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ORIGINAL ARTICLE

Influence of Education on Knowledge and Perception of Precautions in Blood Transfusion among Nurses in a Tertiary Care Hospital in Coastal Karnataka

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ABSTRACT

Introduction and aim: Nurses play a crucial role in blood transfusion. Nurse's knowledge about the precautions taken during blood transfusion is not appreciable in earlier literature. Thus, the present study was aimed at assessment and evaluation of the level of knowledge among nurses of our hospital as regards the various precautions to be taken in blood/component transfusion. **Materials and methods**: This interventional cross sectional study was conducted among 100 nurses of the tertiary care hospital attached to Kanachur Institute of Medical Sciences. Institutional ethics committee clearance was obtained prior to the study. The knowledge and awareness of nursing staff was evaluated by a self-administered questionnaire which had two components – demographic details and 20 knowledge questions. Pre-test and post-test responses were collected before and after the educational intervention by the principal investigator. SPSS 28 software was used for data analysis. Qualitative variables were presented as frequency and percentage. Quantitative variables as mean + or - SD. Chi square test was used to find the association between the variables. P – Value < 0.05 was considered statistically significant. **Results**: Majority of nurses of the present study did not have knowledge about certain theoretical aspects of blood transfusion such as number of lives that can be saved by one unit of blood, time interval between two successive blood donations, volume of blood collected during donation. The educational intervention improved the knowledge of many of the nurses. However, the nurses participated in the study had certain level of prior knowledge in some of the aspects of blood transfusion, thus the improvement after the intervention could not produce statistically significant difference. There was a statistically significant improvement in the overall knowledge among the nurses after the educational intervention. **Conclusion:** By the present study, it can be concluded that there is need for periodic educational sessions for health professionals, with regards to precautions during blood transfusion. This will enhance performance levels of health professionals both for the benefit of patients and the institution.

Keywords: Education; Nurses; Blood transfusion; Intervention; Knowledge

INTRODUCTION

Blood/component transfusion is an important method of medical treatment in patients with varied requirements. Blood/component transfusion reactions can develop in the recipients if utmost precautions are not taken before, during and after transfusion. Blood transfusion is generally considered safe, but there are risks for adverse effects. It is imperative that the blood transfusion is performed while taking precautions for possible adverse blood transfusion reactions and infectious diseases the donor and recipient may face. The understanding of blood transfusion among the health care professionals has been significantly enhanced over the last 30 years[1]. To implement blood transfusion safely, it is very important for health institutions to use national transfusion guidelines and establish blood banks, transfusion laboratories, and blood transfusion protocols[2]. Nurses play a very important role in blood/component transfusion delivery procedure[3]. Few earlier research works on the nurse's knowledge in the precautions to be taken during this process presented varied results[3–5]. Continuous

and periodical educational programs may help the nurses in reasserting the precautions to be taken in the process of blood transfusion. Thus, the aim of this study was to assess and evaluate the level of knowledge among nurses of our hospital as regards the various precautions to be taken in blood/component transfusion. The objective was to make use of the results of this study to decide on the necessity of targeted teaching using lectures and other reinforcing techniques.

MATERIALS AND METHODS

- **Study design:** Cross sectional interventional study.
- **Study population:** Nurses working in the Tertiary care centre hospital attached to Kanachur Institute of Medical Sciences.
- **Study setting:** Blood Centre of Kanachur Hospital and Research Centre.
- **Sample size:** All the nurses present on the day of the study. A total of 100 nurses were included as a part of our study.
- **Ethics committee approval:** Institutional Ethics committee clearance Reference number: KIMS/IEC/FC006/2024-EC/NEW/INST/2023/3522 26th October 2024 was obtained before starting the study.
- **Sample selection**: All the nurses present on the day of the study and willing to participate in the study were included in the study. Nurses who remained absent on the day of the study and those not willing to participate in the study were excluded from the study.
- **Methodology:** This study was conducted on nursing staff of Kanachur Institute of Medical Sciences and Hospital, Mangaluru. The knowledge and awareness of nursing staff was evaluated by a self-administered questionnaire which had two components – demographic details and 20 knowledge questions. The questionnaire was validated for the contents by two external subject experts. Brief explanation of the purpose of the study was given to the participants. Informed consent was taken from the participants. The participants were seated in demonstration room and were allotted serial numbers. The pre-test questionnaire comprising of 20 questions related to precautions of blood transfusion was distributed to nurses and responses were collected. Brief lecture was given by the principal investigator and a post test was conducted using the same questionnaire. Confidentiality was maintained throughout the study. The data was collected, entered and assessed statistically.
- **Statistical analysis:** SPSS 28 software was used for data analysis. Data was entered in Microsoft Excel. Qualitative variables were presented as frequency and percentage. Quantitative variables as mean + or - SD. Chi square test was used to find the association between the variables. P – Value < 0.05 was considered statistically significant.

