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Impact of Training to Improve Knowledge on Blood Transfusion among Health Care Providers from Tertiary Hospitals in Tanzania

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Abstract

Background
Blood transfusion is a lifesaving therapy which is linked to the adverse outcome when given inappropriately. Inadequate knowledge and skills among health care providers have been reported to contribute to safety issues for recipients and wastage of the precious resource. This study was conducted to determine the impact of training of health care providers in Tanzania on improving the knowledge regarding the transfusion of blood and blood components**.**

Methodology
This was a cross-sectional study which used secondary data from pre and post training assessment questionnaire whereby trainees answered the same set of questions before training (pre-test) and after training (post-test). The questionnaire consisted of two Likert scale questions and eight YES/NO questions which assessed the perception of clinicians, nurses and Laboratory personnel on blood transfusion practices. Moreover, there were thirty multiple-choice questions for assessment of basic knowledge related to usage of blood and blood components**.**

Results
One hundred and eleven (111) health care providers who attended training on blood transfusion were recruited into this study, out of which 72.1% (80/111) were from secondary health care facilities and 6.3% (7/111) were from tertiary health care facilities. The pre-test mean percent score was 32.8% (SD ±12.9%), while the post-test mean percent score was 56.6% (SD ±12.9%). The mean percentage of knowledge gain was 26.6% (SD±13.0%) and 27.1% (SD±12.5%) for health care providers and National Blood Transfusion Service staff respectively. It was observed that only 25.8% (24/93) and 19% (19/100) of participants were aware of the transfusion timing of various blood components and principles of platelet transfusion, respectively. Regarding bedside blood handling practices, only 52.9% (46/87) responded, 'warm whole blood unit and packed red blood by putting under room temperature for 30 minutes and the majority of participants 63.1% (65/103) reported not to ask for consent before blood transfusion.

Conclusion
There was a modest improvement in the knowledge on blood transfusion practice among participants. The overall performance of participants increased from 33% in the pre-test to 57% in the post-test. Therefore, this study has shown the positive impact of training for health care providers in improving their knowledge. We recommend regular on job training courses and mentorship program for health care providers for proficiency in clinical transfusion practice.

Key words: Blood Transfusion, Training and Health care providers.

Introduction

Transfusion of blood and blood components is one of the most common medical procedures in the developing world, including Tanzania (1). Adequate knowledge regarding indications, requisition, handling, storage, and transfusion of blood components is a prerequisite to ensure safe transfusion practices (2).

Health care providers' knowledge about blood transfusion has been demonstrated to have a significant impact on their approach towards blood transfusion, especially the management of the patients receiving blood and its products (3). Poor knowledge among health care providers including clinicians, nurses and laboratory technologist can lead to unwarranted adverse consequences to recipients (2). The risk of transfusion transmissible infections (TTIs), transfusion reactions and immunomodulation is of particular concern. Thus, it represents reasons to promote the judicious use of blood and blood components (4–6).

Lack of knowledge regarding transfusion medicine among health care providers is one of the significant obstacles for better and consistent transfusion practices, and education of end-user could close the gap and improve quality of transfusion (7). Training of health care providers has proved to be useful in promoting safe practice and improving quality of national blood transfusion programs (8). The study aimed to assess the impact of training on enhancing knowledge on blood transfusion among health care providers from tertiary hospitals in Tanzania.

Methodology

Study design

This was a cross-sectional study which used secondary data from pre and post-tests whereby trainees answered the same set of questions before training (pre-test) and after training (post-test).

Study setting

National Blood Transfusion Service organized a training workshop among health providers on appropriate use of blood and blood components, which was conducted in Morogoro from 25th to 31st August 2019 heath care providers. In order to assess the basic knowledge of the participants pertaining to principles of blood transfusion practices, a pre-training test was distributed to the participants. This pre-test was carried out using structured questionnaire prepared to assess knowledge, perception and practice of participants. The questionnaire consisted of two Likert scale questions, eight YES/NO questions to assess perception and practice of participants and thirty (30) multiple-choice questions were set to assess the knowledge of participants. Each correct answer was awarded 1 point and wrong answer was awarded 0 point.

