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Introduction: Intravenous fluids are liquid substances that are administered in to the body's circulatory system via a vein. In hospitals intravenous therapy is the most common way of administration and providing fast and satisfying outcome. Nurses play important role in administering and managing IV therapy, however poor knowledge and practice of nurses can arise life threatening complications.

Aim: The aim of study is to assess nurses' knowledge and practice regarding IV fluids therapy in Orotta and Halibet National Referral Hospitals, Asmara, Eritrea.

Methodology: Stratified random sampling was used to select the samples in this study. Each ward was taken us strata. Total sample size was 133. This research used a quantitative cross sectional analytical design. The data collection method was self-administered questionnaire and observational checklist. Data was analyzed by using SPSS (Version 26). Descriptive and inferential statistical tests were done as per the need of research objectives.

Result: The result revealed that The mean (SD) of knowledge of the nurses on IV fluid was 62.29 (11.06) while that of practice was 60.03(11.95). The factors affecting knowledge and practice on IV fluid were determined using independent samples T-test and one way ANOVA. The knowledge score among nurses aged 25 or less was significantly higher than those nurses in the age group 26 or above (t-value=2.086, p=0.039). However, the categories of sex (p=0.149), years of experience (p=0.289), educational level (p=0.376), and further IV therapy training (p=0.915) did not have significantly different knowledge scores. On the other hand, females had significantly higher practice score as compared to males by an average of 5% (t=-1.979, p=0.049). Moreover, at least one of the categories of the educational level was found to have significantly different practice score (F=4.523, p=0.013). However, practice score across the various categories of age (p=0.116), years of experience (p=0.526), further IV therapy training (p=0.791) were not significantly different.

Conclusion: Nursing practice related to the study concluded that the overall knowledge and practice of nurses has no significant correlation between knowledge and practice. Hence the fact that they have more knowledge does not guarantee more practice by the nurses. The knowledge score among nurses aged 25 or less was significantly higher than those nurses in the age group 26 or above. Therefore, efforts to transform nurses' knowledge into practice is an important concern for educational and awareness programs to improve knowledge and practice changes in regard to IV Fluids Therapy.

Implication to the field of nursing: The research findings will enable the organization to develop and organize training programs by identifying the gaps in knowledge and practices of nurses towards IV Fluids Therapy. Efficient knowledge and good practices by the nurses can facilitate patient hospital staying and may contribute to

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decrease the rate complication IV Fluids Therapy. Moreover, the study results will help for the further research in nursing profession.

Keywords: knowledge, practice, nurse and iv fluid therapy, adults.

I. INTRODUCTION

Background: Intravenous therapy (IVT) is the procedure that needs manual skills, professional competency, knowledge about the anatomy and physiology of vascular system. It is used more frequently for administration of different drugs, fluids, blood, nutrition, for sampling and other purposes. In clinical setting of hospital, nurses are believed to be accountable and responsible for handling and managing patient with it. (Sandhya & Rosy , 2019).

Intravenous fluids are liquid substances that are infused into the body's circulatory system via vein. (Frost,2015) and are classified as crystalloids, colloids, and blood products (Westbrook, J., Woods, & Parry, 2011). Fluid and electrolytes balance is crucial for physiology of human body and its normal functioning and metabolism. About 60% (60-67%) of the total body weight is made up of water. Electrolytes are such as sodium, potassium, chlorine, calcium, magnesium and phosphorus. On the other hand, colloids contain large molecules that do not cross semipermeable membranes, thereby remaining within the blood vessels as volume expanders due to their high oncotic pressure; examples include albumin and low-molecular- weight dextran.

The body's homeostatic control mechanisms ensure that a balance between fluid gain and fluid loss is maintained. (Chanak, Gayatri, & Siddheshwar, 2019). The infusions of fluids into the peripheral veins is often indicated when patients is unable to take fluid orally and there are different factors (Illness, trauma, surgery, age, gender, environmental temperature and medication, etc.), which affect the fluid and electrolytes balance and the mechanism of the body. Intravenous therapy is used to maintain or to restore fluid balance, to maintain or to replace electrolytes, administer water-soluble vitamins to provide a source of calories and nutrients, administer drugs and to replace blood and blood products. (Sajjad, Majid, & Mahfood, 2020).

Patient safety, which is one of the highest priority goals of patient treatment and care, is affected by various factors such as hospital environment, the complexity of the quality and the quantity of healthcare workforce, medical processes, technology, and team work. However, patients can be faced with various medical errors (Sezgin, 2007). Nurses are in charge of initiating, monitoring, and terminating fluid therapy. They also need to know and prevent complications caused by catheter inserted through a vein or resulted from intravenous fluid therapy. Nurses are needed to increase their knowledge and performance regarding intravenous (IV) fluid therapy to manage its possible complications and improve patient safety (Nazar & Abbas, 2020).

Basically there are two types of fluid imbalances i.e. over load and fluid volume deficit. Excessive fluid generates edema and is associated with organ dysfunction and even death. The compulsion to interpret all the evidence and observation according to the patient diagnosis as edematous patient may have a positive fluid balance but can be decrease intravascular fluid, which lead to the inadequate oxygenation and tissue perfusion (Chanak, Gayatri, & Siddheshwar, 2019).

