ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF EMERGENCY AND CRITICAL CARE MEDICINE

Knowledge about Transfusion safety practices and associated factors amongst nurses at Tikur Anbessa Specialized Hospital, Ethiopia

A Research Thesis submitted to the Department of Emergency and Critical Care Medicine of Addis Ababa University in Partial Fulfillment of the Requirements for the Specialty Degree in Emergency Medicine and Critical Care

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Acronyms/Abbreviations

WHO	World Health Organization
SSA	sub Saharan Africa
PRBC	packed red blood cells
PLT	platelet
SPSS	Statistical Package for Social science
VNRBD	voluntary non-remunerated blood donors
ATR	Acute Transfusion reactions
USA	United States of America
UAE	United Arab Emirates
RBC	Red Blood Cell

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Abstract

Background*:* Blood transfusion is a lifesaving therapy included on the World Health Organization list of essential medications. It is well established that nurses are leading actors of the clinical service in managing patients with blood transfusion requirement and safe transfusion practices are essential in reducing transfusion related reactions.

Objective: To assess the knowledge about Transfusion safety practices and identify associated factors amongst nurses at Tikur Anbessa Specialized Hospital, Ethiopia

Methodology: A facility-based, cross-sectional study conducted at Tikur Anbessa specialized Hospital. Data collected from 189 nurses by using a Pretested and structured self-administered questionnaire via web link after being prepared by kobotools.org. Data was entered and analyzed using SPSS version 26. Descriptive analysis is used to produce frequencies, mean and standard deviations for statistical analysis. Bivariate and multivariate logistic regression analysis were employed to determine factors associated with knowledge of blood transfusion p-value <0.25 is considered significant. Tables and figures are used to present the results.

Result: One hundred and eighty nine nurses completed the study, with 90% response rate. The Overall knowledge scores of nurses was low with a mean knowledge score of 52.4, range of 17.8-78.5.Data analysis revealed poor knowledge regarding basic blood transfusion safety principles. There were statistically significant relationships between nurse's knowledge, level of education and sex of respondents but no significant association with age, year of experience, number of transfusions and specific department.

Conclusion and Recommendation: This study has shown knowledge deficits whichhave potential implication on patient safety and reduce effective delivery of safe blood transfusion. This places patients to serious risks which can be prevented and ends with patients receiving incorrect transfusions and acquiring bacterial infections. We recommend more research to improve the studies limitations and the ongoing need on the training of the nursing staff on transfusion safety practices.

1. Introduction

1.1 Background

Blood transfusion is a lifesaving intervention where infusion of whole blood or its components into the veins of the patient takes place to improve tissue oxygenation and maintain hemostasis (1). The 1900s is taken as the era where modern blood transfusion began with identification of the ABO red cell antigen system (2). Blood transfusion can be done using any of the blood products which are whole blood, packed red blood cells (PRBCs), platelets (PLT), plasma, or plasma derivatives. In sub Saharan Africa (SSA), blood transfusion is critical to the treatment of diverse pathologies including malaria associated anemia, obstetric hemorrhage, and trauma. However, there is limited access to a safe and adequate blood supply and it remains one of the challenges in much of SSA for the safe and adequate transfusion (3).

Blood transfusion related complications had been categorized into 2 in respect to the time of the appearance of the first symptoms: acute reactions are reactions that occur during or within the first 24 h after blood transfusion is initiated, and delayed complications are type of reactions that occur after 24 hours (6).Over 5-10 % of blood and blood products may carry infective agents like viral agents (e.g. Human Immunodeficiency virus (HIV) ,Hepatitis B, Hepatitis C and Cytomegalovirus), bacterial agents (e.g. syphilis) or protozoan (e.g. Malaria).Therefore Transfusion of blood products should be taken seriously and only used when strongly indicated and safety practices should be carried out while transfusion is under taken(20)

Successful Transfusion requires that the required blood type be given to the right patient in need. Red blood cells (RBC) are indicated for patients with severe anemia to increase the oxygen carrying capacity of blood. One unit of packed RBC is expected to increase the Hemoglobin by 1 mg/dl and Hematocrit by 3% and can replace around 500 ml of blood loss in a typical adult (16) Platelet transfusion is done either prophylactically to prevent bleeding in thrombocytopenic patient or can be given to an actively bleeding patient. The decision to transfuse platelets is made based on the clinical condition of the patient and the level of the thrombocytopenia (8)

Fresh Frozen Plasma is used for bleeding from warfarin over anticoagulation if prothrombin complex concentrate is not available, for replacement of multiple coagulation factors and specific factors transfusion if not available. Cryoprecipitate is a concentrate of factor VIII, fibrinogen, Von will brand's factor, and factor XIII and indicate for the deficiency of this specific factors. (8)

WHO has structured a strategy on universal safe blood transfusion which focuses on five areas: 1) development of nationally coordinated blood transfusion services, 2) exclusive collection from voluntary non remunerated blood donors (VNRBDs), 3) quality-assured donation testing, 4) reduction of inappropriate clinical use of blood, and 5) implementation of quality standards and systems. (12)

Based on studies done in multiple regional teaching hospitals of the country in Ethiopia the most utilized blood component was the whole blood component (10, 13)

1.2 Statement of the problem

Transfusion reactions are defined as adverse events associated with the transfusion of whole blood or one of its components that happen after transfusion is initiated. Their severity may range from minor to life-threatening; these reactions can be acute or delayed and may be immunologic or non-immunologic (17).

Blood transfusion reactions can be of Hemolytic transfusion reactions, febrile transfusion reactions, Allergic transfusion reactions, Transfusion-related acute lung injury; transfusion associated circulatory overload or infectious complications (8).The majority of transfusion fatalities is due mostly to Immediate transfusion reactions caused by ABO incompatibility and are usually the result of technical errors made during the collection of blood, pre-transfusion testing, or patient identification (8)

There are differences regarding to the burden of acute transfusion reactions (ATR) in different countries. The prevalence is between 0.23% and 3.6% in Europe and other continents. The lowest prevalence is reported in the United States of America (USA) (0.23%), while the highest is found in Bangladesh (3.6%). However, the prevalence of ATR ranges from 2.6% to 5.2%, in some African countries, whereas in Ethiopia it is not well studied (1).

Adverse reactions may be seen in up to 20% of all transfusions which may vary in severity and type(8).

Most transfusion reaction related deaths resulted from acute hemolysis following the transfusion of ABO-incompatible products. Other causes of death included acute pulmonary injury, bacterial contamination of product, delayed hemolysis, damaged product, and graft-versus-host disease (5).

