting the right medication, calculating the right dose, identifying the right route,

administering the medication at the right time, and using the right documentation. If this principle is applied, the six rights could have a great impact in the prevention of most MAEs. The occurrence of MAEs can have a number of causes:" an illegible handwriting, distraction, a high patient-to-nurse ratio, unclear verbal communications, insufficient staffing, inadequate training, nursing incompetence, work overload," etc. (5).

The presence of MAE among nurses is a significant problem, and a potential risk to the wellbeing of the patient. A number of studies conducted around the world, and prevalence of MAE is found to be high still now. Determining the cause of MAE is the best and most useful strategy to prevent and decrease the prevalence of MAE.These causes is mainly determined through medication error reporting, nevertheless, nurses are not motivated to report to the client as well as to their supervisors (3).

1.2. Problem statement

Medication administration errors can result in a serious physical injury and even death to patients; In addition, these avoidable errors could also basis for the occurrence of severe financial, psychological, and emotional problem to the healthcare provider and organization (6).

Medication error (ME) causes at least 1.5 million avoidable adverse drug events across the nations, some of which result in patient harm; like up to 98,000 deaths each year (7).

A systematic literature review which carried out in Iran about medication error also shows that reported prevalence of medication administration errors occurrence holds that it is from 14.3 to 70 % compared to 29.8–47.8 % for prescribing error, 3–33.6 % for dispensing error and from 10 to 51.8 % for transcribing errors (8).

In England the estimated occurrence of medication administration error is 237 million yearly and 66 million of this could be result in clinically significant problem .in this country the cost attributed by ME is 98.5 million pounds annually (9).

A systematic review conducted on medication errors in African hospitals shows that 8.4% of patients claims having faced any suspected adverse drug event at hospital admission, while 2.8% of patients admitted to hospital as a result of adverse drug events, and the mortality associated to adverse drug events is 0.1% (10).

Studies on MAE prevalence and safety have been mostly conducted in developed countries with varying amount incidences of 3.3%, 10%, 19.5% and 22.2% (11). Studies conducted in developing country Nigeria shows that the prevalence of adverse drug event is 10.7%which are presumed to be occurring are like gastro intestinal bleeding, hypoglycemia and epigastric pain that result in prolonged duration of hospital stay, but can be prevented if appropriate measures are taken (12).

In Ethiopia, where there is limited number of educated health professionals, and in contrast with high number of health care receivers, evidence shows that medication error is a common problem which is as high as 68.1%(3).

For example, a research conducted recently indicates that, the incidence of medication administration error is 56.4 % from this, the majority (87.5 %) account for documentation error, followed by technique error 73.1 %, and time error 193 (53.6 %) respectively. Ages, work experience, nurse to patient ratio, giving medication at night shift is found to be linked with medication error (13).

In addition to patient harm MEs has an effect on the healthcare professional in terms of lack of confidence and legal punishments. It has also a great impact on health institution by increasing healthcare costs due to prolonged stay and additional treatment (14).

World health organization (WHO) 2017 report shows that globally, the cost attributed by medication errors has been estimated at 42 billion US Dollars annually. The WHO third global patient safety challenge program set a strategy to decrease severely, preventable MAEs by 50% that is launched in 2017, and extends up to 2022, especially by giving more emphasis on harm results from errors due to weakness in the health system and by improving the medication administration process (15).

In general study findings regarding; cause, magnitude, and reporting of MAE in developing countries including Ethiopia is low. So this study is expected address these problems and used as an input for policy makers, health managers, and for health professionals, in turn it's expected to reduce MAE associated problems .it also used to know how much the problem worse is, and an attention will be given by the concerned bodies.

2. LITERATURE REVIEW

2.1. Magnitude of medication administration errors

In systematic review on prevalence of ME in health care setting identifies different rates of occurrence. The median rate of error was 19.6% of all chances for error with wrong-time errors and 8.0% without timing errors, when each medication administration may be with or without error. The median rate of error more than one error is in a single dose is 25.6% and 20.7% without wrong-time errors. A higher median MAE rate was obtained in intravenous route 53.3% by excluding timing errors than all routes which is (20.1%; 9.0-24.6%) (16).

A systematic review about ME which is conducted in Middle East countries indicates that the prevalence of medication administration errors is occurred with a range of 9.4 % to 80 % of administered medications (17). A study on prevalence and cause of common medication administration in nursing in Iran showed that it was 86% (18).

In Nigeria the prevalence of MAES in a university college hospital was 63.5% and these nurses had committed MAE one up two times within a month (19). Prevalence of medication administration error made by nurses in Egypt during the study year was 36.2% from this 51.6% of them made errors once, 28% of them made errors twice and the rest 20.4% made errors 3 times yearly. 82 nurses reported as they had made medication administration error in the past (20).

A cross-sectional study conducted in Ethiopia at Felege Hiwot Referral Hospital indicates that from a total of 360 medication administration, the majority (98.1 %) of medications has associated with at least one type of medication administration error. From 98.1%, 42 (11.9 %) only one type of MAE, 112 (31.7 %) had two type of errors, 168 (47.6 %) had three types of errors and the remaining 31 (8.8 %) account for more than three types of medication administration error. In this study the magnitude of MAE was (56.4 %) (13).

Study held on MAE in pediatrics in Jimma found a prevalence of 196 (89.9 %) MAEs among 218 observed medication administration, and 178 (90.8 %) of which accounted for intravenous (IV) bolus medications whereas 16 (8.2 %) of them occurred during oral medications. Wrong time error with a prevalence of 28.1% became the commonly encountered MAEs when observed whereas 52 (26.5 %), were dose errors and 42 (21.4 %)

were due to drug omission at the time of administration. In addition, wrong administration technique and unauthorized drug errors were 41 (20.9 %) and 6 (3.1 %) (21).