Poor knowledge of IV infusion has the potential of jeopardizing the quality of care provided to patients and consequently lead to poor out-comes. In Kenya, inappropriate IV fluid therapy accounts for about 17% of deaths among hospitalized patients (Abwalaba, Ogutu, & Ng ang¸a, 2018). These errors have been linked to inadequacies in IV fluid therapy knowledge among health care workers, including nurses. Findings of a study conducted in 13 Kenyan hospitals showed that inadequate knowledge of IV fluid therapy among nurses is a risk factor for mortality and further demonstrated that improved knowledge significantly reduced the mortality of patients (Abwalaba, Ogutu, & Ng ang¸a, 2018; Frost, 2015; Westbrook, J ., Woods, & Parry, 2011)

1.1 Problem Statement

In most countries that has conducted research regarding IV fluid therapy has inadequate knowledge and practice. For example, in Iraq about 47.1% was inadequate knowledge (NazarandAbbas, 2020). In Nepal level of practice and knowledge 66.1% and 50.9% respectively (Sandhyalamsal and Rosyshrestha). In Malaysia majority of nurse about 62.5% did not have knowledge (Ahmed and Mohd, 2013).

Intravenous cannulation is more common and is invasive procedure among hospitalized patient However,it is associated with complications that can delay the prognosis and have an adversimpact on the clinical outcome of the patient, like infection, phlebitis, infiltration or extravasations, fluid overload, hypothermia, electrolyte imbalance, embolism. In most countries nurses knowledge and practice of IV-therapy is insufficient, despite the fact thathis study has not been conducted in Eritrea, our aim is to assess nurses knowledge and practice of regarding IV fluid therapy to promote patients' safety and to increase the quality of patient care.

1.2 Significance of the Study

Nurses plays major role in providing fluids via intravenous method. The intravenous route is the best and the fastest way for delivering fluids or drugs. It carries most risk than other routes, so it is important to reduce the risk, it is essential for the nurses to improve their ability and to practice effectively.

This study investigated the knowledge and practices of nurses towards prevention of complication of IV fluid therapy in Orrota and Halibet wards. First, this study has been helpful for us to improve our knowledge and practice for the IV fluid therapy during our clinical period. In addition, the research findings enabled the organization to develop and organize training programs by that identified the gaps in knowledge and practices of nurses towards prevention of complication of IV therapy. Efficient knowledge and good practices by the nurses can facilitate patient care and may contribute to decrease patient staying time in the hospitals. Moreover, the study results will help for the further research in nursing profession.

1.3 Justification of the Study

In our clinical postings and day to day experience, we found that the staff nurses provide IV fluids incorrectly. It is due to the lack of knowledge and proper awareness on IV fluid therapy. This ultimately leads to various complications on patients, loss of resources and many other problems to the health care delivery system. Therefore, the researchers decide to have study on the assessment of knowledge and practice level of nurses on IV fluid therapy. The researchers firmly believe that the study will act as a first step to solve the problem because finding the existing level of knowledge and practice of nurses help authority to provide various in-service programs to improve the efficiency of nurses on this regard. This ultimately improves the health care of our country too.

II. OBJECTIVES

2.1 General Objectives

The aim of the study is to assess the knowledge and practice of nurses on IV fluid therapy.

2.2 Specific Objectives

- To assess the level of knowledge of nurses on IV fluid therapy.
- To assess the level of practice on IV fluid therapy among nurses.
- To determine the relationship between knowledge and practice of nurses regarding IV fluid therapy.
- To determine the association between knowledge of IV fluids and selected socio-demographic variables.
- To determine the association between practice of IV fluid therapy and selected socio-demographic variables.

2.3 Research Question

1. What is the level of nurses' knowledge regarding IV fluid therapy?

2. What is the level of nurses' practice regarding IV fluid therapy?
3. What relationship exists between nurses' knowledge and practice towards an IV fluid therapy?

2.4 Operational Definitions

Knowledge: It is the existing information of nurses regarding IV fluid therapy measured using a self-administered questionnaire.

Practice: It is the existing ability or skill for nurses to perform IV fluid administration measured using an observational checklist.

Staff Nurse: The nurses working in adult wards of Orotta and Halibet hospital.

IV fluid therapy: Administration of IV fluids through IV cannula (RL, DNS, NS, D5etc).

Adults: Patient's admitted in selected hospitals whose age above 18years.

III. LITERATURE REVIEW

A descriptive and inferential study was done by L. H. Hiranandaniin (2018), as an aim to scrutinize best practices in infusion nursing among the nurses in a private tertiary care center hospital, India. A total of400 IV cannulation were evaluated on the basis of the IV therapy monitoring chart among the nurses. 20 nurses were included in the study. The result of knowledge score of the nurses regarding infusion practice were evaluated and it was founded in the 65 % of nurses were rated average and 35% poor.

A cross-sectional study design was done by Sandha and Rosey in (2019) as an aim to assess nurses' knowledge and practice regarding IV fluid therapy in teaching hospital Bharatpur, Nepal. Design was adapted with 177 nurses for assessment of knowledge and 53 nurses to observe on IV fluid therapy. A systematic random sampling technique was used. The level of knowledge was found inadequate and the level of practice was found unsatisfactory on IV therapy.

A descriptive cross sectional research design was done by Sajjad, Majid, Mahfoodin (2020), as an aim to assess nurses' level of education about IV fluid administration at Basrageneral hospital Iraq. On sampling of 300 nurses, more than half of the sample had a level of education of health institute most of the study sample had less than 10 years of employment most of the nurses had good knowledge about IV fluid, where they get high scoring, they haven't find any correlation between variable and the score they got.

