



Assessment of Health Professional Knowledge, Attitude, and Practice toward the Preparation and Administration of Intravenous Medication in Ambo Town, Oromia, Ethiopia

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Abstract

Background: Injectable drugs are the pharmaceutical preparation most frequently given to hospitalized patients around the world. Injectable drugs can be given alone or in the form of a mixture with other parenteral preparations. Intravenous (IV) admixtures are the mixing of two or more parenteral preparations in a hospital to meet an individual patient's therapeutic need.

Objective: To assess health professional knowledge, attitude and practices toward the preparation and administration of intravenous medication in Aurb in Ambo town, Oromia western town.

Methods: A cross-sectional study using a self-administered questionnaire will be conducted. Data will be collected by personal investigator and data will also be analyzed by using Statistical Package for the Social Sciences (SPSS) version 26.0 software. Data will initially, entered into the Microsoft Excel spread sheet before being exported to SPSS. The final result will be presented by using table and graphs.

Results and discussion: Among study participants, 103 (45.18%), 95 (41.67%) and 102 (44.74%) had adequate knowledge, positive attitude and good practice toward preparation and administration of intravenous admixture. This study result was consistence with study done in different area.

Conclusion: In general the current study showed, all participant had respond less than 50% concerning to preparation and administration of IV admixture.

Keywords: Administration, Preparation of intravenous medication, Knowledge, Attitude and practice

Abbreviations: ASHSP: American Society of Healthy System Pharmacist; AURH: Ambo University Referral Hospital; EPA: Ethiopian Pharmaceutical Association; GCP: Good Compounding Practice; IV: Intravenous; KAP: Knowledge Attitude and Practice; NHS: National Health Service; SPSS: Statistical Package for the Social Science; UK: United Kingdom; US: United State; USP: United States Pharmacopeia; WHO: World Health Organization

INTRODUCTION

Injectable drugs are the pharmaceutical preparation most frequently given to hospitalized patients around the world. Injectable drugs can be given alone or in the form of a mixture with other parenteral preparations. Intravenous (IV) admixtures are the mixing of two or more parenteral preparations in a hospital to meet individual patient's

therapeutic needs. The mixing process of parenteral preparations is a complex process with various risks that arise if it is not prepared aseptically. One of the risks is bacterial contamination, and contaminated parenteral preparations can cause severe patient complications (Austin P et al., 2013)

The use of injectable medication has many health care benefits for patients of all ages, however the complexities

associated with prescribing, preparing and administering injectable medicines means that there are greater potential risks for patients than for other routes of administration (Hernandez-Ramos I et al., 2017).

Intravenous (IV) medication preparation is a very complex process including multiple steps: The selection of correct drugs, the dissolving of powder, and the transfer of injectable fluid from the original vial or ampoule into a base solution infusion bag (Hernandez-Ramos I et al., 2017). Medication errors may be introduced during any of these steps of this complex process. IV medications are considered to be particularly dangerous because they usually go directly into the patient's vein *via* infusion, with immediate onset of systemic effects, low therapeutic index of many IV medications, and the difficulty of reversing the pharmacologic effects after IV administration (Thomas M et al., 2015; Macias AE et al., 2010).

If medications are not given appropriately, it may result in harmful consequences. These consequences include infection, drug side effects, and even mortality, all of which can lead to an increase in patient usage of hospital equipment and also length of stay, resulting in an increase in costs of the health-care system.

Patient safety is a principal concern for all medical professionals. Over the years, infectious outbreaks originated by contaminated parenteral products have led to substantial patient injury or even death. Medication safety is a major concern and a global issue related to quality and safety of patient care. The Audit Commission of the National Health Service (NHS) in the United Kingdom (UK) estimated that medication errors accounted for about 20% of deaths from all adverse events. Complications from drug treatment, therapeutic misadventures and diagnostic errors were the most common non-operative medical errors indicated that 61% of life threatening errors were associated with Intravenous (IV) medications (Benner P et al., 2011).