The training was based on appropriate use of blood and blood components and was delivered through didactive sessions, role-plays and hands-on activities using standardized training tools such as training slides and blood transfusion guidelines and protocols. Topics covered during training were; requisition, handling, proper patient identification and storage

of blood and blood components, blood component indication, pre-transfusion bedside check list as well as transfusion reactions and their management. After the training, a post-test was administered to participants using a questionnaire with the same set of questions which were administered during a pre-test.

Sample size

A total of 111 health care providers (Medical Specialists, Medical Doctors, Nurses and Laboratory Technologists) from Zonal Referral hospitals, Regional Referral hospitals and National Blood Transfusion Service were invited to attend the training. All 111 participants were included in the study.

Inclusion criteria

All health care providers who attended the training and attempted both pre and post-test were included in the study.

Exclusion criteria

Participants of the training who did not attempt either pre and post-test or both tests pre and post-test were not included in the study.

Data analysis

Data analysis was performed using the Statistical package for Social Sciences version 18.0 (Chicago, IL, USA). Descriptive analysis was done to describe blood transfusion practices and knowledge among health care providers. Continuous variables were summarized into mean and standard deviation. Categorical variables were compared using a Chi-square test, while the Fischers' exact test was used to compare the percentages between groups. Comparisons of means between groups were performed using student t-test. The correlations between knowledge score and other factors were determined using Pearson test. Statistical significance was set as at 0.05. For the Likert scale questions, their coefficient of reliability was estimated using Cronbach's alpha. Factors whose coefficients of reliability were below 0.80 were dropped.

Ethical consideration

Permission to use data collected during the training was obtained from National Blood Transfusion Service authority. All the questionnaires were filled anonymously, and no identifiable information was included. Each participant was assigned a unique identification number which was not linked to a participant's personal information. This study involved data that was primarily collected during the training where participants were requested to attempt pre and post-tests as part of the training.

Results

Demographic characteristics of the participants

One hundred and eleven (111) health care providers participated in the training, 72.1% (80/111) were from secondary health care facilities, and 6.3% (7/111) were from tertiary health care facilities. Forty-seven 42.4% (47/111) participants were laboratory personnel and 25.2% (28/111) were nurses. The median duration of practice was ten years (range 4 to 18 years), with more than half 51.9% (55/106) of the participants having practised for more than ten years. Three-quarters of the participants 75.0% (78/104) had no training on blood transfusion (Table 1).

Table 1: Distribution of participants by profession and level of facility

Characteristics	n	%/IQR
Level of the facility (N=111)		
Tertiary health care	7	6.3
Secondary health care	80	72.1
National Blood Transfusion Service	24	21.6
Profession (N=111)		
Doctor	36	32.4
Laboratory personnel	47	42.4
Nurse	28	25.2
The median duration of practice (IQR)	10	(4-18)
Duration of clinical practice (N=106)		
<5	30	28.3
5-10	21	19.8
>10	55	51.9
Period of training on Blood transfusion (N=104)		
Yes	26	25.0
No	78	75.0

Assessment of knowledge on blood transfusion:

Out 111 participants who attended the training, more than three quarters 78.4% (87/111) were from tertiary and secondary hospitals while the remaining were from NBTS. Of those who attended training, 98.2% (109/111) attempted pre and post-tests. The pre-test mean percent score was 32.8% (SD ±12.9%), the minimum and maximum pre-test percent score

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was 6.4% and 61.3% respectively. The mean percent score in the post-training assessment was 56.6% (SD ±12.9%), the minimum and maximum post-test percent score was 23.3% and 83.3% respectively. The knowledge gain (difference in means between post & pre-score) was 23.8 % (SD±13.5%), p<0.0001, (Paired-t-test) **(Figure 1).**