RESULTS

The present study on assessment of the impact of education on knowledge about blood transfusion among the nurses of a tertiary care hospital involved 100 nurses belonging to diverse socio demographic distribution. Majority of the study participants (87%) belonged to the age of less than 30 years and majority were female nurses (88%). There was almost equal distribution of participants with regard to the educational qualification between general nursing course and BSc degree in nursing sciences. More than half of the study participants had a working experience of less than one year (59%).

Table 1 gives the details of the responses for knowledge questions before and after the educational intervention. Majority of nurses of the present study did not have knowledge about certain theoretical aspects of blood transfusion such as number of lives that can be saved by one unit of blood, time interval between two successive blood donations, volume of blood collected during donation. The educational intervention improved the knowledge of many of the nurses. Similarly, some other aspects also showed significant improvement after the educational intervention. These are, the use of the same transfusion administration set for 2 to 4 units of blood, thawing and storage conditions of the fresh frozen plasma before transfusion and filling the requisition form for blood.

The nurses participated in the study had certain level of prior knowledge in some of the aspects of blood transfusion, thus the improvement after the intervention could not produce statistically significant difference. These aspects are producing proof of recipient and matching the same with the blood bag details, collecting fresh blood for cross-matching along with requisition form, monitoring the vitals during transfusion, stopping the transfusion in case of any transfusion reactions, which are very crucial practical aspects.

Table 2 gives the comparison of mean knowledge among the nurses before and after the education intervention. There was a statistically significant improvement in the overall knowledge among the nurses after the educational intervention.

DISCUSSION

The present study involved assessment of the influence of education on the knowledge of precautions to be taken during blood transfusion among 100 nurses employed in a tertiary care hospital. The study reported an overall improvement in the level of knowledge after the training session as compared to the initial level of knowledge.

Nurses play a multifaceted role in the blood transfusion process, requiring evidence-based knowledge, a diverse set of skills, and essential personal qualities[3,6]. The understanding of blood transfusion among health care professionals has been significantly enhanced over the last 30 years[1].

In the present study, 62% of the participants had the knowledge that one unit of blood can save more than one lives. However, after the educational intervention we observed an increase in the level of knowledge with regard to the same as 70%. In this regard, an earlier article mentioned about 50% of the study population in Chennai giving correct answer of four lives can be saved by one unit of blood[7]. We can say that the present study population had a slightly better initial knowledge about this aspect and the level of knowledge improved upon the educational intervention. A very good percentage of 81% of the present study population agreed that a healthy person can donate blood once in every three months, and after the educational intervention 94% of the participants agreed with the same statement and the improvement was statistically significant. This number is much higher than earlier published data where only 38% of the study population knew that minimum time interval between two donations is three months[7]. A very lower percentage of 4.3% of Undergraduate Health Sciences students knew this basic knowledge of 3 months gap between donations[8]. In a study conducted earlier in the same geographical area as the present study, only 29.54% of the nurses of a tertiary care hospital demonstrated this knowledge[9]. The workers of the above study emphasized the need of education intervention with regard to many basic aspects related to blood donation[9].

In the present study 67% of the nurses showed a knowledge that from a healthy male, 450 ml of blood is drawn in one donation, and the number has increased to 95% (p=0.0001) followed by education intervention indicating the efficacy of education. We feel that this kind of knowledge is extremely good among the participants of the present study compared to many of the earlier studies where, only 14% of the population in a Chennai study and 15% of the health care professional students of Karamsad had this knowledge[10,11]. The present study included a question on the use of the same blood transfusion administration set (BT set) for transfusion of 2to 4 units of packed cells/RBCs. Initially 75% of the nurses had disagreed with this statement and after the educational program, the population disagreed has improved to 87% with significant p value of 0.014. In the present study, 48% of the participants disagree with the statement that fresh frozen plasma (FFP) is thawed up to 20^0C before transfusion. However, followed by educational intervention, the percentage of participants disagree has increased to a significant 67% (p=0.0001). The FFP is thawed at 37^0C using a water bath[12]. In a study in Kerala, 74% of the nurses did not have the knowledge of the shelf life of thawed FFP at 2-6^0C[13]. The authors of this study opined that the nurses must have the basic knowledge of administration of FFP immediately after thawing or within 24 hours if stored at 2-6^0C[13]. Around 1% of the transfusions end in potentially severe adverse reactions, which vary from a less severe allergy or anaphylaxis to hemolytic reactions, septic reactions and inflammatory lung injury[14–17]. In this context, the present study had a knowledge question with statement that allergy/itching is the commonest blood transfusion reaction in recipient. 69% of the participants answered correctly prior to the educational intervention, and after the intervention the percentage raised to 82%. Symptoms of allergic reaction usually occur within four hours of transfusion and are caused by histamine released from activated mast cells and basophils[18].