According to a cross sectional study in southern Ethiopia on medication administration and associated factors identified 93 (71%) nurses had made MAE for the past 12 months. 43 (46%) of them had made four times, and33 (35%) of them committed two or three times during the defined period. Documentation error was the most common with a prevalence of (85.4%), and MAE most frequently occurred during the time of parenteral medication administration that account for 58.5% (5). Based on a study which was undertaken in Tigray region in public hospitals which is about MAES and contributing factors in inpatient pediatrics identified the prevalence of MAES from a total of 1251 observed patients during medication administration The prevalence of MAES was 62.7% (22).

A study conducted in Addis Ababa in tertiary hospitals which is about MAES and associated factors determined the prevalence of MAES which was 203(68.1%) that the nurses had made in the previous 12 months. From these 119 (58.6%) nurses had committed it two or three times during the defined period, and 77 (37.9%) of them had committed it only once (3).

2.2. Type of medication error

Leape and colleges has reported more than 15 error types of MAEs which are: wrong dose, wrong choice, wrong drug, known allergy, missed dose, wrong time, wrong frequency, wrong technique, wrong route, and extra dose, failure to act on test, equipment failure, inadequate monitoring, preparation error, and other. Among 126 administered drugs by nurses are found to be with wrong dose, wrong technique, and wrong drug. Each error types are expected to occur at different stages, even if, most of these occurring during ordering and administration stage of a medication. Based on this research finding the most common types of errors are, wrong time, omission, and wrong dose(including)extra dose, and the rate obtained from direct observation ranged between20% and 27% including wrong time errors, and between 6&18% when wrong time error is excluded (23).

A systematic review of observational evidence on magnitude and nature of medication administration showed that by most of studies timing errors was the most common error type which accounted for 51 (79.7%) studies as 1 of the 3 most common error types

identified.35 (54.7%) studies had reported omission errors and 30 (46.9%) wrong dose error as 1 of the 3 most common error types. From the number of studies that does not include timing errors (n = 13), omission (n = 10, 76.9%), wrong dosage (n = 9, 69.3%), and /unauthorized drug (n = 7, 53.8%) (16).

According to American journal of nursing the types of MAE is Wrong route, Wrong time of administration, Wrong patient, Wrong dose administered, Wrong drug administered, Medication omission, administering of non-prescribed drug, administered after the order to discontinue, given to patient with a known allergy, Wrong fluid administered, and Wrong rate of administration was identified (1).

According to a study in southern Ethiopia about medication error and associated factors; documentation error was the most common error that was (85.4%) committed, and nurses did not properly document in 132 (95%) of the 139 observed medication administrations. Wrong time was the second common (58.5%) committed incident. Also, 33 (23.7%) of observed drugs were administered out of the ordered time. Wrong route was the third most common incident: 50 (40%) nurses administered medications through wrong routes, and in the same way 14 (10.1%) during observation (5).

By a study which takes place in Tigray the types of MAE in decreasing their occurrence are giving of wrong dose, wrong time, medication omission, giving medication to the wrong patient, wrong patient, administering medication via a wrong route, and giving un prescribed drug which represents 665(85.4%), 429 (55.1%), 18(2.3%), 5(0.6%), 4 (0.5%), 2 (0.3%) and 1(0.1%), respectively (22). A study that carried out in Addis Ababa Concerning about MAE type, wrong time error is the most common that represents (57.8%), next to this

documentation error is the second common which accounts (24.8%), and then as follows in decreasing order; wrong dose 22.5%)wrong route (18.5%)wrong drug (11.7), and wrong patient (8.7%) respectively (3).

2.3. Contributing factors of medication administration errors

Safe medication administration practice is relied on systems, process, and human factor that can be different across a health care setting. System factors that put effort on nurses to act accordingly includes; staffing levels and registered skill mix, shift length, acuity of patient as well as organizational climate. A research finding from 13 articles, and 3 literature review

indicates that organizational factors that affect MAEs are; nurse staffing, work load, organizational climate or working conditions, policies and procedures as well as the technology used in the organization (23).

WHO report of 2016 identified causes of MAEs as; lack of training, Inadequate knowledge about drug and the patient, failure in perception of risk, fatigue, Physical and emotional health issues, Poor communication, workload, Distractions and interruptions, Lack of standardized protocols, Insufficient resources, poor working environment, naming of drug, Labeling and packaging, lack of accuracy of patient records, Patient characteristics, and Complexity of clinical case (24).

Based on a systematic review the cause of MAEs were; Slips and lapses, knowledge-based mistakes and intentional violations, poor written communication, problems with medicines supply and storage, high workload, problems with ward-based equipment, patient factors (availability, acuteness), health status of staff (fatigue, stress) and interruptions/distractions during medication administration (25).

A study carried out in Saudi Arabia identified the contributing factors of MAEs by nurses were; medication packaging, nurse–physician communication, pharmacy processes, nurse staffing and transcribing issues (26). Another study in Eldoret Kenya of teaching and referral hospital on nurses about MAEs in medical surgical units the reported cause of MAEs were physician-nurse communication issues, Pharmacy processes, Documentation-Transcription associated causes, Nurse staffing problems, and Medication packaging (1).

According to a study conducted in Iran on prevalence and determinants of MAEs among nurses and has reported the contributing factors of MAEs as; Increased number of ill patients, presence of many types of medication, use of abbreviated names of drug, drug naming similarities, Different medication dosages, Fatigue resulting from increased workload, shortage of nurse, lack of training, inefficient pharmacology Knowledge, drug miscalculation, and Illegible physician writing (18).

According to an article in Egypt the contributing factors for MAEs were Inadequate training, physical and psychological issues, lack of interest of job, Noisy , environment misarrangement of devices, and equipment's, many drugs in a ward, or in cabinet, malfunction equipment or was not adjusted appropriately, Inadequate lighting, dose miscalculation, absence of rigorous regulations for high-alert medications, low staffs in

each shift, incomplete order by Physician frequently changed medication orders, duty shift, and many drug used by a patient(20).

A cross sectional study conducted in southern Ethiopia allowed the respondents to speak out expected lists of possible associated factors to MAEs,and they have reported as: insufficient training(68.5%),lack of staffing(66.9%),and illegible hand writing by the physician (60.8%),unclear verbal order that accounts(60%),not maintaining of 6, rights of MAEs (59.2%),wrong prescription(59.2%),lack of Staffing(54.6%),nurse's incompetence(53.1%), , interruptions during MA (50.8%), look like/sound like medications (30%) respectively (5).