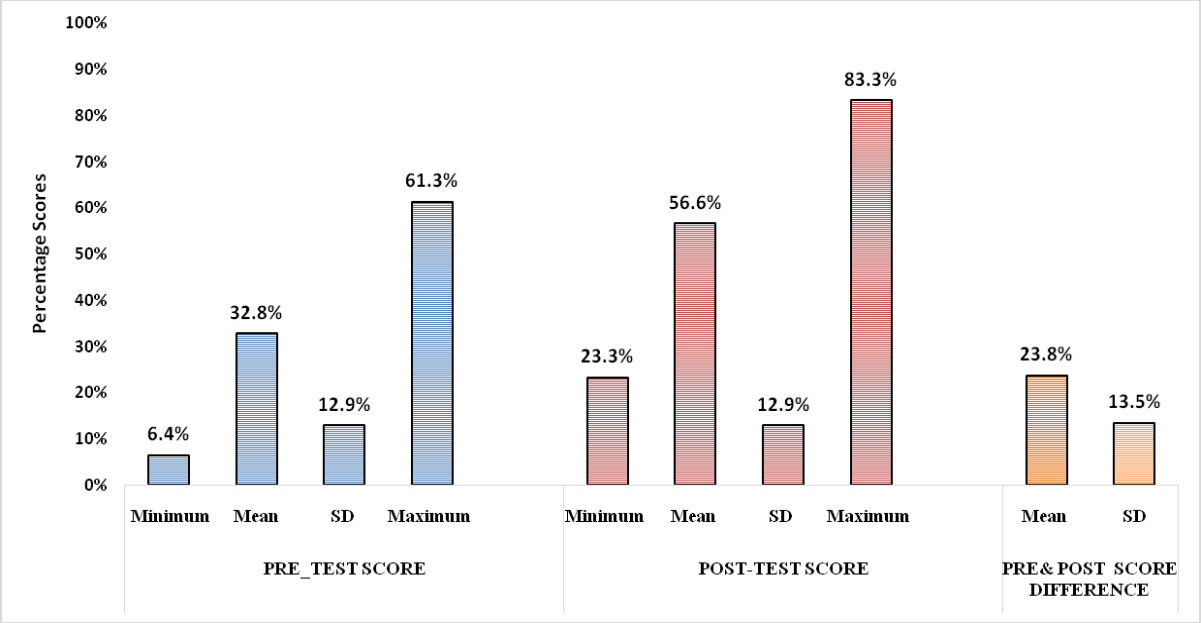

Figure 1: Overall percentage score of the participants in the Pre and Post-Training Test (N=109)

There was a significant difference in mean of percentage scores between pre and post-test by different participant characteristics such that, by the level of facility the mean percentage of knowledge gain was 26.6% (SD=13.0%) (p=0.0020) among the tertiary healthcare, and among National Blood Transfusion Services staff was 27.1% (SD=12.5%): p<0.0001. Mean percentage knowledge gain among doctors was 22.1% (SD=13.6%); p<0.0001, and among laboratory personnel mean percentage knowledge gain was 28.4% (SD=12.7%); p<0.0001). The contribution of several years of practice someone had was associated with mean percentage scores. Such that, those who had less than five years of practice had mean percentage knowledge gain of 26.6% (SD=14.5%); p<0.0001 and those who had more than ten years of practice had mean percentage gain of 24% (SD+12.6%) ;p<0.0001 (Table 2).

The set of 30 questions were pooled from factor analysis and checked for their internal consistency coefficient. Questions with high (α=0.85) and related theme were grouped and analyzed.

On evaluation of the responses of the participants about knowledge on blood transfusion practices, it was observed that during pre-training assessment participants had low knowledge on dosage of blood components, timing and infusion rate, principles of platelets transfusion and autologous donation by 48.4% (46/95), 25.8% (24/93), 27.3% (27/99) and 19% (19/100) respectively. Post-training, the knowledge increased to 64.5% (69/107), 73.6%

(78/106), 56.5% (61/108) and 39.3% (42/107) respectively. The difference between pre and the post-training score was statistically significant. p<0.0001: (Paired-t-test) (Table 3).

Table 2: Difference in Mean percentage of scores between pre and post-training by participants' characteristics (N=109)

Characteristics	n	Pre-Training Mean(sd)%	Post-Training Mean(sd)%	Difference in Mean (sd)%	Paired t-test P-value
Level of facility					
Tertiary health care	6	32.2(15.9)	58.9(9.8)	26.6(13.0)	0.0020
Secondary health care	79	31.9(11.5)	54.4(13.2)	22.5(13.7)	<0.0001
NBTS	24	36.1(3.4)	63.2(9.8)	27.1(12.5)	<0.0001
Profession (N=109)					
Doctor	35	39.5(12.7)	61.6(8.7)	22.1(13.6)	<0.0001
Laboratory personnel	46	30.8(13.2)	59.1(11.7)	28.4(12.7)	<0.0001
Nurse	28	28.1(9.8)	46.2(13.4)	18.1(12.3)	<0.0001
Years of practice (N=105)					
<5	30	30.4(11.2)	57.0(2.0)	26.6(14.5)	<0.0001
5-10	20	34.8(13.0)	54.8(9.2)	20.0(14.8)	<0.0001
>10	55	32.7(13.7)	56.7(15.0)	24.0(12.6)	<0.0001