Immunological accidents are related more often to errors in clinical wards than to errors in the laboratory or in blood production, and errors in getting correct patient identity is the most commonly incriminated reason for this reactions. These errors also involve bedside mix-ups of blood units, misidentification of patients and absence or misinterpretation of screening for red cell antibodies and compatibility errors (7).

1.3 Significance of this study

This study is expected to contribute to improve the current knowledge regarding updated theoretical and practical aspects of transfusion safety practice of nurse's working at different departments of TASH; who are the primary participants in the transfusion of patients and early identification of ATR. This may

help to improve the overall quality of health care partly because provision of transfusion safety procedures by knowledgeable and skillful health professionals will make an important contribution to reduce avoidable death and disability resulting from the avoidable transfusion reactions.

Put otherwise, such interventions help to improve event survival, give insight to possible gaps, and identify related factors and the integration of daily clinical practice along with the current medical guidelines and applications of new technologies.

Moreover, this study can help health care policy makers to design programs that are targeted to train health care providers so that they can attain adequate theoretical and technical preparation to act in emergency situations in the correct way, which would definitely play decisive roles for the survival of the victims. Therefore, the result of this study will be useful for future planning, conducting programs, and design effective strategies on transfusion program targeted at health care providers particularly nurses. Finally, it also will serve as a baseline literature for further research undertakings related to transfusion reactions.

2. Literature review

2.1 Overview on knowledge of transfusion safety practices

A cross-sectional study done in Emirates of Abu Dhabi on 248 nurses showed that knowledge scores were low ranging from 27-56,there were statistically significant relationship between nurses knowledge and the work setting, the country of training and type of qualification.(18). In their study it was observed that nurses with Bachelor Degree in nursing and diploma in general nursing and midwifery performed better than those with Diploma in general nursing. (18)

In the survey done by Saillour-Glenisson et al. where they sampled 1090 nurses in 19 public hospitals in one French region to asses knowledge and practice of blood transfusion. Poor knowledge was reported in several areas including pre-transfusion compatibility test , delay in administering blood and recognition of abnormal reactions after blood transfusion (7).The study findings were mean hazardous knowledge score of 20.9 (median 20, SI 8.1 Range 6-61) and variables that were associated with high hazardous knowledge scores were transfusing less number of times, having little information about transfusion safety, not having received information on the role of the hospital transfusion safety committee.(7)

In a study done in Turkey, Bayraktar and Erdil on knowledge and practice of blood transfusion which took a sample of 100 nurses concluded that the nurses' knowledge was poor (only a few had

scores over 50 of a total score of 100).Knowledge deficient was identified on several aspects including knowledge on complications of blood transfusion, physical observation on initiating a transfusion and post transfusion initiation vital signs recording (17).

A descriptive study done on four hospitals in Jordan involving 345 nurses found that knowledge score was poor with mean of 51.3% .Poor knowledge was identified on the majority of nurses including aspects of pre-transfusion patient preparation, and the importance of proper patient identification. Most of the nurses reported they never received any training onblood transfusion post qualification and deficiency in orientation or training is identified as themain factor for the insufficient knowledge.
(20)

In a retrospective study done in Black Lion Specialized Hospital, Addis Ababa showed that around 361 transfusions taken place in 1 year and 856 units of blood were consumed in a year from in 2009.Whole blood was the product commonly used 85% of the time followed by packed RBCs. (16)

2.2 Conceptual framework

The conceptual framework of the study was developed after reviewing previous similar studies to conceptualize the whole research process and to aid as guide for tool development and analysis for the student researcher (18)