According to a study conducted in Tigray public hospitals in pediatrics ward shows the determinants of MAEs, that were, age of patient, and educational level of health care provider, Availability of medication preparation room, the quantity of drug prescriptions per patient and presence of medication administration guideline, and Health care provider involving in medication administration who have been stayed working in pediatrics unit for less than 12 months is 63% less likely to make MAE than those who have experience of above 24 months with AOR (95% CI) of 0.37(0.21–0.65) (22).

A cross-sectional observation based study carried out at the Felege Hiwot Referral Hospital at inpatient unit indicates that the factors strongly linked with MAEs were, age of the nurses, age of the patient, nurse's working experience, interruption of the nurses at the time of medication administration, change of medication administration, and number of nurse to patient ratio, were the most frequently occurring contributing factor of MAEs at p-value of 0.05 (13).

A study conducted in tertiary hospital of Addis Ababa revealed contributing factors of MAEs which were; Lack of training, Lack of skill, work load, inability to keep the 6RMA, look like/ sound like medications, Wrong order, Uncertain verbal order, poor handwriting by the physician, Interruption, and Nurses write an order in place of physicians (3).

2.4. Medication administration error reporting

A study in Iran hospital indicated that the prevalence nurses not reported MAEs was 45%, and the associated factors were; information gap Fail to recall reporting MAEs to the superior, Attitude and behavior of nurse, high workload, Fear of consequence, lack of clear definition of MAEs (27). A systematic review in African hospitals shown that prevalence of

patients reported to have got any suspected adverse drug reaction during hospital admission was 8.4%, but only a 2.8% adverse drug reactions was reported, and that a median of 43.5% of the adverse drug were found to be preventable (28).

The Ministry of Health (MOH) of Saudi Arabia has developed policy on prevention of medication errors and the one component of this policy is reporting of MAEs with a system of MAER that is an anonymous, non-punitive and strongly motivated process (29).

According to a study in Gonder University Referral Hospital the prevalence of MAER was 29.1%. The reported prevalence of MAER for non-intravenous medications was between 16.8 to 28.6 % and from 20.6 to 33.4 % for intravenous MA, and associated factors were Educational level, difference over time - error definition, administrative issues, and fear (30).

2.5. Conceptual frame work

A conceptual frame work developed after literature review the following literature(1,3,5,13,18,20,22,23,24,25,26)

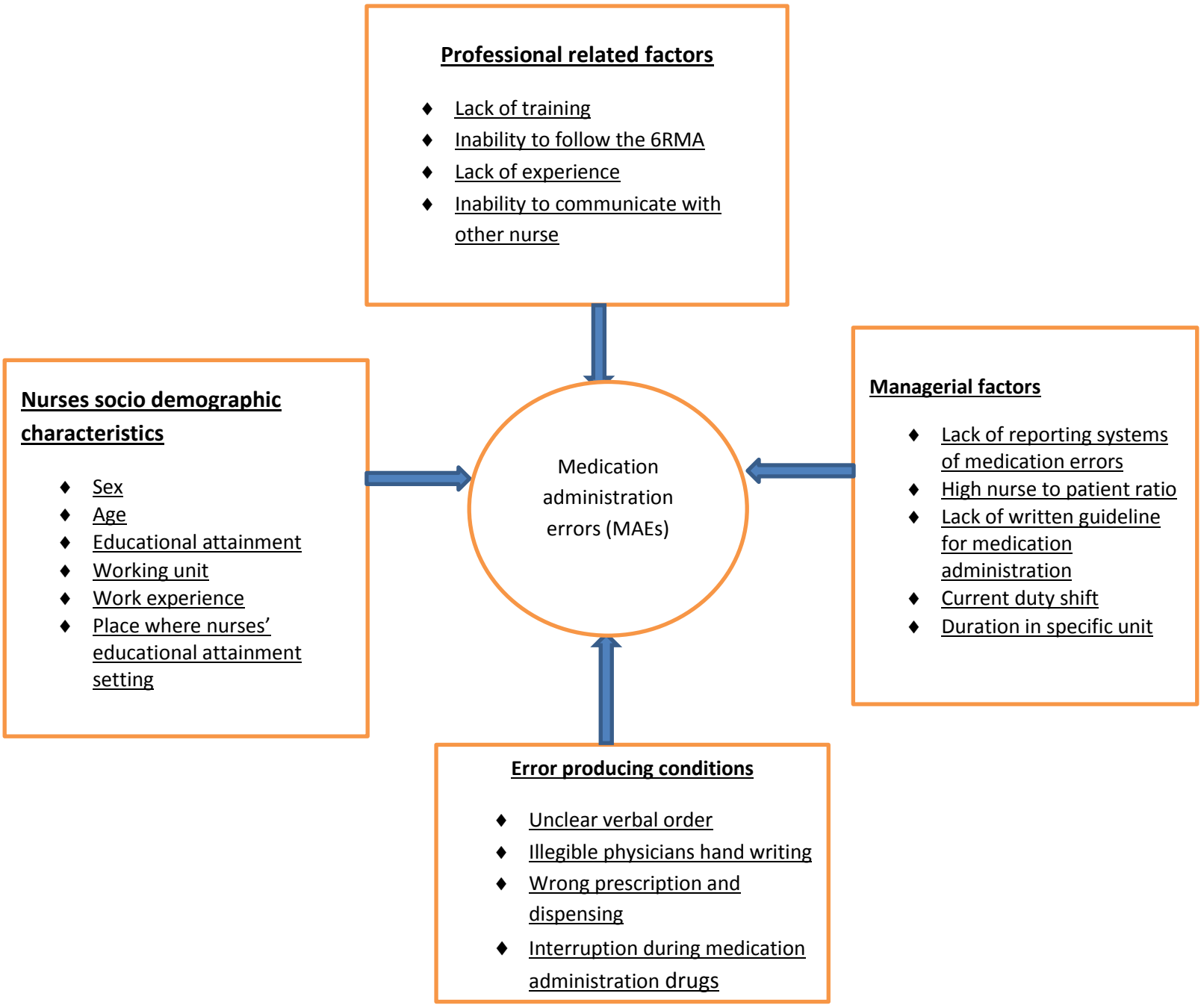

Figure 1 :Diagrammatic representation of the relationship of dependent and independent variables among nurses in Gurage zone selected hospitals in 2020(n=362)

2.6. Significance of the study

As MAE have a great impact on health service users, health care providers, as well as on health institutions. So identifying of the causes of MAEs is expected to provide solution to such problems in turn patients receive best care and will be prevented from MAE, problems, An additional treatment costs. Secondly health care professionals will be benefited from this, that their confidence and emotional satisfaction will be maintained due to their safe provision of services.