More than half (55%) of the participants of the present study had the knowledge that FFP should be transfused immediately after thawing and followed by the educational intervention, the percentage of participants exhibited this knowledge increased significantly (p=0.0001) to 87%. On the contrary, earlier research finding documented a lower percentage of 35.1% of the nurses showing the knowledge of transfusion of thawed FFP[19]. The same authors also quoted the earlier findings of other researchers where the knowledge of storage of blood and its components was not adequate among the nurses[19]. Adding to this finding of earlier authors, less than half of the present study population exhibited the knowledge of platelet storage duration after collection and we have not observed a significant improvement in the level of knowledge with regard to this aspect after educational intervention. In this regard, we, the authors, would like to emphasize that the nurses in the present study in specific and earlier studies in general lack preliminary knowledge about the storage conditions of blood and its components.

More than 60% of the present study participants knew that the requisition form for blood/ blood component needs to be filled in all respects and sent to the blood centre. However, about 90% of the present study participants had the knowledge of filling up and signing the consent form for blood transfusion and blood requisition form by the patient/ patient's attendant. They also had the knowledge that while collecting blood bag from blood centre, the attendant/ nurse should produce a proof of recipient's details to the blood centre. These precautions are essential to prevent any such mismatch happening between the recipient and the blood issued from the blood centre for transfusion. More than 90% of the study participants exhibited sound knowledge about the need of prior cross-matching of the recipient's blood with the blood in the blood centre. They also showcased their knowledge on matching the patient's details in the blood bag with the details of the patients file before transfusion. We, the authors at this juncture are very happy that the nurses of our tertiary care centre showed good knowledge in these precautionary measures to be taken during issue of blood and initiation of transfusion. In this regard, in an earlier

study about nurse's knowledge on blood transfusion, more than 90% of the nurses responded saying that they check the details on blood bag and the blood request form as the first step of collecting the blood bag from blood centre[20].

In the present study, only 54% of the participants said that the blood/component in blood bag should be thoroughly mixed gently before starting and during the process of transfusion. However, after the educational intervention, this knowledge component was understood by 90% (p=0.0001). Prior to the educational intervention, only 24% of the nurses of the present study answered correctly for the question whether blood/ component bag should be warmed in warmer before transfusion. Followed by the intervention, the percentage of nurses correctly answered increased to 57%. However, this improvement is not promising, where the intervention could not educate the other half of the study population. Substantiating the present observation, only 26.5% of the participants of an earlier study answered correctly for the same question[13]. Thus, it can be emphasized that nurses in general lack this basic knowledge.

Majority of the participants in the present study exhibited good knowledge about the transfusion being starting in daytime, checking and documenting the vital signs during transfusion, stopping transfusion immediately in case of any adverse reactions during transfusion and returning the blood/ component bag to the blood centre along with a post transfusion report. However, only 43% of the present study participants knew that blood and urine samples of the recipient should be collected and sent to the blood centre in case of transfusion reaction. And after the educational intervention, 71% of the participants answered the same question correctly (p=0.0001).

Blood transfusion is a crucial, complex and multi-step procedure carried out in the hospitals which involves health care professionals at all levels. Involvement of nurses during all the stages of blood transfusion emphasizes the importance of their level of knowledge in various aspects of blood transfusion. Insufficient training for nursing faculty regarding their work efficiency was highlighted by earlier workers as well[21,22]. The nurses in the present study exhibited sound knowledge at certain aspects related to blood transfusion, however, several aspects were not known to them initially. Educational intervention improved their level of knowledge in such aspects. In some cases the nursing faculty may not be able to register for such continuous education program due to unavoidable circumstances[23,24]. However, if such programs are conducted regularly, participation of all the nurses can be rest assured. In this direction, the implementation of education programs was highlighted by earlier workers as well[25].

Undoubtedly the nursing students are given the basic knowledge regarding the precautions to be taken during blood transfusion, however implementation of the acquired knowledge happens only when these students start working in hospitals. Blood transfusion is one of the crucial procedures among various treatment modalities such as monitoring the vitals like pulse, blood pressure, drug intake, intravenous infusion, feeding of the patient. Any mistake by the nurse during the delivery of duty during the process of blood transfusion will end up in severe adverse events. To avoid such adverse events happening, regular training programs should be conducted. In this regard, the present study enhances the existing awareness on the importance of education among the nurses about blood transfusion.