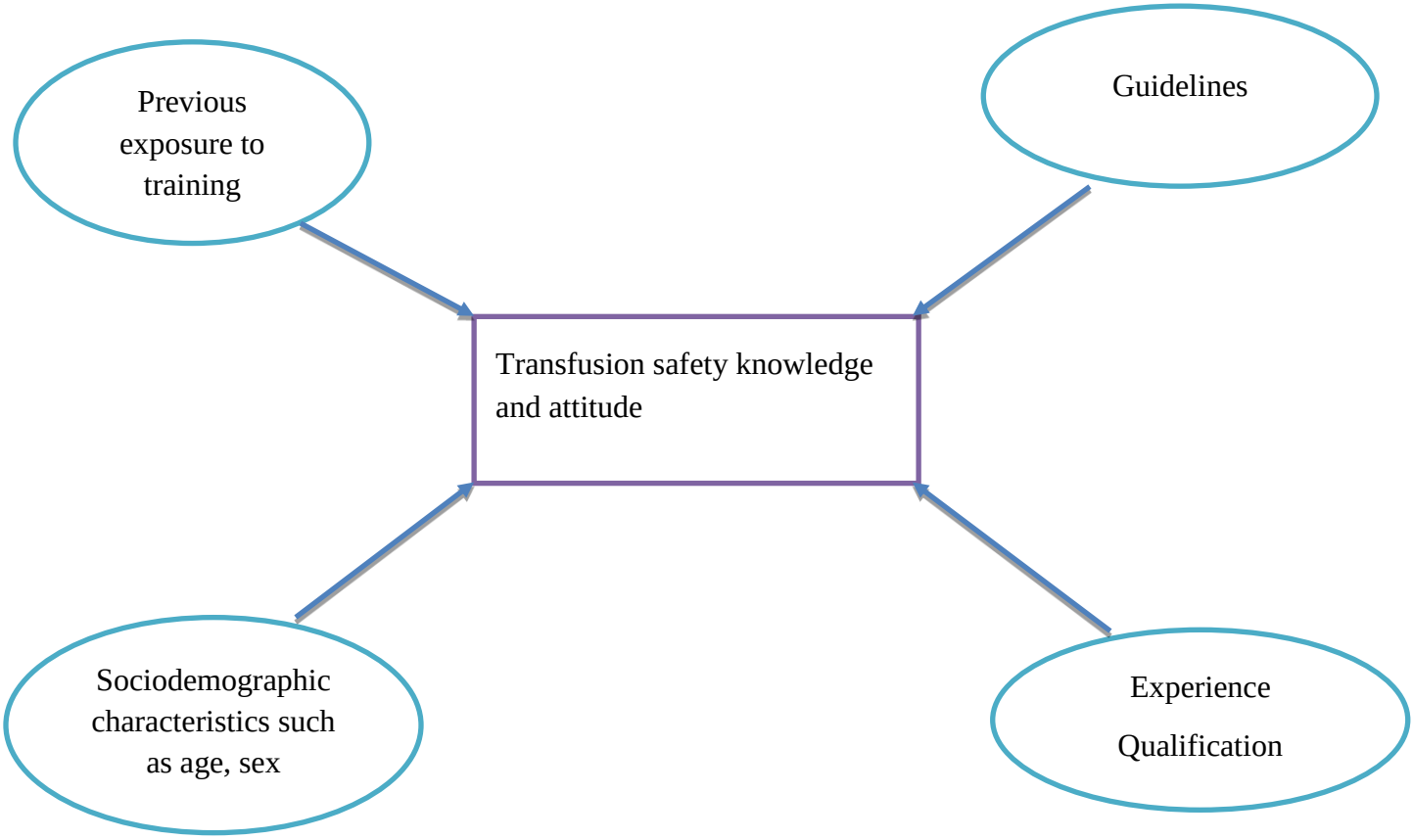

Figure 1.Conceptual framework of factors affecting knowledge, attitude and practice regarding Transfusion safety practice amongst nurses at Tikur Anbessa Specialized Hospital, Ethiopia.

3. Objective of study

3.1 General objective

- To assess the knowledge about Transfusion safety practices and associated factors at Tikur Anbessa Specialized Hospital, Ethiopia

3.2 Specific objective

- To assess the knowledge of Transfusion safety practices of nurses working at Tikur Anbessa Specialized Hospital, Ethiopia
- To determine factors associated with Knowledge of Transfusion safety practices of nurses working at Tikur Anbessa Specialized Hospital, Ethiopia

4. Methods and Materials

4.1 Study area

The study is conducted at Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia. TASH is a tertiary hospital located in the capital city of the country,Addis Ababa. It provides high level of clinical care for millions of people and training to health science students from different parts of the country and the Horn of Africa as well. The hospital has several specialty and sub-speciality Departments which deliver specialized care to over half a million patients per year. This 700-bedded hospital embodies 1121 physicians (faculties and postgraduate trainees), 394 nurses, 115 other health professionals along with 950 permanent and contract administrative staff dedicated to providing a range of health careservices.

The hospital gets blood from the central blood bank of Ethiopia, which is collected from voluntary non-remunerated blood donors (VNRBD).The blood is then stored at a refrigerator in the main laboratories blood bank until required and collected by ward or emergency personnel.

4.2 Study design

An institution-based, cross-sectional study was employed to assess the knowledge Transfusion safety practices of nurses working at Tikur Anbessa Specialized Hospital, Ethiopia.

4.3 Study period

The study period was from September 25, 2024 to October 30, 2024

4.4 Source Population

All Nurses who are directly involved in active regular clinical care working in different outlets of TASH

4.5 Study population

All nurses who are directly involved in active regular clinical care working in different outlets of TASH during the study period

4.6 Eligibility criteria

4.6.1 Inclusion criteria

- All nurses who are active elements of clinical care and who are willing to participate in the study

4.6.2 Exclusion Criteria

- Those nurses were not available during the study period (annual leave, sick leave, maternity leave and exam leave)

4.7 Sample size determination

Single population proportion formula is used to calculate the sample size for this study. Taking the proportion of nurses who had poor knowledge to be 40.8% from previous reports [7,],

$$n = \frac{z^2 p(1-p)}{e^2}$$

n = the sample size required

p = the proportion of nurses having poor blood transfusion knowledge - 40.8%

$Z_{\alpha\backslash 2}$ = the critical value at 95% confidence level = 1.96

e = precision (margin of error) = 5%

Accordingly,

$$n = \frac{(1.96)^2 * 0.408(1 - 0.408)}{0.05^2}$$

$$n = \frac{(1.96)^2 * 0.408(0.592)}{0.05^2}$$

$$n = 368$$

With a population size of 394 $n' = \frac{n}{1+\frac{z^2 p(1-p)}{e^2 \mathrm{N}}} = 190$

Hence, adding 10% non-response rate, the final sample size becomes 210

4.8 Sampling technique

The study participants were selected from each unit of the hospital by proportion to population size allocation, based on the total numbers of nurses in each unit using proportional stratified random sampling method from those who fulfill the eligibility criteria.

To determine the proportional sample=>

The average nurse population of the working unit *Total sample size (210) divided by total source population, as calculated below:

Internal medicine: $\frac{98*210}{394} \approx$ 52 nurses

General surgery: $\frac{30*210}{394} \approx$ 16 nurses

Orthopedic surgery: $\frac{12*210}{394} \approx$ 6 nurses

Surgery: $\frac{30*210}{394} \approx$ 16 nurses

GYN/OBS $\frac{36*210}{394} \approx$ 19 nurses

Pediatrics: $\frac{66*210}{394} \approx$ 35 nurses

Emergency: $\frac{78*210}{394} \approx$ 41 nurses

ICU: $\frac{74*210}{394} \approx$ 40 nurses

Then after, from each unit, nurses were recruited randomly for participation with lottery method.

4.9 Data collection tools and procedures

Structured, pre-tested self-administered questionnaire is used to collect data directly from potential . The Routine Blood Transfusion Questionnaire is used after multiple modifications were made, both closed and open ended questions are contained in this tool specifically designed for the study and adapted from previous similar studies of Bilal Hiji et al (2011) and Bilal M Hiji (2012). (18, 20) The data collection format includes questions divided into three parts (background information, knowledge of transfusion safety, and attitude towards Transfusion safety).

The questionnaire was pre-tested on 8 nurses from other hospitals and slight modifications weremade on three items, and after that two professional healthcare workers were recruited and briefed on the data collection procedure, who were made to directly observing the questionnaires being filled to overcome some issues of measurement bias

4.10 Study variables

4.10.1 Dependent variables

- Knowledge of Transfusion safety

4.10.2 Independent variables

- Number of transfusions
- Work experience
- Current working unit
- History of blood Transfusion safety training

- Nursing qualification
- Age
- Sex

4.11 Operational definitions

- **Knowledge about Transfusion safety:** study participants who answer 60% and above correct answers to the knowledge questions on blood transfusion are considered to have good knowledge, while participants who scored below 60 % were considered to have poor knowledge.

4.12 Data processing and analysis

Data entering, coding, clearing and statistical analysis was done using SPSS (Statistical Package for Social science) version 26. Frequency and cross tabulation were used to check for missed value and variables. The demographic knowledge and attitude of participants were computed using descriptive statistics such as mean, percentage, frequencies, and standard deviation and are presented using tables.