The institution unnecessary expenditure will be saved that formerly was extravagated by MAEs associated problems. Generally, this study finding will be used as a frame work in establishing medication administration guide lines for health managers, and will be used by policy makers as its magnitude and effect on a country initiate them to give priority, and in turn patients will be benefited.

Finally, the finding will be used as a source for some on who wants to conduct a study on medication administration related problems and other medication related phenomenons.

3: OBJECTIVE OF THE STUDY

3.1. General objective

- To determine the magnitude of medication administration errors and to identify contributing factors among Nurses in Gurage zone Hospitals, in, 2020

3.2 specific objectives

- To determine the magnitude of medication administration errors in Gurage zone selected Hospitals
- To identify the contributing factors of medication administration errors in Gurage zone selected hospitals.

4. METHODS, AND MATERIALS

4.1. Study area, and period

The study was conducted in Gurage zone hospitals. Gurage zone is one of the administrative zones in south nation nationality people's region (SNNPR). It has thirteen districts and two town administrations. Wolkite is the capital city of Gurage zone which is 153 kilometers' apart from Addis Ababa; capital city of Ethiopia. There are 5 governmental hospitals in this zone. These are Wolkite university specialized referral teaching hospital, Butajira general hospital, Buye primary hospital, kuante,and Gunchireprimary hospitals with the following and there are a total of 385 nurses in Gurage zone governmental hospitals.

4.2. Study design

An institution based quantitative cross sectional study design was conducted from from December 5 up to 11 in 2020.

4.3. Population

4.3.1. Source population

All nurses working in Gurage zone Hospitals, and involved in providing of health care.

4.3.2. Study population

All nurses who are involved in the provision of care in Gurage zone hospitals and present during the data collection period.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

All nurses who fulfill the requirements of nursing profession or a minimum of having diploma qualification in nursing, and involve in providing health care services in Gurage zone hospitals

4.4.2 Exclusion criteria

Nurses who is on annual leave, maternal leave, sick nurse, nurses who is not present in Gurage zone sampled Hospitals during the data collection period, nurses who is at training during the study period was excluded, and nurse who has less than 6 month work experience or duration.

4.5. Sample size determination

Sample size was calculated by the formula below with the following assumptions: The estimated proportion of medication administration error among nurses is 68.1%,(3) the margin of error 5%, confidence interval 95% and non-response rate 10%. The required sample size (n) was calculated as follows:

$$n_i = \frac{Z^2 p(1-p)}{d^2}$$

Where "n"- Minimum sample size "P"-Estimated proportion of medication administration error (68.1%) (3)" d" the margin of sampling error tolerated (5%)" Z^2"is the standard normal distribution at 1-α% confidence level (95%=1.96)

$$n_i = \frac{(1.96)^2 (0.681)(0.319)}{(0.05)^2} = 334$$

By adding 10% non-response rate or 10% of 334 the final sample size becomes

334+34=368

So nF=368

Based on proportional allocation the all 368 samples was allocated to each hospital by the following formula **nJ=$\underline{\text{n* NJ}}$**

N

Where NJ=is the sample size of the jth hospital

NJ=is population size of the jth hospital

n= n1+ n2+n3 is the total sample size (368)

N=N1+N2+N3 is total population size of hospitals (_385)

Wolkite specialized teaching hospital (NJ=100) 368*100/385=96

Butajira General Hospital (NJ=120) 368*120/385=115

Gunchire primary hospital (NJ=50) 368*50/385=48

Buye primary hospital (NJ=60) 368*60/385=57

Kuante primary hospital (NJ=55) 368*55/385=52

4.6. Sampling technique

Nurses was selected or sampled using simple random sampling technique, that up to complete our calculated amount for each hospital, study participants were responded to the questionnaires' and up to the time set for data collection period had been elapsed.

4.7. Study variables

4.7.1. Dependent variable

- Medication administration error (MAE).

4.7.2. Independent variables

Nurses socio demographic characteristics

- Sex
- Age
- Educational level
- Working unit
- Work experience
- Place where nurse's educational attainment setting

Professional related factors

- Lack of training
- Inability to follow the 6 rights of medication administration(RMA)
- Lack of experience
- Poor communication between nurse and doctors

Managerial factors

- Lack of reporting systems of medication administration errors
- High nurse to patient ratio
- Lack of written guideline for medication administration
- Current duty shift
- Duration in specific unit

Error producing conditions

- Unclear verbal order
- Illegible physicians hand writing
- Wrong prescription and dispensing
- Interruption during medication administration drugs

4.8. Operational definition

- Wrong medication: A medication given to the patient is different from a one which is on the patients 'medication prescription chart.
- Dose error: when the medication dose is either high or low, strength or quantity given is different from that of prescribed
- Patient error: when a medication of one patient is wrongly given to another patient
- Route error: when a medication is given on a wrong route of administration
- Time error: when there is greater than or less than 3o minute of medication administration from the recommended time
- Medication administration error (MAE): an error which comprises either a single or a combination of the above listed errors or any act that violates the rights of medication administration during administering of medication to the patient.