A cross-sectional survey was done by Winfrindah Wangui and Elzabeth kalondo in (2021), as the aim to measure nurses' knowledge of basic aspects of intravenous fluids, in medical and surgical wards in County teaching hospital in Kenya among 52 staff nurses. The overall mean knowledge scores on IV fluid therapy by nurses at the adult medical and surgical wards was 57.4% (*SD* = ±28.55), which depicted a moderately adequate knowledge level. A higher proportion of the nurses (65%) had moderately adequate knowledge whereas 23% had inadequate knowledge regarding IV fluids.

Descriptive study desiegn was conducted in Egypt by wafaa EL-said Ouda, Prof.Manal Farouk Mahmoud, Dr Rihab Hassan Kafl, Dr. Hadeer Hussien Soliman, Msc.(2019). The aim of the study was to investigate nurses knowledge & practice regarding peripheral IV Cannulation & blood sampling in pediatric ICU AIN Sham University on 81 nurses. The result was half of the studied nurses had satisfactory regarding cannulation and blood sampling while the majority of them had unsatisfactory practice.

A comperative study was conducted in Iraq Hawler Medical university by Nazar Rmadhan Othman, Abbas Abdulqadr(2020). The aim was to compare nurses knowledge, Attitude and practice concerning fluid therapy in children in public versus private Hospitals in Erbil city the result was in knowledge, attitude, practice in public hospital were poor,while the nurses from private hospitals had an acceptable level of knowledge,attitude and practice of iv fluid therapy.

Descriptive study was conducted in university Hospital Turkey by Aysegul Gunes & Sevilay Senonolcelik. The aim of the study was to examine knowledge and practice of nurses

concerning IV K admistration on 105 nurses. The result was mean score knowledge was 9.48 and for practice 10.85.

Descriptive cross sectional was conducted by Sajjad Selim Issa, Majid Abdulwahab Haattook, Mahfood Falih 2022. The aim of the study was assessment of nurses knowledge about intravenous fluids administration at Basra general Hospital Iraq. Study was conducted among 300 nurse's. The reasult revealed that most of the nurses has good knowledge.

Descriptive cross sectional research design was conducted by Chanak Trikhatri, Gayatri Rana and Siddheshwars. Angadi in Nepal (2019). The aim of the study was knowledge and practice regarding fluids and electrolytes administration among 110 nurses working in teaching Hospital Chitaw. The result was average mean score of knowledge and practice 45% and 65.2%.

Descriptive cross sectional research design was conducted by Mohammed MA, Elshamy KF and Mohammed HAB in Egypt(2019). The aim of the study was effect of implementing IV Fluids Therapy protocol among 123 nurses knowledge and performance at specialized medical Hospital. The result that revealed adequate knowledge but poor on performance to follow protocols.

IV. METHODOLOGY

4.1 Study Design

Cross sectional analytical study design was used to conduct the knowledge and practice of nurses regarding IV Fluid Therapy at the two National Referral Hospitals (Orotta and Halibet) in Asmara, Eritrea. Quantitative study approach was employed to assess the knowledge and practice of the nurses. The study was conducted from February 2023 to April 2023.

4.2 Study Area

Hospital based setting in the capital city of Eritrea, Asmara, is planned in order to conduct the study. Asmara is located in the latitude and longitude 15020' N and 38056' E respectively, and sits at an elevation of 2325 meters (7628ft) above sea level. Its total population in 2018 was estimated to be 896,000. It has two main national referral hospitals. Those hospitals are Orotta and Halibet National Referral Hospitals.

ONRH has 255 beds in adult inpatient department while in Halibet referral hospital has the total number of 181 beds.

4.3 Study Population

Staff nurses who work in Orotta and Halibet Hospital adult inpatient wards was constitute the target population for the study. The wards in Orotta are generally classified as Medical, Surgical, Emergency, ICU, Recovery, Maternity, Oncology, ENT and Halibet wards are Burn, emergency, ward-A, ward-C, prison-ward, ward-MB, ward-G, and recovery.

Table 1: Number of Beds and Number of Staff Nurses in Onrh and Hnrh

OROTTA		
WARD	No. of Beds	No. of Staff Nurses
ENT	20	7
GYN	32	9
PO	31	9
PP	12	8
S2B	24	8
S2A	35	8
MA3	35	8
MB3	24	8
ICU Adult	9	16
Recovery	8	7
ER Adult	25	27

HALIBET		
Burn	17	5
Emergency	22	7
Ward A	24	8
Ward C	15	7
Orthopedic A	18	7
Orthopedic B	14	5
Orthopedic OR	16	12
General OR	16	12
Ward G	30	5
Recovery	9	5

4.4 Sample Size and Sampling Method

Determination of sample size; the sample should be representative of the target population and of sufficient size to produce meaningful results and to allow tests of statistical significance to be applied**.**

Sample size was calculated using the one proportion sample size formula as:

$$n= \frac{NZ^2pq}{d^2(N-1)+pqZ^2}$$

Where n = sample size

N = total number of target population

Z_a= standardized normal score

p = probability of participants who have CVS

q = probability of participants who does not have CVS

d = margin of error

Based on a 95% CI, 5% margin of error, an expected proportion of 0.5 (since no previous studies were conducted), and population size of 188, the sample size is:

$$n= 188*1.92*0.5*0.5/0.05*(188-1)+0.5*0.5*1.96$$
$$=126.4 \approx 127$$

After considering 5% non-response rate, a final sample size of 133 students will be selected.

Stratified random sampling will be used to select the samples from each ward so as to have representative samples. Each ward will be taken as strata because of the similarity that exist among workers of the same ward.