Chi-squared test was done and the variables which have significant value of 0.05 were selected and were subjected to bivariate logistic regression analysis, then important covariates were selected using P-value of < 0.25 based on Wald test from logistic regression. Then multivariate logistic regressions is used to show association between dependent and independent variables. The Hosmer and lemeshow model's goodness of fit is done.

Finally, the study finding are presented using diagrams, tables and figures. .

4.13 Data quality management

Brief training was given for data collectors and supervisors to ensure data quality. After this, the questionnaire was pre-tested on nurses from other hospital taking 5% of the total sample size a week before the actual data collection, and after gaps were identified necessary modifications were made. Data was then collected from the participants while they were in their

respective working area. The supervisor and principal investigators were strictly following the data collection process day to day by the for completeness and consistency everyday by the supervisor and principal investigators before proceeding to the analysis.

4.14 Ethical consideration

Ethical clearance and support letter was obtained from the department of ECCM and informed verbal and written consent was obtained from each participant before administering the questionnaire. The questionnaire is kept anonymous and confidential.

5.1 Results

Total of 210 invitations were sent via online web with link provided from kobo toolbox and also paper based questionnaire to all nurses at their respective workplaces of TASH. 189 nurses from 6 different departments' responded making Response rate 90% excluding pretest (6) participants.

5.2 Characteristics of study participants

Total of 189 nurses completed the questionnaire of whom most were male 110 (58.2%). Their Age ranged from 23 – 47 years old (mean 31, SD 5.09).The majority of the nurses have bachelor of nursing degree (n =145, 76.7%), and >5 years of work experience (n=131, 69.3%).

Most of the nurses were from Emergency department (n=51, 27%) and most of the nurses were found to have not received any training on transfusion safety practice (n=157,83.1%). The number of transfusion they undertake was mostly greater than 12 times over past 6months (n=69, 36.5%).

Table 1 nurses demographic characteristics

Characteristics		Mean	Number	Frequency %
Age		31		
	21-30 years		115	60.5%
	31-40 years		64	33.7%
	41-50 years		10	5.3%
Sex	Male		110	58.2%
	Female		79	41.8%
Nursing qualification(s)	Diploma		6	3.2%
	Degree		145	76.7%
	Masters		38	20.1%
year of experience	<5 years		58	30.7%
	5-10 years		89	47.1%
	>10 years		42	22.2%
Department	Orthopedics & surgery		18	9.5%
	Emergency		51	27.0%
	Internal medicine		33	17.5%
	ICU		33	17.5%
	Gynecology & Obstetrics		24	12.7%
	Pediatrics		30	15.9%
Training on blood transfusion?	No		157	83.1%

	Yes		32	16.9%
Over the past 6 months, How often did you transfuse blood?	1 to 4 times		40	21.2%
	5 to 8 times		33	17.5%
	9 to 12 times		47	24.9%
	> 12 times		60	31.7%
	Other		9	4.8%

5.3 Blood transfusion safety Total knowledge score

The overall Nurses score was computed out of 100 and the mean score was 52.4+ 13.8.Fifty nurses (26.5%) had a good knowledge score of 60% or above, while 139 (73.5%) obtaineda score of less than 60% thus having poor knowledge.

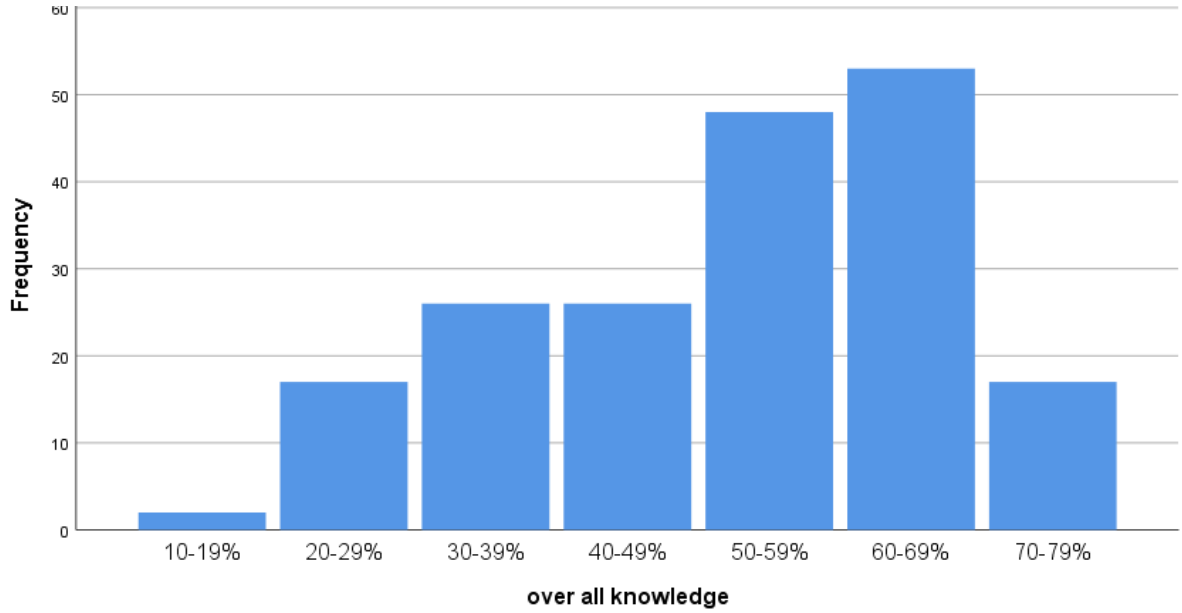

Figure 2 – Bar graph showing nurse's overall knowledge score percentage frequencies

5.4. Knowledge regarding Pre-transfusion patient management

Results of knowledge regarding pre-transfusion initiation patient management are presented in Table 2.The issue of patient preparation prior to collecting blood is where most of participants lacked knowledge. This research also show that 180 (95.2%) nurses would act on a medical order which is incomplete and not specifying the duration and amount specifically. Only 42 nurses (22.2%) had knowledge on the best practice of when to start transfusion which is immediately after the blood is collected and brought to the patient.However, 147 (77.8%) responded that they cover the collected blood with blanket, put on room temperature,immerse in hot water, or put inside arm pit.Finally, 102 nurses (54%) didn't know the best time to start transfusion while 99 nurses (52.4%)
answered correctly on the time the unit of blood could stay out of blood bank fridge.