4.9 Data collection instrument, procedure, and personnel

A structured self-administered questionnaire which is adapted from previous study prepared in English was used. The questionnaire was obtained from other previous similar studies. It has 5 parts, the first about socio demographic data, the second questions related work environment, the third about magnitude of medication administration, and reporting, the fourth about types of medication administration errors, and the last about causes of MAEs.data was collected by 3 Nursing students, and a one-day training preceding data collection was held. Information was provided if they ask for clarification and finally collected and evaluated for its completeness and handled for further analysis. Study participants was notified verbally that not to fill their names. Each study populations were kept to fill and respond for up to designed data collection period.

4.10. Data quality assurance

The questionaries' was adapted from previous study (3). Data was collected by nurses and a one-day training among the nurses was under taken preceding the data collection period; on how to collect, way of interaction with study participants, and on means of checking for completeness and on supervision of study participants when they fill it, as well as responding and clarifying if they have faced an ambiguity. Study participants was also informed that it has no a problem on them as well as on the institution that the only thing aimed to obtain from this is to identify magnitude and contributing factors of MAEs.data was checked for completeness, safely handled, coded, recorded, and SPSS version 25 was used. Binary and multiple logistic regressions were used to determine an association between dependent and independent variables.

4.11. Data processing and analysis

After checking of the data for completeness, it was coded and entered into statistical product service solution (SSPS) for analysis. To explain the study population in relation to relevant variables, descriptive statistics such as frequencies, and percentages was calculated. In addition, the cross tabulation was computed using dependent and independent variables. To identify the strength of association between independent, and dependent variable, bivariate and multivariate logistic regression analysis was carried out. Variables in the binary logistic regression which have p value less than or equal to 0.25 was entered into multiple logistic regression. The adjusted odds ratio was used to interpret the strength of association between independent, and dependent variables at 95% CI. A statistical test of association was considered significant at a p-value of <0.05. The result was presented using figures, tables, graphs, and charts.

4.12. Ethical consideration

The study was conducted after getting ethical clearance from Wolkite University, College of Medicine and Health Science department of nursing. Administrators of the study population (Hospital administrators) were communicated through formal letter written by Wolkite University College of Medicine and Health Science department of nursing. The respondents were notified verbally about the objective of the study. The study participants were informed that they can quit whenever they wanted to and also was assured that their confidentiality will be maintained.

4.13. Dissemination plan

The final result paper will be submitted, and defended to Wolkite University College of medicine and Health Science Department Nursing, another copy of this will be given to Wolkite health bureau, and even an effort will be made to publish it to be accessible for every one online.

5. RESULT

5.1. Sociodemographic characteristics of nurses

A total of 362 nurses were participated in this study with a response rate of 98.4%. Among the total participants 55 %(199) were males.. Regarding marital status 50.8 %(184) were single, 47.8 %(173) were married, and 1.4 %(5) divorced. The educational level of the respondents shows that 32.6%(118) diploma nurses,65.2%(236), BSC(bachelor of sciences degree in Nursing, and 2.2%(8) were MSC(master of sciences in Nursing).

Table 1: Sociodemographic characteristics of Gurage zone selected hospitals nurses in 2020(n=362)

NO	Variables	Categories	frequency(n=362)	Percentage
Age		20-25	127	35.1%
		26-31	140	38.1%
		32-37	47	13%
		>37	48	13.3%
2.	sex	male	199	55%
		Female	163	45%
3. marital status		single	184	55%
		Married	173	47.8%
		Divorced	5	1.4%
4. Educational level		diploma	118	32.6%
		BSc	236	65.2%
		MSc	5	1.4%
5. Education award		government institution	292	80.7%
		Nongovernment institution	70	19.3%

5.2. Work related characteristics of nurses

More 59%(214) of the participants has a work experience of less than five year, and 27.9% of the nurses provide care for more than 13 patients per shift. Only 36% of the nurses had taken training, and have guideline for MA. On the other hand 57.2 % of nurses has faced interruption during medication administration .75% of the respondents communicated with each other when they made MAE

Table 2 work related characteristics of Gurage zone selected hospitals nurses in 2020(n=362)

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NO	Variables	response	frequency(n=362)	percentage(100)
1.	work experience	<5year	215	59.4%
		5-8 year	93	25.7%
		>8 year	54	14.9%
2.	Nurse to patient ratio	4-8	116	32%
		9-13	145	40.1%
		>13	101	27.9%
3.	Training on MA	yes	131	36.2%
		no	231	63.8%
4.	Have guideline for MA	yes	131	36.2%
		No	231	63.8%
5.	Faced interruption	yes	207	57.2%
	During MA	no	155	42.8%
6.	Communicate when	yes	273	75.4%
	facing doubt or MAE	no	89	24.6%

5.3. Magnitude type and reporting of medication administration errors

In this study 81.8% of the nurses has made medication administration error (MAE), and only 22.38 % of medication administration had reported whereas 77.62% remains unreported,. Not reporting of MAE is due to lack of reporting system 45.6%, fear of reporting 23% and 22.8 % is due to work load.

Regarding on the type of medication administration error (MAR), and their magnitude wrong time is the most prevalent type of medication administration error (MAE) accounted for 69.6% (252), followed by documentation error 35.9%(130),wrong medication 20.2 %(73),wrong route 16%,(58),wrong dose 15.2%((55),and wrong patient 13.3 %(48) in a decreasing order respectively. From route of error the majority of errors are occurred during parenteral administration of medications which accounts 67.2% route error .In self report of had facing medication administration in the last six month 62.6% individuals made MAE once, 31.7% made MAE twice, and 5.7% made medication administration more than two times.