Medication safety during administration is a major concern at a global level, and is related to safety and quality of patient care. Medication errors are unintended failures in the drug treatment process that can occur during prescription, dispensing, storing, preparation and administration of medications (Farhan YM, 2018).

Shane stated that errors with IV medications were reported in the United States (US) even though the hospital pharmacy was responsible for the preparation of these medications. It is now common for allied health professionals to be involved in the preparation and administration of IV medications. For example, Nurses are now responsible for the preparation and administration of IV medications in most European countries. Nurses are involved in preparation and administration of IV medications in Malaysia although cytotoxic drugs, parenteral nutrition, and parenteral medications for acute pain service are prepared separately by pharmacists.

To improve safety and reduce errors related to sterile compounding preparations, national efforts have been made through enforceable standards, guidelines, and

educational materials. At this time, regulations and guidelines on compounding sterile preparations are available from the United States Pharmacopeia (USP), the American Society of Health-Systems Pharmacists (ASHP), and the ISMP. Despite these national efforts, errors related to sterile compounding persist. According to the 2020 State of Pharmacy Compounding Survey, 23% of facilities surveyed over the past five years have experienced at least one patient incident involving a compounding error. Many medication errors were found to be due to lack of pharmacological knowledge, proper attitude and skills in medication administration. The evidence of poor quality and errors in the preparation and administration of IV medications among health professional's points towards quality of care issues. Quality of this process is vital in providing safe patient care and attempts at quality improvement should be continually explored.

To the best of researcher's literature review there is no study conducted on KAP of health care professionals regarding IV medication preparation and administration in Ethiopia. Therefore, this study will be conducted to assess the knowledge, attitude and practice of health care professional towards IV medication preparation and administration in AURH, Ambo, Oromia, Ethiopia.

According to different studies inappropriate IV medication preparation and administration contributes for medication error that affect patient. As the preparation and administration of IV medication is the responsibility of health care professional, improving health care professional's knowledge, attitude and practice regarding IV medication preparation and administration is important to improve patient safety. So, since there is no study conducted on this topic in Ethiopia the result of this study will be used to create awareness about IV medication preparation and administration to AURH health care professional and to other health care professional in our country, to improve medication error occur due to inappropriate IV medication preparation and administration.

The result of this study will also be used as base line for other researchers on this topic in providing information on knowledge, attitude and practice of health care professionals regarding IV medication preparation and administration.

Objective of the study

General objective: To assesses health professional's knowledge, attitude and practices toward the preparation and administration of intravenous medication in AURH, In ambo town, Oromia western Ethiopia.

Specific objective:

- To assess the level of health professional knowledge toward preparation and administration of intravenous medication.
- To assess health professional's attitude toward the preparation and administration of intravenous medication.
- To assess health professional practice toward the

preparation and administration of intravenous medication.

MATERIALS AND METHODS

Study area and period

The study was conducted in Ambo town. Ambo town is the capital city of west Showa zone, which is located about 114 km from Addis Ababa in west direction. The town covers a total area of 3025 sq. km and altitude of 2169 m above sea level, with woinadega type of climatic condition. The town has a total population of 80712, of which male accounts 39549 and female accounts 41163 (Ambo Town Health Office).

The study was conducted from March 1 to March 30, 2023.

Study design

A hospital based cross-sectional study using self-administered questionnaires will be used to assess KAP of health professionals towards IV medication preparation and administration in AURH.

Population

Source population: Source of population was all health professionals in AURH.

Study population: Study of population was all physicians, pharmacists, nurses and midwifery, who are willing to respond and available during data collection period.

Sample size and sampling techniques

Since, all health professional (physician, nurse, midwifery and pharmacists) in ambo university referral hospital are included in the study, sample size determination is not required.

Illegibility criteria

Inclusion criteria: All physicians, pharmacists, nurses and midwifery, who are willing to respond and available during data collection period.

Exclusion criteria: Those health professionals who are not available during data collection period and not willing to participate in the study

Variable

Dependent variable: Knowledge, attitude and practice toward the preparation and administration of intravenous medication.