Table 3: Knowledge on blood component dosage, storage, administration and autologous donations

Questions	Pre Training Assessment			Post Training Assessment			z-test P-value
	n	Correct n (%)	Incorrect n (%)	n	Correct n (%)	Incorrect n (%)	(diff-test>0)
Blood component dosage	95	46(48.4)	49(51.6)	107	69(64.5)	38(35.5)	0.0107
Blood component storage	99	48(48.5)	51(51.5)	108	91(84.3)	17(15.7)	<0.0001
Timing and infusion rate of blood components	93	24(25.8)	69(74.2)	106	78(73.6)	28(26.4)	<0.0001
Fluids that can be given concurrently with PRBCs	98	38(38.8)	60(61.2)	109	78(71.2)	31(28.4)	<0.0001
Principles of autologous donations	99	27(27.3)	72(72.7)	108	61(56.5)	47(43.5)	<0.0001
Principles for platelet transfusion	100	19(19.0)	81(81.0)	107	42(39.3)	65(60.7)	0.0007

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Assessment of blood transfusion practice

A total of 87 participants responded to questions for bedside blood handling practice. Regarding warming of blood prior blood transfusion, 23.0% (20/87) and 24.1%(21/87) reported to warm whole blood unit and packed red blood cell by putting a blood unit in a water bath and under linen/clothes of patients respectively. In comparison, 52.9% (46/100) responded to warm whole blood unit and packed red blood by putting under the room temperature for 30 minutes. Regarding warming practice of fresh frozen plasma, only 47.1% (41/87) responded to use a water bath. It is recommended an issued blood unit issued from blood bank to the ward, if unused must be returned within 30 minutes. The current study shows a 40.2% (35/87) of the participants do not adhere to this recommendation. Among 103, who responded to time spent from dispatch of blood to commencement of transfusion, more than half 56.3% (58/103) reported spending less than one hour. Furthermore, at least more than three quarters 63.1% (65/103) of participants reported seeking informed consent before transfusing the patients within their facilities (Table 4).

Table 4: Bedside blood handling practices

Description of Bedside Transfusion Practice	Frequency	% of Respondents
Warming whole blood/PRBC unit before to transfusion N=87		
Put a unit in a water bath at 37°C	21	24.1%
Put a unit under linen/clothes of the patient	20	23.0%
Put a unit at room temp for 30 minutes	46	52.9%
Warming FFP unit prior transfusion N=87		
Put a unit in a water bath at 37°C for 30 minutes	41	47.1%
Put a unit at room temp for 30 minutes	46	52.9%
Return unused blood to a blood bank in 30min, N=87		
YES	52	59.5%
NO	35	40.2%
Time spent from dispatch of blood to commencement of transfusion N=103		
Less than 1 hour	58	56.3%
1-2 hours	37	35.9%
More than 2 hour	8	7.8%
Time to transfuse one unit of packed red cells or whole blood unit N=103		
Up to 4 hours	92	89.3%
More than 4 hours	11	10.7%
Obtain informed consent prior before transfusion? N=103		
YES	65	63.1%
NO	38	36.9%

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The set of questions were pooled from factor analysis and checked for their internal consistency coefficient and was found to be high (α=0.85). Less than or equal to three quarters [median score=5 (IQR: 4-5)] of responses STRONGLY AGREED that low haemoglobin level increases likehood of ordering blood in their facilities. Less than or equal to a quarter [median score=2(IQR: 1-2)] of responses STRONGLY DISAGREED that increased blood bags availability increases likehood of blood ordering within their facilities (Figure 2).