The computed sample size will be allocated using proportional allocation as:

$$n_i = nN_i/N$$

Where: $\mathbf{N_i}$= total number of students in each stratum

$\mathbf{n_i}$= sample size of the allocated stratum.

The samples distributed as per the hospital and ward is displayed at Table 2.

Table 2: Distribution of Total Nurses and Samples by Hospital and Ward

Hospital	WARD	No. of Staff Nurses	Sample of Nurses
OROTTA	ENT	7	5
	GYN	9	6
	PO	9	6
	PP	8	6
	S2B	8	6
	S2A	8	6
	MA3	8	6
	MB3	8	6
	ICU Adult	16	10
	Recovery	7	5
	ER Adult	27	18
	Burn	5	4
	Emergency	7	5

Halibet	Ward A	8	6
	Ward C	7	5
	Orthopedic A	7	5
	Orthopedic **B**	5	4
	Orthopedic OR	12	8
	General OR	12	8
	Ward G	5	4
	Recovery	5	4

4.5 Criteria for Selectio

Inclusion Criteria: Staff nurses currently working at Orotta and Halibet Hospitals.

4.5.1 Exclusion Criteria

- Head nurses
- Nurses not actively involved at patient care
- Nurses working in pediatric wards
- Nurses who are not willing to participate in the study

4.6 Data Collection Tools and Methods

A structured standard questionnaire (Fernandez, 2009) tool was adapted after necessary modifications to assess the knowledge and a standard observational check list from Eritrean nursing procedure guide lines was used to assess practice.

Demographic characteristics: sex, age, work experience, level of education, further training on IV therapy

Knowledge assessing items: 7 back ground questions 18 response questions

Practice assessing items: 7 back ground same knowledge assessing & 24 observational checklist

4.7 Study Variables

Socio-demographic variables

- Sex, Age, Work Experience, Level Of Education, Further Training on IV-Therapy

Research variables

- Knowledge of IV-Fluid Therapy, Practice of IV-Fluid Therapy

4.8 Pilot study

The pilot study was done in Sembel Hospital in Asmara. This study was aimed at assessing the feasibility of the study, validity, sensitivity and understandability of the data collection instrument. The sample for pilot study was 10% of general study sample size.

4.9 Validity

The face and content of validity of the items that assess knowledge and practice of IV fluid therapy was be done by panel of experts in the field, from Orotta College of Medicine and Health Science, and Ministry of Health**.**

4.10 Reliability

The internal consistency of the questionnaire regarding knowledge and practice, Cronbach's alpha was computed. It was performed using Cronbach's alpha. Values that are greater than 0.6 are usually considered to be acceptable in perception related studies.

4.11 Ethical consideration

Permission for the study will be taken from the Research and Ethics Committee of Orotta College of Medicine and Health Sciences and subsequently by the Committee in Ministry of Health. Then, approval from the head departments of the OROTTA and HALIBET national referral hospital wards will be sought. Staff members will be asked to participate voluntarily through written formal consent. All nurses will be informed that they have the right to leave, if inconveniences exist. Furthermore, there will be a confirmation on confidentiality of the collected data

4.12 Statistical Analysis

Data was directly entered to SPSS (Version 25) after being cleaned properly. The descriptive analysis was performed using frequency and percentage for categorical variables. The

quantitative variables was analyzed using mean and median along with their measures of dispersion, as appropriate after checking normality. The scores of knowledge and practice on intravenous fluid therapy was computed from each nurse. To compare the knowledge and practice score across the categories of the independent variables, independent samples t-test and one-way ANOVA was used. P-value less than 0.05 was considered as significant throughout the analysis.The variables that are significant at bivariate level was further analyzed at multiple logistic regression to avoid their confounding effect. Crude and adjusted odds ratio was computed to assess the strength and direction of association.

V. ANALYSIS AND RESULTS

5.1 Socio-Demographic Characteristics

The socio-demographic characteristics of the study participants are displayed in Table 3. The median age of the nurses was 25 years (IQR=6) in which almost half (51.9%) were in the age group 25 or less. Almost seven out of ten (72.2%) of the nurses were females and median years of experience was 4.0 years (IQR=5). Most of the nurses were at diploma level (54.9%) and did not get any further IV therapy training (61.7%).

Table 3: Socio-Demographic Characteristics of the Study Participants

Variable		Frequency	Percentage
Age, years (Md=25.00, IQR=6, Min.=20, Max.=50)			
	25 or less	69	51.9
	26 or above	64	48.1
Sex			
	Male	37	27.8
	Female	96	72.2
Years of experience (Md=4.0, IQR=5, Min.=1, Max.=25)			
	5 or less	86	64.7
	More than 5	47	35.3
Educational level			
	Bachelor	8	6
	Diploma	73	54.9
	Certificate	52	39.1
Further IV therapy training			
	Yes	51	38.3
	No	82	61.7

5.2 Knowledge of Nurses on IV Fluid

The knowledge of the nurses in an item-wise is displayed in Table 4. The percentage of nurses who correctly answered that an IV fluid contains blood, fluid and solutions, only fluid and albumin were 21.1%, 95.5%, 88.7%, and 5.3% respectively. The classification of an IV fluid was correctly answered by 60.9% of the nurses. Less than half (42.9%) of the nurses were able to correctly differentiate crystalloid from colloid. More than six out of ten (63.9%) were able to correctly know the identification mechanism of type of colloid. Identification of crystalloid was correctly known by ninety percent of the nurses (90.2%). Moreover, the most physiologic IV fluid (81.2%), description of the term isotonic (79.7%), an ion not contained in RL solution (85.7%) were correctly known by almost eight out of ten nurses. Other items related to knowledge and their percentage distribution is displayed in Table 4.