Independent variable: Gender, age, profession, year of experience, training.

Data collection tools

The structured observational checklists were developed according to guidelines to assess the actual practices of IV admixture of sterile pharmaceutical compounding in AURH. The practices of sterile compounding of pharmaceutical product guidelines implementation status assessments were made with each ward.

Data collection was made through self-administered for assessment of KAP of those who practice sterile pharmaceutical compounding. The questionnaire was

adapted from reviewing literature of related studies and guide lines prepared for compounding of sterile pharmaceutical product (Shamsuddin AF et al., 2012). The questionnaire contains close-ended questions.

Ethical consideration

Ethical clearance was obtained from the Ethics Review Board Ambo University, CHS, and Department of Pharmacy. Formal letter was submitted to hospitals and permission was also obtained. Information was provided to participants about the purpose of the study. They were also informed that participation will be voluntary. Participants was also be assured that the information they provide will be treated with strict confidentiality and neither their names nor the name of their institutions will be mentioned in any report rather aggregated analysis of the data will be performed. Informed consent was obtained from all individuals participating in the study.

Data quality management

Data consistency and completeness was assured throughout the data collection, data entry and analysis by checking each checklist and questionnaire on the day of data collection, as well as, entry day. Validation of data entry was done by cross checking the hard copy with the database, by doing exploratory analysis on frequency and cross tabulations.

Data processing and analysis procedures

Completed questionnaires were checked for completeness and accuracy daily. Data was entered, cleaned and analyzed by SPSS version 26.0 using descriptive statistics. The descriptive statistics was performed which includes frequency, percentage, mean and standard deviation.

Operational definition of terms

Adequate knowledge: The knowledge status of study participant when they score equal to or more than the mean.

Inadequate knowledge: The knowledge status of study participant when they score less than the mean.

Positive attitude: Category of study participant when they score equal to or more than the mean value.

Negative attitude: Category of study participant when they score less than the mean value.

Good practice: Category of study participant when they score equal to or more than the mean value.

Poor practice: Category of study participant when they score less than the mean value.

RESULTS

Socio-demographic characteristics

A total of 279 structured questionnaires were distributed to the health staff for AURH. Of the questionnaires distributed, only 228 were returned with a response rate of 81.7%. Of the total of 228 respondents, 131 (57.5%) were male and 97 (42.5%) were female. Greater than half of participants, 158 (69.3%) of the study participants have 1-5 years of work experience. Less than half of the study participants, 71

(31.1%) received training on health professional toward the preparation and administration of intravenous medication, as shown in Table 1.

Table 1. Socio-demographic characteristics of the respondents in AURH, Ambo, Ethiopia 2023.

Socio-demographic characteristics			
Parameter	Category	Frequency	Percentage
Gender	Male	131	57.5
	Female	97	42.5
Age	<30	174	76.3
	>30	54	23.7
Years of experiences after graduation?	1-5 years	158	69.3
	6-10 years	48	21.1
	11-15 years	22	6.6
How long you have been working in this hospital?	1-5 years	240	88.6
	6-10 years	29	10.7
	>10 years	2	0.7
What is your profession?	Pharmacist	34	14.9
	Nurse	131	57.5
	Physician	30	13.2
	Midwifery	33	14.5
What is your longest time area of prior experience?	Government hospital	192	84.2
	Private hospital	36	15.8
Ward/units	ICUs	59	25.9
	Obstetrics and gynecology	32	14
	Medical	78	34.2
	Emergency	32	14
	Oncology	14	6.1
	Pediatrics	13	
Did you receive any related to "sterile pharmaceutical preparation" training?	Yes	71	31.1
	No	157	68.9

Knowledge of health professional toward the preparation and administration of intravenous medication in AURH

All participants (n=228) attempted the question. The statements were sorted according to the correct answers. Healthcare professionals were rated as having adequate knowledge if they were above the mean (>14.46) of 9

points in the knowledge assessment questionnaire, and as inadequate informed if they were below the mean (<14.46). The result shows that 103 (45.18%) of the health profession have adequate knowledge and 125 (54.82%) of them have inadequate knowledge of health professional toward the preparation and administration of intravenous medication, as shown in Figure 1.