CONCLUSION

The present study participants exhibited moderate level of knowledge regarding various aspects of blood transfusion. Significant improvement at their level of knowledge was observed after educational intervention. Thus, it can be concluded that there is a need of regular periodical educational programs, among the nurses with regard to the precautions of blood transfusion.

Conflicts of interest

The authors declare no conflicts of interest.

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Table 1: Knowledge about blood donation among study participants

Sl No	Questions		Response		Test statistic	P value
			Pre test n	Post test n		
1	Donation of one unit of blood can help save the life of only one person	Disagree	33	27	35.761	0.001*
		Neutral	5	3		
		Agree	62	70		
2	A healthy male person can donate blood once in every 3 months	Disagree	9	5	9.673	0.022*
		Neutral	10	1		
		Agree	81	94		
3	The volume of blood collected during each blood donation in a healthy male is about 450 ml.	Disagree	19	2	27.286	0.0001*
		Neutral	14	2		
		Agree	67	96		
4	The same transfusion administration set (BT set) can be used for the transfusion of 2 to 4 units of packed cells /RBCs	Disagree	75	87	10.619	0.014*
		Neutral	12	1		
		Agree	13	12		
5	Fresh frozen plasma (FFP) is thawed upto 20^0 C before transfusion.	Disagree	48	67	21.475	0.0001*
		Neutral	16	4		
		Agree	36	29		
6	The commonest blood transfusion reaction in a recipient is Allergy or itching.	Disagree	19	10	4.657	0.097
		Neutral	12	8		
		Agree	69	82		
7	Fresh frozen plasma after thawing should be transfused & used immediately.	Disagree	27	7	22.286	0.0001*
		Neutral	18	6		
		Agree	55	87		
8	Platelet transfusion should be completed within 5 days of collection of platelets.	Disagree	39	39	1.756	0.625
		Neutral	24	18		
		Agree	37	43		
9	Requisition form for blood/blood component need not be filled in all respects and sent to the Blood centre.	Disagree	61	70	17.835	0.0001
		Neutral	6	0		
		Agree	33	30		
10	Consent form is to be filled and signed by the patient/patient's attendant and submitted to Blood centre before blood transfusion.	Disagree	9	3	3.20	0.202
		Neutral	3	2		
		Agree	88	92		
11	While collecting blood bag from blood centre, the attendant/ nurse/ student nurse should always produce a proof of recipient's details to the blood centre.	Disagree	1	2	0.177	0.915
		Neutral	7	0		
		Agree	92	98		
12	A fresh sample of blood is always collected for cross matching & sent along with requisition form.	Disagree	4	0	0.076	0.963
		Neutral	3	1		
		Agree	93	99		
13	After receiving the blood/component bag, the patient's details should be matched with the patient's file before starting the transfusion.	Disagree	3	3	2.667	0.264
		Neutral	5	1		
		Agree	92	96		
14	Blood/component in blood bag should be thoroughly mixed gently before starting & also during the transfusion.	Disagree	24	7	34.696	0.0001*
		Neutral	22	3		
		Agree	54	90		
15	Blood/ component bag should always be warmed in the warmer before transfusion.	Disagree	24	57	18.856	0.0001*
		Neutral	13	12		
		Agree	56	31		
16	Ideally, routine transfusion is to be started during day hours and not during the night.	Disagree	33	12	2.605	0.272
		Neutral	21	0		
		Agree	46	88		
17	Vital signs (Temperature, Pulse, Respiratory rate) should be checked and documented by nurse/duty doctor routinely during any transfusion.	Disagree	1	0	—-	—–
		Neutral	3	0		
		Agree	96	100		
18	In case of a transfusion reaction, transfusion should be stopped immediately.	Disagree	5	0	0.088	0.957
		Neutral	3	1		
		Agree	92	99		

Continued on next page

Table 1 continued

19	In case of a transfusion reaction, blood/ component bag along with Post Transfusion report is to be returned immediately to the blood centre.	Disagree	10	8	10.152	0.017
		Neutral	13	2		
		Agree	77	90		
20	In the event of a transfusion reaction, blood and urine sample of the recipient need not be collected and sent to blood centre	Disagree	43	71	24.286	0.0001
		Neutral	23	1		
		Agree	31	28		

Statistical test: Mc Nemar test: *p value <0.05 is considered statistically significant

Table 2: Comparison of knowledge between pre and post-test among the study participants

Variable	Pre test (n=100)	Post test (n=100)	Mean difference	Test statistic	P value
Knowledge	28.64 ± 4.215	34.24 ± 4.472	5.6	12.69	0.0001*

Statistical test: Paired t test;*p value <0.05 is considered statistically significant

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