Table 4: Percentage Distribution of Nurses on their Knowledge Regarding IV Fluid, Item-Wise Analysis

Question		Incorrect n(%)	Correct n(%)
What an IV fluid contains			
	Blood	105 (78.9)	28 (21.1)
	Fluid and solutions	6 (4.5)	127 (95.5)
	Only fluid	15 (11.3)	118 (88.7)
	Albumin	126 (94.7)	7 (5.3)
Classification of IV fluid		52 (39.1)	81 (60.9)
Difference between crystalloid from colloid		76 (57.1)	57 (42.9)
Identification of type of colloid		48 (36.1)	85 (63.9)
Identification of crystalloid		13 (9.8)	120 (90.2)
Know the most physiologic IV fluid		25 (18.8)	108 (81.2)
Description of the term isotonic		27 (20.3)	106 (79.7)
Knowing an ion not contained in RL solution		19 (14.3)	114 (85.7)
Most relevant IV fluid for a patient with profuse watery diarrhea		45 (33.8)	88 (66.2)
Most relevant IV fluid for a vomiting of ingested material frequently and presented to ER		106 (79.7)	27 (20.3)
Most prefered IV fluid for a patient with decreased glucose in blood and increased Na in blood		14 (10.5)	119 (89.5)
Know the human body that mainly monitor fluid balance		21 (15.8)	112 (84.2)
Manifestations of hypovolemia		42 (31.6)	91 (68.4)
Infusion rate in micro drip set		44 (33.1)	89 (66.9)
Complication of IV fluid therapy			
	Thrombophlebitis	79 (59.4)	54 (40.6)
	Infiltration	93 (69.9)	40 (30.1)
	Air embolism	54 (40.6)	79 (59.4)
	Thrombus embolism	94 (70.7)	39 (29.3)
Risk of administering reapid hypertonic solution for a patient with trauma or hyponatremia			
	Cerebral edema	25 (18.8)	108 (81.2)
	Hypokalemia	112 (84.2)	21 (15.8)
	Hypomagnesemia	9 (6.8)	124 (93.2)
	Hyperventilation	8 (6.0)	125 (94.0)
Know the sequestration of excess isotonic fluid into tissue spaces		56 (42.1)	77 (57.9)
Time the intravenous tubing should be changed to minimize the risk of phlebitis		40 (30.1)	93 (69.9)

5.3 Nurses Practice on IV fluid

The practice of nurses was collected after observing the nurses on the clinical area by the researchers. The activities or practices that they were supposed to perform were recorded one after the other to the observational checklist. The result is displayed in Table 5.

Almost ninety percent (88.7%) of the nurses were able to check physician order and nursing care plan. However, almost one fourth (27.1%) of the nurses were observed to identify, greet, introduce his/herself and explain the procedure. More than ninety percent of the nurses were observed to attach tubing to bottle solution and hang it on the IV stand (90.2%), open the regulator and removal air bubbles from the tube and close the regulator (94.7%), place to urniquet above selected site of the arm (94.0%), put on gloves, locate vein with your fingers and the site with antiseptic (95.5%),

remove tourniquet if blood comes and open regulator (97.0%) and insert cannula into the vein and observe if blood comes through the needle (99.0%).

On the other hand, less than thirty percent of the nurses were observed to assist the patient comfort position and place Rx rubber and cover under arm or under the area to be injected (21.8%), calculate drop factor and set the rate accordingly (23.3%), and return to client frequently to evaluate response and adverse reaction (29.3%).

Table 5: Percentage Distribution of Nurses' Practice on IV Fluid, Item-Wise Analysis

Observational items	Yes n (%)
Check physician order and nursing care plan	118 (88.7)
Identify, greet, introduce his/herself and explain procedure	36 (27.1)
Wash hands, before assembling equipment and supply for administering IV fluid and take it to the bed side	60 (45.1)
Check the patient card and assess patient condition in relation to the IV fluid ordered	84 (63.2)
Describe the objective of administering IV fluid	65 (48.9)
Attach tubing to bottle of solution and hang it on the IV stand	120 (90.2)
Open and clean stop per of solution bag	35 (26.3)
Assemble, equipment and supply for administering IV fluid and take it to the bed side table	111 (83.5)
Attach the IV fluid level (date, time, types of solution amount of fluid order per hour	93 (69.9)
Open the regulator and removal air bubbles from the tube and close the regulator	126 (94.7)
Attach the covered needle to tubing	87 (65.4)
Assisst the patient comfort position and place Rx rubber and cover under arm or under the area to be injected	29 (21.8)
Place to urniquet above selected site of the arm	125 (94.0)
Put on gloves, locate vein with your fingers and the site with antiseptic	127 (95.5)
Insert cannula in to the vein and observe if blood comes through the needle	132 (99.2)
Remove tourniquet if blood comes and open regulator	129 (97.0)
Calculate drop factor and set the rate accordingly	31 (23.3)
Assist client in comfortable position and ask the client for any sensations	64 (48.1)
Dispose used materials in safe disposal	103 (77.4)
Clean and return other equipment and supplies in proper place	94 (70.7)
Wash hand after procedure	40 (30.1)
Return to client frequently to evaluate response and adverse reaction	39 (29.3)
Record and report (type of solution, amount, route, site, time, response of client and any medication aid)	68 (51.1)

5.4 Composite Knowledge and Practice on IV Fluid of the Nurses

Overall knowledge of the nurses on IV and their practice scores were computed after assigning the necessary value for each item. There were a total of 18 questions resulting to 27 scores for the knowledge assessing questionnaire. On the other hand, there were a total of 24 questions resulting to 24 scores for the practice assessing questionnaire. Finally, for an ease of interpretation, the scores are transformed to percentage. After computing the total scores, the normality of the scores was checked; with skewness (kurtosis) values for knowledge and practice being -0.443 (0.781) and -0.520 (-0.212), respectively; they were taken as normally distribued.