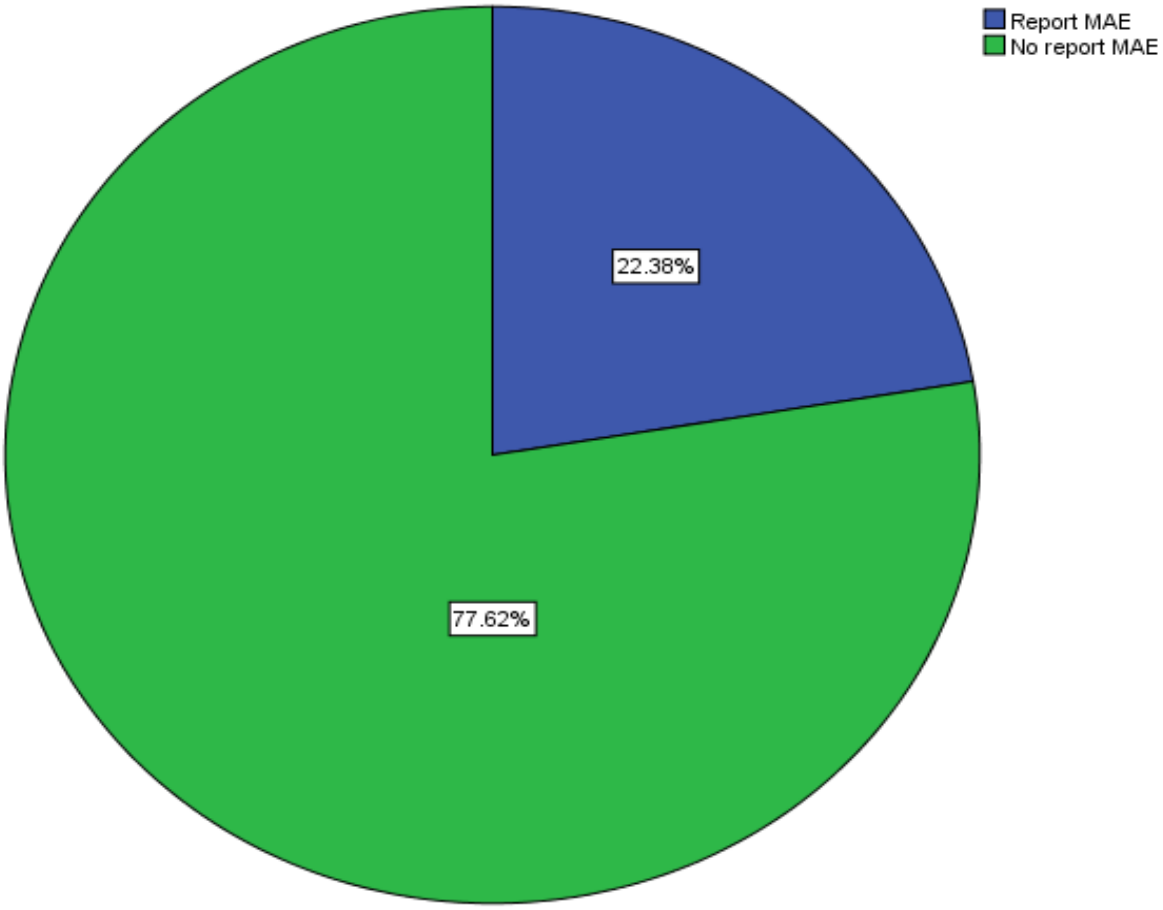

Figure 2: percentage of reported and non-reported MAE Among nurses of Gurage zone selected Hospitals in 2020 (n=362)

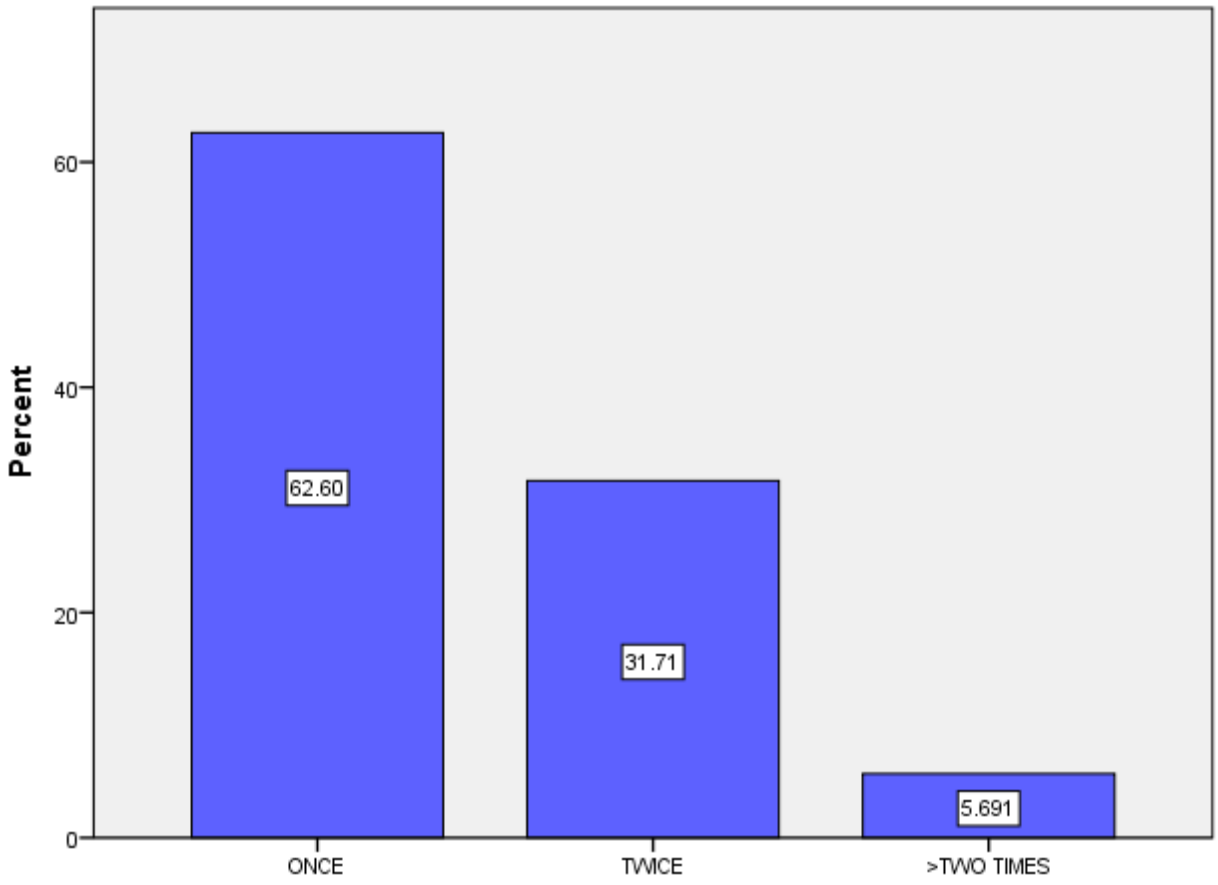

Figure 3: Percentage of MAE being made, once, twice, and more than twice in Gurage zone selected hospitals in 2020 (n=362)

5. 4. Perceived contributing factors of medication administration errors

When nurses asked for their perception about the cause of medication administration error 80.9% (293) of nurses reports that keeping the 6 rights of medication administration can prevent medication administration error, and additionally they list the perceived cause of MAE as lack of sufficient training 81.5%, workload 75.7%, lack of experience 75.4%, and illegible hand writing 72.1% were the major cause of MAE according to report of their perception.