Table 2 nurse's knowledge regarding pre-transfusion patient preparation

Question item (correct answer)	**Number of respondents**		**Percentage %**
When to check an intravenous line availability (Before the blood is collected)	Incorrect	39	20.6%
	Correct	150	79.4%
Aspects of information to patient before each blood transfusion episode? (Reasons for transfusion, the risks1, and symptoms if reactions happen)	incorrect	81	42.9%
	correct	108	57.1%
The nurse's immediate decision on incomplete order (refuse to give the blood)	incorrect	180	95.2%
	correct	9	4.8%
Baseline vital signs should be taken (Within 30' prior to transfusion)	incorrect	34	18.0%
	correct	155	82.0%
When to start Blood transfusion after delivered to ward. (Start the transfusion immediately)	incorrect	147	77.8%
	correct	42	22.2%
When to start Blood transfusion after delivered to ward. (Start the transfusion immediately)	incorrect	147	77.8%
	correct	42	22.2%

Blood bag transport method. (Validated special box)	incorrect	77	40.7%
	correct	112	59.3%
Steps for patient identification (identification details on blood bag,and the request form)	incorrect	105	55.6%
	correct	84	44.4%
Bedside identity check can be omitted. (Never)	incorrect	101	53.4%
	correct	88	46.6%
Transfusion start time after it is brought to patient side at 6:00 (6:10)	incorrect	102	54.0%
	correct	87	46.0%
Maximum duration a blood bag could be out of fridge (30minutes)	incorrect	90	47.6%
	correct	99	52.4%
Action for protection against infection of disease via blood transfusion (wear non-sterile gloves)	incorrect	92	48.7%
	correct	97	51.3%
Blood warming is indicated for. (Exchange transfusion, rapid transfusion, cold agglutinins	incorrect	146	77.2%
	Correct	43	22.8%

5.5 Knowledge regarding Post-transfusion initiation patient management

Findings of knowledge questions on post transfusion initiation patient management and related issues are presented on Table 3. The findings showed that 101 nurses (54.2%) knew the recommended activities that should be performed after initiating a blood transfusion. Majority of nurses 99(52.4%) knew about after how long a unit of blood should be completed.However 129(68.3%) failed to set manually the flow rate. Regarding the timing and duration of physical observation for transfusion reactions 134 (70.9%) answered correctly.

Table 3: knowledge regarding responsibilities after post-transfusion patient preparation

Question item(correct answer)		Count	Percentage %
When to complete a unit of blood. (4hours)	incorrect	90	47.6%
	correct	99	52.4%
Rate of transfusion on adult patient. (< 120 ml/hour)	incorrect	129	68.3%
	correct	60	31.7%
Timing of initial observation for transfusion reaction. (10-15 minutes)	incorrect	55	29.1%
	correct	134	70.9%
Manual regulation of flow rate (40 drops/minute)	incorrect	100	52.9%
	correct	89	47.1%

5.6 Complication related knowledge

Table 4 presents nurses awareness of complications. The respondents who replayed that blood,5% dextrose and lactated ringer could be given simultaneously and safely was 105 (55.6%). Very few nurses (n = 44, 23.3 %) were aware that identification error as the commonest cause of fatal transfusion reaction. On the response of nurses to the item that tested decision regarding patient who develops acute hemolytic reaction 116(61.4%) answered correctly.

Table 4 nurses knowledge scores regarding transfusion reactions

Question Item (correct answer)		Number	Percent %
Actions to minimize the development of transfusion related reactions. (compatible blood administration,initiating transfusion within 20 minutes, total duration of 4 hours, avoid incompatible drugs/solutions)	incorrect	83	43.9%
	correct	106	56.1%
Acute hemolytic reaction (AHTR) symptoms. (Tachycardia, chest pain, hypotension, nausea/vomiting)	incorrect	66	34.9%
	correct	123	65.1%
Management of AHTR. (Stop the transfusion,open vein with N/S, check vitals, notify the doctor and begin emergency treatment)	incorrect	73	38.6%
	correct	116	61.4%
Fatal transfusion reaction commonest cause. (Patient identification error)	incorrect	145	76.7%
	correct	44	23.3%
usual presenting complaint in mild allergic reaction. (Urticarial rash)	incorrect	66	34.9%
	correct	123	65.1%
First thing the nurse should do in mild allergic transfusion reaction. (Slow transfusion rate and notify the doctor)	incorrect	32	16.9%
	correct	157	83.1%
compatible agents (morphine, normal saline 0.9%)	incorrect	57	30.2%
	correct	132	69.8%
In case of co-administration of drugs incompatible with blood (stop transfusion, flush, administer drug and flush with NS)	incorrect	105	55.6%
	correct	84	44.4%
Diseases Transmitted through blood transfusion (herpes virus, Hepatitis B, Malaria)	incorrect	82	43.4%
	correct	107	56.6%
Slow blood transfusion indications. (heartdisease, severe anemia)	incorrect	124	65.6%
	correct	65	34.4%
Vital signs recording after starting a transfusion (5' ,15' , then every 1 hour)	incorrect	155	82.4%
	correct	33	17.6%

5.7 Factors associated with Knowledge of transfusion safety

Bivariate logistic regression was used to determine relationship between knowledge of pretransfusion safety practice with sex, work experience, educational level and number of transfusions undertaken over the last 6 months and statistically significant associations were found in nurses' knowledge, having p-value of < 0.25 and were subjected to multivariate analysis.

However after clearing possible confounding factors a multivariate logistic regression model showed significant association between sex of respondents (female AOR -4.840 ,95% CI-2.125-11.026, P -0.000) and Year of Experience (5 to 10 years' experience AOR-0.126,95%CI -0.046-0.344,P- 0.00 and those with > 10 years of experience AOR-0.343,95%CI- 0.067-1.764, P-0.20)

Table 5 – Logistic regression analysis showing factors associated with nurse's knowledge

Variables		**Knowledge**		**COR (95%CI)**	**p-Value**	**AOR (95%CI)**	**p-Value**
		Poor	Good				
Age	21-30	25	90	1			
	31-40	20	44	1.636 (0.821-3.262)	0.162		
	41-50	5	5	3.600 (0.965-13.428)	0.057		
Ever taking training	Yes	42	115	1			
	No	8	24	0.913 (0.381- 2.189)	0.838		
Department	Surgery	2	16	1			
	Emergency	15	36	3.333 (0.681- 16.323)	0.137		