Table 4.4 shows the summary measures of the knowledge and practice scores. The mean (SD) of

knowledge of the nurses on IV fluid was 62.29 (11.06) while that of practice was 60.03(11.95).

The result shows that six out of ten of the knowledge items were known by the nurses. Similarly, six out of ten of the practice assessing questions was being practically applied by the nurses, after being observationally measured.

Table 6: Summary Measures of the Composite Knowledge and Practice Scores of Nurses

Variable	M (SD)	Md (IQR)	Minimum	Maximum
Knowledge	62.29 (11.06)	62.96 (14.81)	25.93	88.89
Practice	60.03 (11.95)	62.50 (12.50)	33.33	83.33

5.5 Factors Affecting Knowledge and Practice on IV Fluid

The factors affecting knowledge and practice on IV fluid were determined using independent samples T-test and one way ANOVA. The results from the analysis are displayed in Table 7.

The knowledge score among nurses aged 25 or less was significantly higher than those nurses in the age group 26 or above (t-value=2.086, p=0.039). However, the categories of sex (p=0.149), years of experience (p=0.289), educational level (p=0.376), and further IV therapy training (p=0.915) did not have significantly different knowledge scores.

On the other hand, females had significantly higher practice score as compared to males by an average of 5% (t=-1.979, p=0.049). Moreover, at least one of the categories of the educational level was found to have significantly different practice score (F=4.523, p=0.013). However, practice score across the various categories of age (p=0.116), years of experience (p=0.526), further IV therapy training (p=0.791) were not significantly different.

Table 7: The Difference in Knowledge and Practice Scores Across the Categories of Demographic Variables among Nurses Who Work in Orotta and Halibet Referral Hospitals

Variable		Knowledge	Practice
		M (SD)	M (SD)
Age, years			
	25 or less	64.20 (10.26)	61.59 (12.44)
	26 or above	60.24 (11.60)	58.33 (11.26)
	t-value	2.086	1.581
	p-value	0.039*	0.116
Sex			
	Male	60.06 (10.15)	56.76 (12.16)
	Female	63.16 (11.33)	61.28 (11.69)
	t-value	-1.452	-1.979
	p-value	0.149	0.049*
Years of experience			
	5 or less	63.05 (10.82)	60.51 (13.11)
	More than 5	60.91 (11.48)	59.13 (9.54)
	t-value	0.556	0.636
	p-value	0.289	0.526
Educational level			
	Bachelor	67.59 (12.00)	48.96 (7.63)

	Diploma	61.85 (9.85)	61.76 (11.03)
	Certificate	62.11 (12.46)	59.29 (12.88)
	F-value	3.984	4.523
	p-value	0.023*	0.013*
Further IV therapy training			
	Yes	62.16 (12.27)	60.38 (10.55)
	No	62.38 (10.32)	59.81 (12.80)
	t-value	-0.107	0.266
	p-value	0.915	0.791

Post hoc test results using Least Significant Difference (LSD) method showed that nurses at degree level have significantly lower practice as compared to those at diploma level (MD=-12.80, 95% CI: -21.38, -4.22). Moreover, nurses at degree level have significantly lower practice score as compared to those at certificate level (MD=-10.34, 95% CI: -19.09, -1.59). However, nurses at diploma and certificate level had similar practice score (p=0.246). The results are displayed in Table 8.

Table 8: Post Hoc Test Result Using Least Significant Difference (Lsd) Method

Comparison	MD (95% CI)	p-value
Bachelor Vs Diploma	-12.80 (-21.38, -4.22)	0.004
Bachelor Vs Certificate	-10.34 (-19.09, -1.59)	0.021
Diploma Vs Certificate	2.46 (-1.72, 6.64)	0.246

5.6 Multi Variable Determinants of Practice Score

The factors that affect the practice score after controlling the confounding effect of each other was performed using two way analysis of variance. The two variables that were significant at bivariate level, namely, sex and educational level, were retained for multivariable analysis. The result showed that only educational level was a significant determinant of the practice score (p=0.016), but not sex (p=0.065).The results of the two-way ANOVA are given in Table 9.

Table 9: Factors Affecting Practice Score at Multivariable Level

Variable	F-value	p-value
Sex	3.47	0.065
Educational level	4.287	0.016

5.7 Correlation between Knowledge and Practice of IV Fluid

The correlation between the knowledge and practice scores was calculated using pearson's correlation coefficient, since both scores were normally distributed. The result revealed that there was no significant correlation between knowledge and attitude (r=0.016, p=0.858, n=133). Hence, the fact that they have more knowledge does not guarantee more practice by the nurses.