Table 3: perceived cause of medication administration errors among nurses in Gurage zone selected hospitals, in 2020.(n=362).

No	Variable	Response	frequency(n=362)	percentage(100)
1 .	Failure to follow 6RMA	yes	293	80.9%
		No	69	19.1%
2.	Lack of sufficient training	yes	295	81.5%
		No	67	18.5%
3.	Lack of experience	yes	273	75.4%
		No	89	24.6%
4.	Workload	yes	274	274%
		No	88	24.3%
5.	looklike/sound like drugs	yes	154	42.5%
		No	208	57.5%
6.	wrong prescription	yes	197	54.7%
		No	165	45.6%
7.	unclear verbal order	yes	232	64.1%
		No	130	35.9%
8.	illegible hand writing	yes	261	72.1%
		No	101	27.9%
9.	interruption during MA	yes	198	54.7%
		No	164	45.3%

5.5. Associated factors of medication administration errors

Factors that are associated with medication administration in multivariate logistic regression were lack of taking training with AOR 2.97, 95% CI (1.67-5.28), and interruption during medication administration with AOR 2.79, 95% CI (1.57-5.00).

The above AOR implies that nurses who do not took training were three times more likely to commit MAE than nurses who took training. And nurses who were interrupted during medication administration were 2.8 or around three times more likely to commit medication administration errors than nurses who do not interrupted during medication administration.

Variable		Medication error		COR(95%CI)	P value	AOR(95%CI)	P value
		Yes	No				
Taking training	No	201	30	2.54(1.48-4.37)	0.001	2.97(1.67-5.28)	0.00
	Yes	95	36	1		1	
have guideline for medication administration	yes	96	35	1		1	
	No	200	31	2.35(1.15-3.72)	0.002	1.69(0.81-3.49)	0.16
Interruption during MA	Yes	180	27	2.24(1.3-3.86)	0.004	2.79(1.57-5.00)	0.001
	No	116	39	1		1	
Knowing the rights Of MA	No	35	4	2.08(0.70-6.00)	0.18	2.6(0.85-8.02)	0.096
	YES	261	62	1		1	

Table 4: binary and multiple logistic regressions of variables in Gurage zone selected hospitals in 2020(n=362).

6. Discussion

The main aim of this study is to identify the magnitude, contributing factors, and level of reporting of medication administration error. The magnitude of MAE in this study was high. Errors can result in a serious physical injury and even death to patients; In addition, these avoidable errors could also basis for the occurrence of severe financial, psychological, and emotional problem to the healthcare provider and organization (6).

In this study the prevalence of medication administration was 81.8% which is consistent with a study conducted in Iran about the prevalence and contributing factors of medication administration error among nurses (18) and with systematic review conducted in Middle East countries.

Our result was lower than a study conduct in Jimma in pediatrics unit which was 89 .9% this may be due to study design difference(retrospective observational based) and limited to only pediatrics unit whereas this study was in hospitals and have many departments. This result is higher than from a study carried out in Nigeria college hospital, Felegehiwot referral hospital, and Tigray pediatric unit this may be due to different number of sample size, and the above studies were limited to only one health institution but this were conducted in five hospitals (13, 19, and 22).

Study in Felege Hiwot referral hospital was qualitative and quantitative study but this one was only a quantitative and the number of hospital with its clinical unit or departments is greater than that of Felegehiwot (13).

In this study the percentage of medication administration errors committed once was 62.6%, twice 31%, and more than two times was 5.6%. Regarding route error parenteral route were highly prevalent or accounting more than half of route errors, and enteral route error was less common. This commission of an error once, twice, almost similar with a study which was conducted in Egypt but errors made more than two times in this study was less than that of Egypt's. This may be due to the difference in the number of study hospitals was high in this study including its clinical units ,and also the sample size of this study (362) is greater than that of Egypt's sample size which is 257 (20). High prevalence of parenteral route error was lower than that of jimma pediatric unit result which may be attributed by study

design difference: jimma ‘s study design was retrospective observational based and only limited to pediatric ward,(21), but this study was a quantitative cross sectional study design ,and comprises of all clinical departments or units of each studied hospital.

Regarding type and magnitude of MAEs wrong time was the most prevalent type of medication administration error (MAE) accounted for 69.6% (252), followed by documentation error 35.9%(130),wrong medication 20.2 %(73),wrong route 16%,(58),wrong dose 15.2%((55),and wrong patient 13.3 %(48) in a decreasing order respectively. This finding is matched with other studies of jimma pediatric unit study, and Addis Ababa tertiary Hospital study by which they identified timing error as the most common type of medication administration error (3, 21). This result is also consistent with a systematic review of observational evidence on magnitude and nature of medication administration by most of (51) studies the commonest and prevalent identified type of error was time error (giving a medication at wrong time) (16). The type of error committed, and identified in this study were also consistent with the type of medication administration errors identified by American journal of nursing, in two public hospitals of southern Ethiopia and a study conducted in Addis Ababa in tertiary Hospitals (1, 3, 5).

In this study the variables associated with medication administration error were lack of training, and interruption during medication administration with AOR 2.97,95 % CI (1.67-5.28) and 2.79, 95% CI (1.57-5).This finding was consistent with study conducted in Addis Ababa tertiary hospitals with a value of lack of training AOR 3.16, 95% CI (1.67-6), and interruption during MA AOR 2.42,95 %CI (1.3-4.49) (3).