	Internal medicine	6	27	1.778 (0.320-9.885)	0.511		
	ICU	15	18	6.667 (1.317-33.749)	0.022		
	Gynecology	4	20	1.600 (0.259-9.877)	0.613		
	Pediatrics	8	22	2.909 (0.543 -15.577)	0.212		
Number of Transfusions	1-4 times	10	30	1		1	
	5-8 times	7	26	0.808 (0.269-2.425)	0.703	0.116 (0.021-0.646)	0.014
	9-12 times	14	33	1.273 (0.492-3.292)	0.619	1.043 (0.353-3.083)	0.940
	>12 times	19	50	1.140 (0.468-2.775)	0.773	0.800 (0.285-2.243)	0.671
Educational level	Diploma	3	3	1		1	
	Degree	31	114	0.272 (0.052-1.414)	0.122	0.201 (0.021-1.906)	0.162
	Masters	16	22	0.727 (0.130-4.082)	0.717	2.542 (0.234-27.584)	0.443
Experience	≤5 years	22	36	1		1	
	5-10 yrs	12	77	0.255 (0.114-0.572)	0.001	0.126 (0.046-0.344)	0.000
	>10 yrs	16	26	1.007 (0.444-2.282)	0.987	0.759 (0.216-2.670)	0.667
Gender	Male	20	90			1	
	Female	30	49	2.755 (1.418 - 5.353)	0.003	4.840 (2.125-11.026)	0.000

6 Discussion

The study involved 189 nurses working at 6 different departments of the hospital Nurses' where most of the participants were male sex (58.2%) with majority 60.5% aged between 21 and 30 years of age. Nurses holding Bachelor's degree accounted for 76.7%, with 20.1% having master's degree and 3.2% of them had diploma and 69.3% of them having >5 years of work experience.

Data was collected using pretested questionnaire which was administered through internet using Kobo tool box and paper based questionnaire, which was subjected to measurement bias; where respondents could answer by searching from the internet and discussing within themselves. So to overcome that the data collectors were made to directly observe the respondents while they fill out the questionnaire and also to help guide during any difficulty. This was sometimes difficult as the nurses were in their work posts and could leave before completion of the questionnaire in times they were needed.

Overall knowledge scores were generally low with 26.5% of nurses having adequate knowledge. These results are worse than were reported by Khadar and Bilal Hiji (2011) where the knowledge scores were generally low and ranged from 27-56(mean 40.8, SD 5.15, CI 95%) Insufficient knowledge was attributed to level of education of the nurses and the areas of education. (18)The study found that nurses with more than 5 years of experience did not perform significantly better than the less experienced ones, which is similar to the findings in our study where nurses with less than 5 years of experience having statistically significant knowledge scores than the experienced one's. This denotes that the more experienced nurses does not necessarily have more knowledge. (18)

The number of nurses who had received in service training on blood transfusion were 157(83.7%) which is similarly reported by Belal Hiji et al. (2011) and most nurses reported there is no written transfusion policy in their respective wards (64%).

In our study there were statistically significant associations between sex of nurse's, and overall knowledge scores. Where female nurses were more likely to have good knowledge (AOR -4.84, 95%CI-2.125-11.026,p-0.000) and those with >5 years of work experience tend to have poorer knowledge (5-10 years AOR 0.126,95%CI - 0.046-0.344,P- 0.00 and > 10 years' experience AOR-0.343,95%CI- 0.067-1.764, P-0.20).

This study did not show any significant association between number of transfusions, level of education and their knowledge, even most of the respondents transfuse blood frequently their knowledge score was low; which suggest the transfusions are not being implemented as per protocol.

Proper patient identification at bedside in the transfusion process is essential to prevent new errors from happening and helps to detect that could happen. (19)problem in identification of patient is the most cause of incorrect transfusions and also transfusion reaction and related morbidity. In ourstudy 52.5% of nurses know the proper steps for patient identification which is better than studies in the UAE (United Arab Emirates).

7 Study limitations

This study used only self-administered questionnaire where the respondents could answer by discussing or using the internet. We tried to address that limitation by directly observing the respondents during submission for those that filled the questionnaire right away; but couldn't be applied for those that filled the questionnaire at a later time.

Some of the limitations are the multiple choice items can provide opportunities for guessing and the presence of the researcher could have put undue stress when the participants were completing the questionnaires.

The study was only conducted in a single hospital which is the largest teaching hospital of the country were most of nursing activities are also handled by nursing students and interns, so not including facilities of care which are not teaching hospitals could help improve the quality of this research and also for the external validity of the findings.

8. CONCLUSION

In summary, the overall knowledge on transfusion safety practices of nurses working at TASH Ethiopia is low. The results of the current study found a statistical significant relationship between years of experience, sex of respondent and overall knowledge scores.

The provision of Training regarding blood transfusion is poor where most of the nurses were not receiving in service training and there is also low provision of transfusion policy and protocols in the wards.

9. Recommendation

- The nurses have to update themselves with transfusion safety guide line to fulfil their role of insuring patient's safety while transfusing patients.
- To offer ongoing trainings and access for education to advance their education level.
- Continuous assessment CPD focusing more on the knowledge of blood transfusion
- For researchers to further investigate on the reason of poor knowledge and to give insights for policy makers.

References

1. Yalew Muche, Yemataw Gelaw, Aytenew Atnaf & Zegeye Getaneh , Blood Transfusion Complications and Associated Factors Among Blood-Transfused Adult Patients at Debre Markos Comprehensive Specialized Hospital, Ethiopia: A Cross Sectional Study, Journal of Blood Medicine 2023, 389-398
2. Ron M. Walls, Rosen's emergency medicine: concepts and clinical practice, ninth edition, Elsevier 2018
3. P. Ingrand, N. Surer-Pierres, D. Houssay, and L.R. Salmi, Reliability of the pretransfusion bedside compatibility test: association with transfusion practice and training, TRANSFUSION 1998;38: 1030-1036
4. Eleftherios C. Vamvakas1 and Morris A. Blajchman, Transfusion-related mortality: the ongoing risks of allogeneic blood transfusion and the available strategies for their prevention, Blood. 2009;113: 3406-3417
5. K. Sazama, Reports of 355 transfusion-associated deaths: 1976 through 1985, TRANSFUSION 1990;30:583-59
6. Erwin Strobel, Hemolytic Transfusion Reactions, Transfus Med Hemother 2008;35:346–353
7. F. Saillour gleinsson, s. Tricaud, S. Mathoulin pelissier, B. Bouchon, I. Galperine, P.Fielon, & L.R. Salim, Factors associated with nurses' poor knowledge and practice of transfusion safety procedures in aquintaine, France, international journal for quality health care 2002; volume 14: 25-32.
8. Tintinalli JE. Tintinalli's Emergency medicine a comprehensive study guide, 9th ed. by McGraw-Hill Education; 2020.
9. A. Weimer, C.T. Tagny, J.B. Tapko, C. Gouws, A.A.R. Tobian, P.M. Ness, and E.M. Bloch: Blood transfusion safety in sub-Saharan Africa: a literature review of changes and challenges in the 21st century, TRANSFUSION 2019;59;412–427
10. Haymanot Tewabe, Asaye Mitiku & Habtamu Worku, Assessment of Blood Transfusion Utilization and Patient Outcomes at Yekatit-12 Hospital, Addis Ababa, Ethiopia, Journal of Blood Medicine 2022, 171-180
11. M. F. Murphy, S. J. Stanworth & M. Yazer, Transfusion practice and safety: current status and possibilities for improvement, Vox Sanguinis 2011, 100, 46–59
12. WHO, Status of Blood Safety in the WHO African Region,Brazaville, 2014
13. Mahteme Bekele Muleta, Etsehiwot Haileselassie Yisak, Hana Abebe Gebreselassie, Tsega Tefera, Eden Berhanu, Adugna Lissanewerk Mekonnen, Woineshet Alaye, Gizachew Taddesse Akalu, Engida Abebe Gelan & Delayehu Bekele ,A Cross-sectional