VI. DISCUSSION

5.8 Knowledge of Nurses on IV Fluids Therapy

The result that found on this study on assessment of nurse's knowledge regarding IV fluids is M(SD) 62.29%. The result is similar with those of recent study by Winfrindah in kenya (2021) which found that the majority of nurse knowledge is M(SD) 65%. The reason for this current result could related low educational level. The second reason could be lack of refreshing training for the staff

nurses that are organized by the Ministry of Health or the Hospital. Similar result revealed in another study by Victan (2013) in which 88.8% of nurses were having training on IV therapy were more knowledgeable than those who don't have.

5.9 Practice of Nurses on IV Fluids Therapy

In the present study, the practice regarding IV fluid therapy among nurses Orotta and Halibet referral Hospital is M(SD) 62.50%.The result was similar to another study by Sandhya and Rosy(2019) in Nepal, which found that practice was M(SD) 66.1%. The reason for this result could be the nurse were not practicing appropriate protocols in administering IV fluids. In concern with the availability of guide lines on fluids and electrolytes administration they didn't follow the protocol at the same time there were lack of adequate performance evaluation by the supervisors. Similar study done by Mohammed, Elshamy and Mohammed HAB(2015) the result revealed that the nurses were increased their performance on IV Fluids therapy administration after implementation of the procedure protocol. Second reason could be educational qualification. In contrast to this study. Another study by Bharatpur by Lamsal and Shretah (2019) revealed that the nurses practice level was M(SD) 33.9%.

5.10 Demographic Factors Affecting Knowledge and Practice on IV Fluids Therapy

This research found that there was association of knowledge with age (P=0.039). A similar finding have been reported by lamsal and shretah (P=0.012) in Chetaw. It is significantly associated with age which is consistent with the works of West Brook et.al (2011) that demonstrates 10.9% reduction in IV Therapy related nursing errors with increasing age. This indicated that nurses forget the information they acquire during nursing over time.

Educational level is highly correlated to IV fluid knowledge with Bachelor nurses scores M(SD) 67.59% but in diploma M(SD) 61.89% and certificate M(SD) 62.11%.Bachelor verses diploma (P=0.023) and this aligns with previous study by Winfrindah and Elizabeth in Kenya (2021) Bachelors M(SD) 79.7% in diploma M(SD)50.6% in certificate M(SD) 41.9%(P=0.001). The reason that reflect this consequence is in increasing level of education there is broader theoretical base followed by yearlong internship.

There was negative correlation practice with level of education and the result that revealed is bachelors M(SD) 48.96%, diploma M(SD) 61.76% and certificate M(SD) 59.29%. Bachelor verses Diploma (P=0.004) and Bachelor verses certificate (P=0.21). However another study by Chanak et al(2019) in Chetaw found that Bachelors M(SD) 80% and Diploma M(SD) 63.3%(P=0.001).

The result that found in this present study on the association of sex with practice, females had significantly higher practice score as compared with males (P=0.049). The reason may be female nurses were more cooperative than males regarding participating in research process. The result is similar with previous study was done in Basra Iraq (2022). The second reason may be by using maltivariable determinants of practice score sex is influenced by level of education so most female nurses are Diploma or Certificate.

The study revealed that there is no significant association among knowledge and practice with further IV Therapy training (P=0.915) and (P=0.791). Unlike previous study done by Lamsal and Shretah (2019) there was significant association between knowledge and in-service training which is (P=0.033). The reason may be the training is not given frequently and they were not serious about further training. Another reason could be the performance evaluation of in-service training is not done.

5.11 Correlation between Knowledge and Practice of IV Fluids Therapy

The study result reveals that no significant correlation between level of knowledge and practice. The correlation between the knowledge and practice scores was calculated using Pearson correlation coefficient, since both scores were normally distributed. The result revealed that there was no significant correlation between knowledge and practice(r=0.016, P=0.858,

n=133). Hence the fact that they have more knowledge does not guarantee more practice by the nurses. Similarly a previous study was done by Chanak Gayatri and Siddheshwar (2019) revealed that there was no significant correlation between knowledge and practice (P=0.170). The reason could be nurses don't have interest to update their knowledge through reading and studying.

VII. CONCLUSION AND RECOMMENDATION

7.1 Conclusion

The study was conducted to assess the level of knowledge and practice towards level of knowledge and practice regarding IV Fluids therapy among nurses at Orrota and Halibet national Referral Hospitals at Asmara in Eritrea. Data were collected from 133 nurses using self administered questionnaire to assess knowledge and observational check list to assess practice.

The study concluded that the knowledge and practice of nurses has no significant correlation between knowledge and practice. Hence the fact that they have more knowledge does not guarantee more practice by the nurses. The knowledge score amog nurses aged 25 or less was significantly higher than those nurses in the age group 26 or above.

The socio demographic variables (age, level of education) have significant value on the knowledge. The socio-demographic variables (Sex, level of education) has significant value on the practice of nurse. In contrast level of training does not show significant value on knowledge and practice of IV Fluids Therapy. Nursing practice and knowledge regarding IV Fluids Therapy is not satisfactory. Therefore improving nurses' knowledge and practice by instating educational program is important and in addition close monitoring and instituting motivation is important.

7.2 Recommendation

- A well-structured in-service educational programs for nurses to improve knowledge and skill on IV fluid therapy.
- Adequate supervision and support for improving skills of IV fluid therapy
- Ensure adequate supply of materials to practice safe IV fluid therapy
- Provision of the evidence based knowledge and practice of nurses regard to IV fluid therapy.

The study recommends continuing ion service program should be the success full strategies of improving knowledge and practice.

Limitation

- In this study there was constraints in time.
- This study was limited to specific departments of selected hospitals.