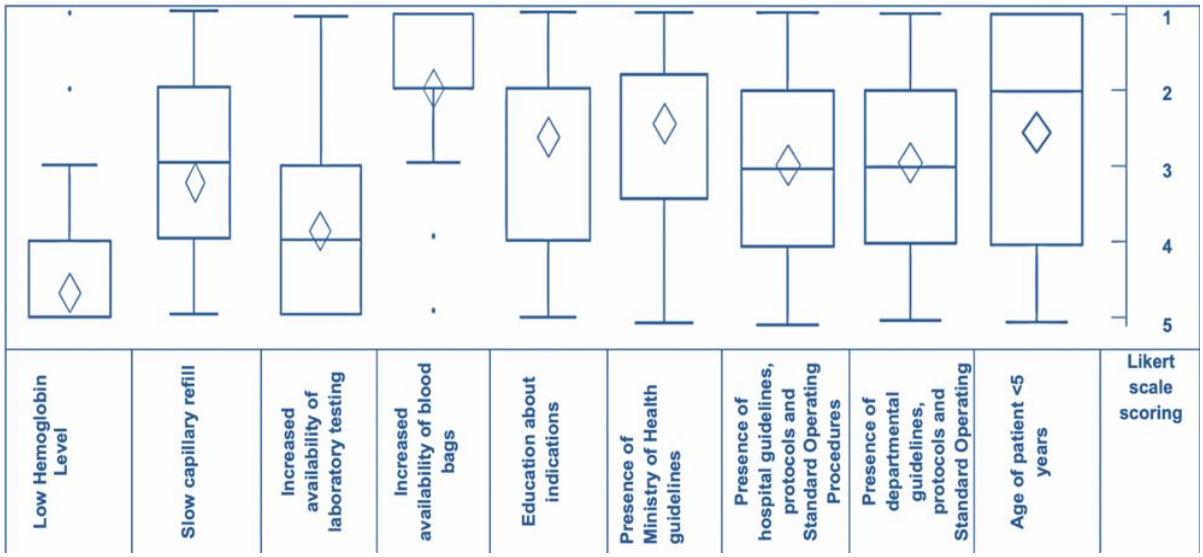

Figure 2: Boxplot of responses from the factors which by participants' opinion were reported to increases the likelihood of ordering blood for transfusion. 1- STRONGLY DISAGREE, 2 DISAGREE, 3- NEUTRAL, 4- AGREE 5 - STRONGLY AGREE

Discussion

Safety of blood transfusion is a crucial aspect to be considered when providing this life-saving treatment. Safety is determined to a large extent by knowledge and skills of health care providers. Having well trained and informed health care providers ensure minimal wastage of blood and its products which are a precious and scarce resource. This study determined the level of knowledge and practice of health care providers before and after training. Inadequate knowledge of blood transfusion has been widely reported and may contribute to a significant adverse outcome for recipients (9,10).

In this study, the performances of participants in the pre-test assessment on the knowledge regarding blood transfusion practice were mean percent score of 33%. This is consistent with other studies conducted in both developed and developing countries (11–14). Koren et al. reported poor knowledge of red blood cell transfusion among physicians in a survey conducted in Israel, which documented a mean score of 47%(0-100) (9). These findings highlight the challenges facing the practice of transfusion of blood and its products.

Blood transfusion practice of participants was noted to have serious concerns, one of which is lack of consent before transfusion. Majority of participants (63%) reported not to ask for informed consent prior to transfusion. Obtaining consent is usually accompanied by provision of relevant information to recipients, including anticipated complications. Similar findings were reported by Saptoka et al. In a study conducted in Nepal in which only 8.2% of blood recipient was informed about reasons for transfusion and 2.4% were informed on risks of blood transfusion before receiving the treatment (10). In a study conducted in Uganda, only 25% of participants reported obtaining consent before transfusion (14).

Three days of training on several aspects of blood and blood components transfusion was provided to all participants and post-training evaluation was conducted using the same questions administered before training. There was a modest improvement in the performance of participants. Kaur et al reported the impact of training on health care provider's knowledge on transfusion among medical doctors with increase 34% (2). This underscores the importance of regular in-service training for health care providers.

This study evaluated the knowledge and practice of participants and the role of training among participants. One of the limitations of this study is the possibility of participants not reporting on their actual practices, which could result in over-reporting of the desired practice.

Conclusions and Recommendation

There was a modest improvement in the knowledge on blood transfusion practice among participants. We recommend regular on job training courses and mentorship program for health care providers for proficiency in clinical transfusion practice.

Competing interests

The authors declare that they have no competing interests

Funding

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Authors' contributions

AJB, OM, WIM, EM, IN, FFF and MAL prepared the training material, conducted the training and prepared the assessment tools. AJB and WIM processed the data and analyzed the data. FFF wrote the draft of the manuscript. All authors read and approved the manuscript.

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