Study to Analyze Blood and Blood Component Transfusion Practice at Tertiary Care Hospital of Ethiopia, Clinical Audit, 2021

14. Yemataw Gelaw, Berhanu Woldu & Mulugeta Melku , Proportion of Acute Transfusion Reaction and Associated Factors Among Adult Transfused Patients at Felege Hiwot Compressive Referral Hospital, Bahir Dar, Northwest Ethiopia: A Cross-Sectional Study, Journal of Blood Medicine, 2020, 227-236
15. Tufa Feyisa, Girum Tesfaye Kiya, Wondimagegn Adissu Maleko; Assessment of recipients' characteristics, transfusion appropriateness, and utilization pattern of blood and blood products in Jimma Medical Center, Jimma, Ethiopia, PLoS One. 2021
16. Melaku Tamene, Assessment of blood and blood components utilization in black lion specialized hospital, addis ababa, Ethiopia. 2011
17. Jolee T. suddock, kendall P. crookston: Transfuion reactions, 2023
18. Belal Hijji, Kader Parahoo, Mohammad Moshaddeque Hussein and Owen Barr; Knowledge of blood transfusion among nurses,JCN,2011
19. AM Harris, Guideline on the administration of blood components; British committee for Standards on hematology, 2009

19. Bilal M Hijji; Measuring knowledge of blood transfusion: A survey of Jordanian nurses,2012
20. Ivy,ekhem; National Guidelines for the clinical use of blood and blood products: National blood service, Ghana; 2013

Annex

Annex I: Information sheet

Addis Ababa University

Department of Emergency & Critical Care Medicine

What follows is a questionnaire that will be used to assess the knowledge, attitude, and practice of Transfusion safety practices amongst nurses working at TASH.

I, undersigning this document, am giving my consent to participate in the study entitled as ―assess the knowledge about Transfusion safety practices and associated factors amongst nurses working at TASH, Addis Ababa, Ethiopia. I have been informed that the purpose of this study is to assess the knowledge of transfusion safety practice of nurses working at TASH, Addis Ababa, Ethiopia. I have understood that participation in this study is entirely voluntarily. I have been told that my answers to the questions will not be given to anyone else and no reports of this study ever identify me in anyway. I have also been informed that my participation or non-participation/my refusal to answer questions will have no effect on me. I understood that participation in this study does not involve risks. I understood that Dr. Natnael Nebro is the contact person if I have questions about the study or about my rights as a study participant.

- ✓ Do you have any question?
- ✓ □ Do I have your agreement to precede? If yes ……Continue

  If no ……..Stop

Annex 2: English Version Questionnaire

001. Data collector: code ____/___/___ Name _____

002. Date of data collection ____/___/____ Time _____

003. Checked by supervisor: Signature _____day _____month _____ year____

004. Serial number_____

I. Background data

101. Age_____

102. Sex: □□Male □□Female

103. What nursing qualification(s) you hold?

a. Diploma in general nursing and midwifery b. Bachelor of nursing degree

c. Master's degree d. Other (please specify) _____

104. Year(s) of work experience: _____

105. What department are u in? □Internal Medicine □Emergency Medicine □General surgery □ Pediatrics □Gyn-Obs □Orthopedics

□Other (specify _____

106. Have you ever taken training on blood transfusion □Yes □ No

107. Have you ever transfused blood: □Yes □ No

108. How often do you transfuse blood over last 6 months?

□ 1 – 4 times □ 5 – 8 times?

□ 9 - 12 times □ >12 times

□ Other (specify) _____

II. Knowledge and practice questions

201. The nurse assigned to a patient in need of transfusion should check the availability and patency of an intravenous access line -

□ After bringing the blood to the ward.

□ Before bringing the blood to the ward.

202. Do you obtain informed consent?

□ Always □ Never □ often □ Other If other specify _____

203. On what issues should the patient be informed before each blood transfusion episode? (Choose THREE answers only).

a. Reasons for the blood transfusion

b. Management of acute transfusion reaction

c. Risks of blood transfusion

d. Reaction symptoms

e. Possible consequences of rejecting to have the transfusion

204. What should be the nurse's immediate decision on physician's order of give 1 Unit of packed cells IV?

□ collect the blood and clarify the order with the physician prior to administration

□ seek assistance from the head nurse/nursing supervisor

□ collect blood and transfuse the patient

□ Refuse to collect and administer blood

205. When collecting blood from the blood bank, what information should a nurse have to ensure that he/she is collecting the right blood for the right patient (Choose ONE answer only):

a. If the patient's identification details are identical on the blood bag label and blood request form, then collect the blood.

b. If the patient's identification details mentioned above are the same on the blood transfusion compatibility report form and those on the blood request form, then collect the blood.

c. If the patient's first, second and third name are identical on the blood bag label and blood request form, then collect the blood.

d. If the patient's identification details are the same on the drug chart and request form, then collect the blood.