Implication to the field of nursing

The research findings will enable the organization to develop and organize training programs by identifying the gaps in knowledge and practices of nurses towards improving knowledge and practice among nurses IV Fluids Therapy. Efficient knowledge and good practices by the nurses can improve patient health minimize patient staying in Hospital and prevent complications related IV Fluids Therapy. Moreover, the study results will help for the further research in nursing profession.

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Appendex:- Questionnaire

Part I: Assessment of knowledge of respondents on IV Fluid Therapy.

Q101. Hospital name _____

Q102. Name of the respondent

Q103. Sex of the respondent: 1. Male 2. Female

Q104. Age of the respondent in completed years? _____

Q105. Work experience in completed years? _____

Q106. Level of education? 1. Bachelor's degree 2. Diploma 3. Certificate

Q107. Further IV therapy training? 1. Yes 2. No

Part II: Knowledge Assesment of IV-fluids Therapy

1. What is iv fluid? (multiple answer are possible)
   a. contains blood b. contains fluid &solute(ions)
   c. only contains fluid d. albumin
2. What are the clasificatin of iv fluid?
   a. B Blood & colloid b. blood & crystalloid
   c. blood, crystalloid & colloid d. crystalloid & colliod
3. What are the main diference/s of crystalloid from collid?
   a. hypertonic b. contain small molocules
   c. contain large molecule d. hypotonic
4. Which one of the folowing is colloid?
   a. RL b. NS c. dextros d. albumin e. others
5. Which one of the folowing is crystalloid?
   a. albumin b. blood c. NS d. gelatin
6. What is the most physiologic iv fluid?
   a. NS b. RL c. 3%NS d. dextros
7. Which of the folowing describe the term isotonic?
   a. a solution that has the same concentration as does blood plasma
   b. the natural tendency for substance to flow from an area of higher concentration to an area of lower concentration
   c. a solution that has ahigher concetraion of K+ than does the cell
   d. a solution that has lower concetration of Na than the cell
8. Which ion is not contained in RL solution?
   a. K+ b. Na c. Cl- d. c (carbon)
9. Patient A is presented with profuse watery diarrhea for the last 2 days what is the most indicated iv fluid for this pt?
   a. NS b. RL c. 5%DW d. DNS
10. Patient B is complaining of vomiting of ingested material frequently & presented to ER what is the most indicated iv fluid?
    a. NS 0.9% b. DNS c. RL d. NS 3%
11. When a patient presented with decreased glucose in blood & increased Na in blood then what is the most preferred iv fluid?
    a. DW b. RL c. NS d. DNS e. others

12. What are the two systems in the human body mainly monitored to assess the fluid balance?
    a. circulatory & renal b. respiratory & circulatory
    c. renal & gastrointestinal d. hepatic & lymphatic
13. All are manifestation of hypovolemia except?
    a. cold & clammy skin b. hypotension c. tachycardia d. bradycardia
14. The physician orders a continuous infusion of NS 800 ml/shift(8hour).calculate the infusion rate in macro drip set(15gtt)/ml?
    a. 25gtt/min b. 26gtt/min c. 27 gtt/min d. 28gtt/min
15. What are the complication of iv fluid therapy?
    a. thrombophlebitis b. infiltration c. air embolism d. thrombus embolism
    e. others
16. What will be the potential risk if administered rapid hypertonic solution for a patient with trauma or hyponatremia ?
    a. cerebral edema b. hypokalemia c. hypomagnesemia d. hyperventilation
    e. others
17. The sequestration of excess isotonic fluid in to tissue spaces are often referred to as?
    a. hypervolemia b. fluid retention c. dehydration d. hypernatremia
18. To minimize the risk of phlebitis the intra venous tubing (line) should be changed every _____hrs ?
    a. 10-12hrs b 12-24hrs c 24-48hrs d. 48-72hrs

Part III: Practice Check Observation List

SR. NO	Items	Yes	No
1	Does he/she check physician order and nursing care plan		
2	Dose he/she identify, great, introduce his/herself and explain procedure		
3	Does he/she wash hands, before assembling equipment and supply for administering iv fluid and take it to the bed side		
4	Does he/she check the patient card and assess patient condition in related the iv fluids that ordered		
5	Does he/she describe the objective of administering iv fluid		
6	Does he/she attach tubing to bottle of solution and hang it on the iv stand		
7	Does he/she open and clean stop per of solution bag		
8	Does he/she, assemble equipment and supply for administering iv fluid and take it to the bed side table		
9	Does he/she attach the iv fluid level (date, time, types of solution amount of fliud order per hr)		
10	Does he/she open the regulator and removal air bubles from the tube and close the regulator		
11	Does he/she attach the covered needle to tubing		
12	Does he/she assisit the patient comfort position and place Rx rubber and cover under arm or under the area to be injected		
13	Does he/she place to urniquet above selected site of the arm		
14	Does he/she put on gloves, locate vein with your fingers and the site with antiseptic		
16	Does he/she insert cannula in to the vein and observe if blood comes through the needle		
17	Does he/she remove tourniquet if blood comes and open regulator		
18	Does he/she calculate drop factor and set the rate accordingly?		
19	Does he/she assist client in comfortable position and ask the client for any sensations		
20	Does he/she dispose used materials in safe disposal		
21	Does he/she clean and return other equipment and supplies to the in proper place		
22	Does he/she wash hand after procedure		
23	Does he/she return to client frequently to evaluate response and adverse reaction		
24	Does he/she record and report (type of solution, amount, route, site, time, response of client and any medication add		