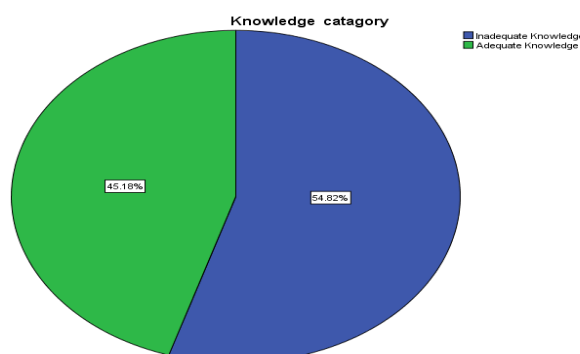


Figure 1. Knowledge of health professional toward the preparation and administration of intravenous medication in AURH.

Regarding the preparation and administration of intravenous medication in AURH

It was found that respondents managed to score high level of correct responses (>50% of respondents) for most of information posed except for statement 2, 5, 6, 7, 8, and 9 (preparation of IV hydrocortisone solution, IV antibiotics,

material movement in the compounding room, identification of each Employees involved in product preparation and dispensing, reconstituted IV drugs and calculation of IV norepinephrine injection) were only 48.7%, 47.2%, 31.0%, 43.5%, and 48.0% of respondents managed to get the correct answers (Table 2).

Table2. Knowledge of health professional toward the preparation and administration of intravenous medications in AURH.

Variable	Category	Frequency	Percent
Hands washing with antiseptic or alcohol rub should be performed before preparation of IV antibiotic solution	Correct response	169	91.40%
	Incorrect response	16	13.10%
Preparation of IV hydrocortisone solution does not require hands cleaning using antiseptic or alcohol rub	Correct response	46	24.90%
	Incorrect response	169	75.10%
The Cefoperazone vial top should be swabbed with alcohol swabs prior to reconstitution with NaCl 0.9%	Correct response	94	50.80%
	Incorrect response	91	49.20%
Any reconstituted IV medications can still be used if it is less than 48 hours from the date of reconstitution or preparation	Correct response	102	54.60%
	Incorrect response	84	45.40%
IV antibiotics are stable when diluted using NaCl 0.9% or NaCl 3%	Correct response	78	42.20%
	Incorrect response	107	57.80%
During the administration of IV fluids, maintaining accurate flow rate is not a must for all fluids	Correct response	77	41.60%
	Incorrect response	108	58.40%
When 6 ml of IV Noradrenaline (4 mg/ml) is diluted with 50 ml of 5% dextrose saline, the final concentration of Noradrenaline infusion solution in 3 g/ml is 480 g/ml (1 mg=1000 g)	Correct response	71	38.40%
	Incorrect response	114	61.60%
IV Ceftriaxone (Rocephine®) can be administered simultaneously with solution containing calcium gluconate via a Y-site, at a slower rate of 5 mg/min	Correct response	83	44.90%
	Incorrect response	92	55.10%
Medication administered intramuscularly acts rapidly than if administered intravenously	Correct response	59	31.90%
	Incorrect response	126	68.10%

Attitude of health professional toward the preparation and administration of intravenous medication in AURH

In assessing the attitudes of health professionals towards, the health professional toward the preparation and administration of intravenous medication, 8 items were asked of participants as strongly agree, agree, neutrally, disagree, and strongly disagree. The mean value for assessing the attitudes of health professionals was analyzed. The mean of the score was 14.22 ± 4.00 . The

result showed that respondents above the mean (14.22) agree with attitudes, which means that they have a positive attitude, while a mean value below 14.22 showed that respondents disagree with attitudes (negative attitude). The result showed that 95 (41.67%) of the respondents have a positive attitude towards a sterile pharmaceutical composition, while 133 (58.33%) of the respondents had a negative attitude towards a health professional toward the preparation and administration of intravenous medication,, as shown in Figure 2 below.