In this study the perceived cause of MAE were lack of sufficient training 81.5%, workload 75.7%, lack of experience 75.4%, and illegible hand writing 72.1% were the major cause of MAE according to report of respondent’s perception, and 77.62% of MAEs were not reported due to lack of reporting system 45.6%, fear of reporting 23% and 22.8 % is due to work load. Regarding contributing factors this study is similar with other studies ;(Iran, southern Ethiopia, and Addis Ababa tertiary hospitals) that they identified the contributing factors of MAEs. (3, 5, 18) .The proportion of medication administration error not reported in this study is consistent with a study which is conducted in Gonder university hospital

about medication administration and reporting the proportion of not reported MAEs was 71%(30).

Imitation of the study

The limitation of this study is that it is quantitative data was used to generalize and lacks qualitative data(respondents) may not report or respond to our questionnaire about the reality of MAEs,contributing factors of MAEs,and MAER.

CONCLUSION

The prevalence of medication administration is high in this study which is 81.8% with wrong time is the most type sof error occurrence accounting 69.9%.Lack of training and interruption are the variables which are associated with medication administration error an AOR 2.97,95% CI(1.67-5.28), And with AOR 2.79, 95% CI(1.57-5.00). Lack of sufficient training 81.5%, workload 75.7%, lack of experience 75.4%, and illegible hand writing 72.1% were the major cause of MAE according to report of respondents' perception. MAEs in this study which did not reported was 77.62%, and when the respondents asked the reason of not reporting of MAEs they responded as 45.6% of not reporting MAEs was due to lack of reporting system.

Recommendation

- We recommend Gurage zone health office and hospital administrators to provide training programs, and establish a reporting system for MAEs.
- Gurage zone health office should have to reduce the work load of nurses by recruiting new nurses in order to avoid MAEs that are associated with insufficient nurse or increased work load.
- For health workers of Gurage zone hospitals we recommended that as much as possible they should have to minimize interruptions, and if occurred try to tolerate it.

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ANNEX

Information sheet

Dear respondent Good morning, (afternoon) my name is----------

The aim of this questionnaire is to determine the magnitude and identify contributing factors of medication administration errors that affect the patient, health care provider, and the health institution and to investigate such factors your participation has a great role. We are sure that nothing will be happened on you by responding to this questionnaire and that your security is confidential no one knows you. Individual data singly will not reported, and you can withdraw when you are not interested even your response has a high value. So, as much as possible by knowing its aim we are telling you to give valid and real information for each question.do not write your name. You only encircle the choice, and fill only asked questions on the space provided. Do you agree A.yes B.no?

1. Socio demographic characteristics of the respondent

SNO	Question	Response	Remark
100	Age	_____years	
101	Sex	_____	
102	Marital status	1.Single 2.Married 3.Divorced 4.widowed	
103	Educational level	1.Diploma 2.Bsc 3.Msc	
104	Work experience	_____years	
105	Where do you earn your	1.Government institution	

	education award	2.non government institution	

2. Questions related to work environment

S.No	Question	Response	Remark
200	Working unit	1.medical ward 2.surgical ward 3.pedi ward 4.emergency 5.oby/gyne 6.OPD 7.Other(specify)_____	
201	Duration in the present unit	_____in month	
202	Current duty shift	1.day shift 2.night shift 3.aleternat shift	
203	On average how many patients do you care per shift? (in number)	_____	
204	Do you take training in medication administration practice	1.Yes 2.No	

205	Do you have a guideline for medication administration procedures	1.Yes 2.No	
206	Have you ever faced interruption during medication administration	1.Yes 2.No	
207	Do you communicate with another nurse when you made medication Administration error	1.Yes 2.No	

3. Magnitude of medication administration errors and reporting of medication administration error by nurses.

S.No	Question	Response	Remark
300	Do you know the 6 rights of medication administration	1.Yes 2.No	
301	Do you think keeping the 6 Rights of medication administration can prevent medication administration error	1.Yes 2.No	
302	Have you made any medication administration errors in the last 6 months	1.Yes 2.No	
303	If your answer to Question 302 is yes how many times?	1.once 2.twice 3.three times above	

304	Is there a system for reporting medication administration errors in your hospital?	1.Yes 2.No	
305	Have you reported medication administration errors in the last 6 months?	1.Yes 2.No	
306	If your response to question 305 is No, what was the reason for not reporting	1.workload 2.lack of reporting system 3.fear of reporting 4.others(specify)_____	

4. Questions on types of medication administration errors

S.No	Question	Response	Remark
400	Have you given a wrong medication to patients in the last 6 month	1.Yes 2.No	
401	Have you administered the wrong dose to patients in the last 6 months	1.Yes 2.No	
402	Have you administered a medication to wrong patients in the last 6 months	1.Yes 2.No	
403	Have you made wrong route of medication administration in the last 6 months	1.Yes 2.No	
404	If yes to Question 404, which route?	1.parenteral 2.enteral	

		2.topical 3.others(specify) _____	
405	Have you administered medication 30 minutes before or after the ordered time in the last 6 month	1.Yes 2.No	
406	Have you document all medications which you give to the patient in the last 6 months	1.Yes 2.No	
407	Have you made errors during the preparation of medication for administration in the last 6months?	1.Yes 2.No	
408	Have you been checking the expiry date of a medication before administration	1.Yes 2.No	

5. Contributing factors of medication administration errors

More than one answer is possible and you can fill that you perceive as a cause of medication administration error

	Question	Response		Remark
S.NO		YES	NO	

500	Lack of sufficient training			
501	Lack of experience			
502	Insufficient Nurse's (workload)			
503	Failure to follow the 6RMA			
504	Look like/ sound like drug			
505	Wrong prescription			
506	Unclear verbal order			
507	Illegible handwriting by physician			
508	Interruption during medication administration			
509	Nurses write a prescription in place of physicians			
Others(specify)_____				

Thank you for your participation.