206. A 40-year-old patient admitted for blood transfusion. His blood group is A Rh D positive. On collecting the blood from the blood bank, a nurse noticed that the unit is A Rh D negative. What action should he/she take first provided that the collected blood is compatible with the patient blood? (Choose ONE response only).

a. Inform the doctor

b. Transfuse the unit after checking details

c. Check details with another nurse- then transfuse the unit

d. Refuse to transfuse the unit

e. Initiate the transfusion, but observe and monitor the patient closely

207. Which method should the nurse use to transport blood from blood bank to ward? (Choose ONE answer only)

a. A validated blood transport box

b. A clean stainless steel ward tray with cover

c. A clean kidney basin with cover

d. A clean plastic bag or a plastic tray e. A super-cooled cubed ice

208. In the ward after obtaining a blood bag, how would you handle the blood? (Choose ONE answer only).

a. Wrap the unit with a blanket or bed sheet

b. Allow blood to wait in room temperature

c. Immerse the unit in hot water

d. Commence the transfusion immediately

e. put inside armpit

207. Before administering blood, when is it acceptable NOT to check patients' details at the bedside? (Choose ONE response only)

a. Nurse clearly knows patient

b. Patient is unconscious

c. Never

d. Patient is barrier nursed

208. A patient is ordered a blood transfusion. The blood was delivered to the ward at 6:00 hours. What is the best time by which the transfusion should start? (Choose ONE answer only).

a. 6:10 hours

b. 6:20 hours

c. 6:30 hours

d. 6:40 hours

209. What is the maximum time a unit of blood could be out of blood bank fridge before starting the transfusion?

a. 10 minutes

b. 20 minutes

c. 30 minutes

d. 40 minutes

210. Which action should a nurse perform for protecting herself/ himself against infection of disease via blood transfusion? (Choose ONE answer only)

a. perform proper hand washing

b. wear non-sterile gloves

c. put on protective gown and mask

d. use sharps container

e. use antiseptic solution

211. An adult patient, 15 minutes after the initiation of the transfusion, had 300 ml remaining in the blood bag. How many drops/minute should he receive to consume this amount in two hours. (Choose ONE answer only)

a. 40 d/min b. 45 d/min c. 50 d/min d. 55 d/min e. 60 d/min

212. An adult patient is to receive 1 unit of packed red cells. The unit has been removed from the blood bank at 4 PM. Under normal conditions, the unit should be completely transfused NO later than: (Choose ONE answer only)

a. 6 PM b. 7 PM c. 8 PM d. 9 PM

213. For which patient is slow blood transfusion should be considered? (Choose THREE answers only)

a. Patients with heart disease

b. Patients with renal failure

c. Older patients

d. Patients with severe anemia

e. Patients with CVA

214. Specify which ones of the following solutions/agents could be safely mixed with transfusion of packed red blood cells. (Choose TWO answers only)

a. 5% Dextrose water

b. Normal saline 0.9%

c. Morphine 10 mg/ml in normal saline

d. Lactated Ringer

215. While receiving blood, a patient developed a sudden onset of pulmonary oedema, manifested by dyspnea. His physician ordered Frusemide (Lasix) 40 mg IV stat. What should be done to administer the drug through the blood transfusion line as the patient has NO other access line? (Choose ONE answer only).

a. Stop the blood, administer the drug then restart transfusion

b. Do not stop the transfusion; administer the drug slowly diluted with 10 ml of 0.9% Normal Saline.

c. Stop the blood, flush with normal saline, administer the drug and flush with normal saline.

d. Stop the blood, flush the line with normal saline, administer the drug and restart the transfusion

216. 1. What interventions could minimize the risk of the patient experiencing acute transfusion reaction? (Choose FOUR answers only)

a. Administration of blood that is compatible with that of the recipient.

b. Starting the transfusion within 20 minutes after collection from blood bank

c. Starting the transfusion within 40 minutes after collection from blood bank

d. Administering a unit of blood to the patient within four hours after collection

e. Taking history from the patient

f. Not transfusing together drugs or solutions that are incompatible with blood

g. Stopping blood if there are signs and symptoms of transfusion reaction

217. What may happen to a patient if rapid (>50 ml/kg/hour.) administration of cold blood is performed through a central venous route terminating in or near the right atrium? (Choose ONE answer only)

a. Post transfusion purpura

b. Cardiac arrhythmia.

c. Acute intravascular hemolytic reaction

d. Transfusion associated acute lung injury

218. What signs and symptoms indicate the patient is developing an acute hemolytic transfusion reaction? (Choose FOUR answers only)

a. Leg pain b. Tachycardia c. Chest pain

d. Bradycardia e. Hypotension f. Fever

g. Shallow slow respiration h. Nausea/vomiting I. Cold clammy skin

219. What should be done IMMEDIATELY when signs and symptoms of acute hemolytic transfusion reaction mentioned in question 4 are seen? (Choose FOUR answers only)

a. Stop blood transfusion

b. Notify the blood bank

c. Keep vein open with 0.9% normal saline

d. Inform nursing supervisor

e. Check patient's vital signs (Temp., BP, pulse, resp. rate).

f. Write an incident report

g. Notify the doctor and begin emergency treatment according to medical order

221. From the list below, identify THREE diseases that could be caused through blood transfusion.

a. Herpes virus

b. Leukemia

c. Chronic inflammatory disease

d. Hemophilia

e. Hepatitis B

f. Malaria

220. A patient has sustained a mild allergic transfusion reaction. What is the usual presenting complaint? (Choose ONE response only)

a. Pain in the arm

b. Loin pain

c. Urticarial rash

d. Drop in BP

e. Mild dyspnea

221. What action should be taken FIRST to handle the patient's condition in question 11? (Choose ONE response only)

a. Stop the transfusion and notify the doctor

b. Notify the doctor and slow the transfusion rate

c. Slow the transfusion rate and notify the doctor

d. Check the patient's vital signs and notify the doctor

e. Notify a senior nurse

224. What is the commonest cause of the most fatal transfusion reactions? (Choose ONE response only)

a. Warming blood to more than 37 C

b. Error in blood bank testing

c. Antibodies in Rh system

d. Identification error of patient

225. When and at what intervals, should vital signs of the patient be checked and recorded during transfusion PROCEDURE? (Please be PRECISE)

1. _____

2. _____

3. _____

4. _____

301. Is there a written policy for the administration of blood in your ward?

a. Yes b. No c. I do not know

30 2. If yes, have you read the policy?

a. Yes b. No

Declaration

This is to certify that the thesis entitled "A cross-sectional study on knowledge about transfusion safety practice and associated factors of nurses at TASH, Ethiopia" by Dr. Natnael Nebro for partial fulfillment of the requirement for the degree of specialty certificate of Emergency and Critical Care complies with the regulations of the university and meets the accepted standards concerning originality and quality which was carried out under advisors Dr. Sophia Kebede, and Dr. Meron Tesfaye

Advisors' Name:	Signature	Date
Dr. Sophia Kebede	_____	_____
Dr. Meron Tesfaye	_____	_____