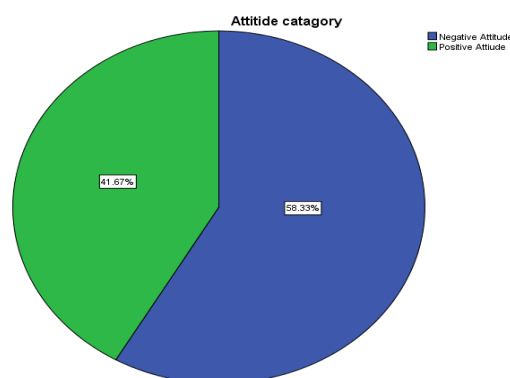


Figure 2. Attitude of health professional toward the preparation and administration of intravenous medication in AURH.

The highest percentage of health professionals strongly agree with the recruitment test question: Ongoing and specific training on safe management of IV drugs could reduce the risk of error (n=142, 76.8%), all sterile preparation should be labeled (n=141, 76.2%), clinical skills

about safe management of drug therapy should be regularly evaluated (n=169, 62.6%), characterize sterile preparation (n=117, 63.2%) and Intravenous medication errors should be reported in order to provide an improved care (n=110, 59.5%) as shown in Table 3.

Table 3. Attitude of health professional toward the preparation and administration of intravenous medication in AURH.

Variable	Category	Frequency	Percent
Ongoing and specific training on safe management of IV drugs could reduce the risk of error	SA	142	76.80%
	A	39	21.10%
	N	2	1.10%
	SD	2	1.10%
Errors prevention can reduce the occurrence of errors during the drug preparation	SA	107	57.80%
	A	49	26.50%
	N	23	12.40%
	SD	6	3.20%
Intravenous medication errors should be reported in order to provide an improved care	SA	110	59.50%
	A	42	22.70%
	N	19	10.30%
	DA	2	1.10%
	SD	12	6.50%
Use of abbreviations and dose expressions helps in safe administration of IV medication	SA	32	17.30%
	A	37	20.00%
	N	29	15.70%
	DA	49	26.50%
	SD	38	20.50%
Poor hand washing before starting sterile pharmaceutical compounding can affect quality and purity of preparation	SA	105	56.80%
	A	40	21.60%
	N	24	13.00%
	DA	14	7.60%
	SD	2	1.10%
Eating and drinking in IV admixture room can affect the quality of preparation	SA	108	58.40%
	A	27	14.60%
	N	20	10.80%
	DA	6	3.20%

	SD	24	13.00%
Clinical skills about safe management of drug therapy should be regularly evaluated	SA	117	63.20%
	A	58	31.40%
	N	6	3.20%
	SD	4	2.20%
All sterile preparation should be labeled	SA	141	76.20%
	A	20	10.80%
	N	20	10.80%
	DA	4	2.20%

Practice of health professional toward the preparation and administration of intravenous medication in AURH

In assessing the practice of health professionals towards, the preparation and administration of intravenous medication, 7 items were asked of participants as Yes or No question. The mean value for assessing the practice of health professionals was analyzed. The mean of the score

was 8.1 ± 1.34 . Healthcare professionals were rated as having good practice if they were above the mean (>8.1) and as poor practice if they were below the mean (<8.1). The finding of this study showed that only 102 (44.74%) of the respondents had good practice.

While the remaining 126 (55.26%) respondents had poor practice as shown in Figure 3.

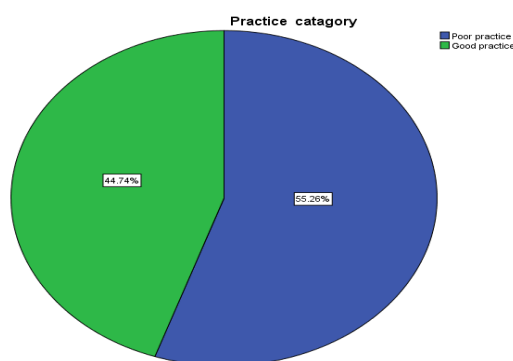


Figure 3. Health professionals practice categories.

DISCUSSION

The specific aim of this study was to determine knowledge, attitudes practice towards preparation and administration of IV medication in AURH, Ambo. In this study, health professionals were considered as having adequate knowledge if they performed above the mean (14.46 ± 2) in the knowledge assessment questionnaire, and as inadequate knowledge if they were below the mean. The results showed that 103 (45.18%) of the health professionals had adequate knowledge and 125 (54.82%) had inadequate knowledge of preparation and administration of IV medication, as shown in Figure 1. In addition, less than 50% of the participants were unable to answer correctly for the preparation of IV hydrocortisone solution (24.9%), IV antibiotic stability in NS 0.3% (42.2%), during the administration of IV fluids, maintaining accurate flow rate is not a must for all fluids (42.2%).

The majority of participants ($>50\%$) gave the correct answer for most of the information provided. This study was similar to the study carried out in Malaysia by Shamsuddin and Shafie, which shows that around 93.9% of nurses respond to washing their hands with an antiseptic or rubbing alcohol before preparing an IV antibiotic solution, and more than 50% of respondents had knowledge of intravenous drug

preparation. In our result, more than 70.0% of the participants were the correct answer regarding the calculation of the drug dose during the drug preparation phase. In contrast to this study, the participant in Malaysia has little knowledge of the calculation, as only 37.8% of the respondents gave the correct answer. The contrast may be due to small number of sample size from precious study (246) and 228 from current study. In this finding, less than half of the participants miscalculated the dose of norepinephrine IV, which is comparable to the study conducted in Iraq (Farhan YM, 2018), which suggests that more than half of the nurses use the dose prescribed for patients Steroids (dexamethasone) calculated incorrectly. In this finding was lower compare to study in Malaysia, 82.2% of the participants have knowledge of calculating the drug dose. This difference may be due to the previous study done in one hospital, while current study was in four hospitals.

With regard to attitudes in the present study, less than half (41.67%) of those questioned have a positive attitude towards preparation and administration of IV admixture (Figure 2). According to a study in Italy and Spain, 86% and 96.3 of respondents agree with preventive measures, such as frequent training, authoritative guidelines (available scientific evidence) and continuous evaluation can improve

pharmaceutical preparation practice and reduce errors, which is comparable with this result, since around 91% of the participants respond above agree with preventive measures. In addition, our study shows that around 88% of respondents agree with error prevention, which can reduce the occurrence of errors in drug preparation, similar to a study in Italy, as 87% of participants agree with these statements. Our finding was similar to study done in Spain most participants agreed that the dose calculation could reduce the number of drug errors.

With regard to practice in the present study, less than half (44.74%) of those questioned have a good practice towards preparation and administration of IV admixture (Figure 3). In addition, our study shows that around 94.1% of respondents agree with wash your hands before preparing, which can reduce the occurrence of contamination in drug preparation, similar to a study in Italy, as 87% of participants agree with these statements. Our finding was similar to study done in Spain most participants agreed that the vital signs before and after administration of vasoactive drug.

CONCLUSION

This study assessed the knowledge and attitudes of health professionals towards preparation and administration of IV admixture. Less than half of the participants received training on sterile pharmaceutical composition. Less than fifty-five percent of the participants had adequate knowledge and attitude towards the preparation and administration of IV admixture.

Based on the results of this study, the following recommendations are suggested. These are:

- All personnel working in the sterile pharmaceutical compounding area should receive training on sterile pharmaceutical compounding.
- All personnel in the sterile pharmaceutical compounding area should be required to follow aseptic procedures to prevent product contamination.
- Furthermore, the national survey may be necessary to determine the actual practice of sterile pharmaceutical compounding practice in our country.
- Further research may be needed to cover all components of sterile pharmaceutical compounding practice in hospitals found in our country.

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