Nurses' Competence in Safety Blood Transfusion: The Impact of a Training Module

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Abstract

The Aim: The aim of this study was to evaluate the effectiveness of a training module about safety blood transfusion on nurses' competence. **Methods:** Pre experimental one group pre and post-test design was adopted. The study was conducted at the hematology department in Oncology Center Mansoura University Hospital. A convenient sample of 60 staff nurses were included. Data were collected by a structured interview questionnaire to assess nurses' knowledge level and observation checklist to assess nurses' practices pre, and post-blood transfusion training. Data were analyzed by using both descriptive and inferential statistics. **Results**: Revealed a highly statistically significant difference in the mean score of the nurses' knowledge level and practice about safe blood transfusion pre and post the training intervention (p=0.001). There was a strong positive relation between nurses' knowledge and practices scores post-training (r=0.745, P<0.000). Otherwise, it was observed that there was no correlation in the nurse's knowledge or practice with age and years of experience. Data were presented using tables and charts**. Conclusion**: Training module on safety blood transfusion can positively improve nurses' level of knowledge and practice. **Recommendation:** Ongoing in-service training to nurses at hematology units are essential to improve their knowledge and practice level. Evidence-based practices for blood transfusion should be integrated into the nursing curriculum.

Keyword: *Nurses' Competence, Safety Blood Transfusion, Training module.*

Introduction

Blood transfusions (BT) are a common life-saving treatment for patients. Its main goals are to treat recipients' underlying disorders and to replace blood loss, to increase the oxygen- carrying capacity of the blood in patients with anemia, to give blood exchange, to nourish the tissue with oxygen, to prevent bleeding and coagulation disorders[(1)]. Errors in the transfusion procedure often cause serious problems for the recipient, also severe and fatal reactions are not rare. As there is a possibility of an error occurring at every step of the blood transfusion procedure, close cooperation between health care providers and adequate knowledge is essential for the proper use of blood products and safe blood transfusion [(2)].It is estimated that out of every 13,000 blood transfusions patients, one error occurs most often due to human errors that can be avoided by proper education and redevelopment in transfusion protocols [(3)].

The most common causes of errors during the blood transfusion process are wrong blood group transfusions (inappropriate ABO), improper storage, and uncertain patient identity. These errors are related to insufficient training of nurses and lack of experience due to the lack of blood transfusion activities in some hospital wards [(4)].

In 2008 safe blood defined as the blood that does not cause disease or pose a danger to the recipient and does not contain harmful or infectious agents [(5)]. Nurses' competence in administering blood transfusion

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is a critical factor conditioning safety-high quality transfusion therapy [6].Several studies have been implemented on the nurses' knowledge level and practice about blood transfusion indicated that the nurses did not have adequate experience regarding safe blood transfusion skills, prevention of potential adverse reactions, and blood transfusion standards[7,8]. It appears essential to improve nurses' knowledge and practice to confirm the safety of this intervention.

Significance of the study

Reports of the World Health Organization indicated that more than nine million recipients in 90 different countries receive blood annually.It is recognized about 70% of all reported adverse events related toimproper transfusion. Additionally, half of these events involve more than one transfusion error [7]. The quality, effectiveness, and safety of blood transfusions are based on nurses' knowledge and practice. Inappropriate BT practice may lead to complications that may threaten patients' safety and/or the death of some recipients.In 2008, the American Association of Registered Nurses recommended that there was an urgent need to train and educate nurses about the hazards of blood transfusion, the latest safety guidelines, and clinical decision-making, it also directed the necessity to check nurses' knowledge and practices regularly ([9]) .

Many studies have been done in developed countries to assess the knowledge and practice of nurses concerning blood transfusion, however, few studies have been conducted in developing countries, especially Egypt. Therefore, the current study will cover this gap. This research study aimed to evaluate the effectiveness of a training module about safety blood transfusion on nurses' competence.

Aim of the Study

The present research study aimed to evaluate the effectiveness of a training module about safety blood transfusion on nurses' competence through the following objectives:

1.Assess nurses' knowledge level about safety blood transfusion pre and post module implementation.

2.Evaluate nurses' level of practice about safety blood transfusion pre- and post-module implementation.

3.Design and implement training module according to actual nurses' needs about safety blood transfusion.

4.Analyze the correlation between nurses' knowledge, practice scores and their sociodemographic characteristics.

Hypotheses

H1. The studied nurse who participates in the safe blood transfusion training module will have a higher knowledge score post implementation than pre-implementation score.

H2. The studied nurse who participates in the safe blood transfusion training module will have a higher practice score post-implementation than pre -implementation score.

H3. There is a relationship betweensociodemographic variables andnurses' knowledgeand practice scores.

Research Variables

The independent variablethe independent variablein the study is the blood transfusion training module.

The dependent variablesare the nurse's level of knowledge and practice.

Theoretical Framework

5-Steps Problem-Solving Model (PSM)

Among the various theories, the problem-solving theory has been recognized as aneffective framework for research, learning, teaching, and an effective framework for research, learning, teaching, and practice of problem-solving

The 5-step problem-solving model explains the problem-solving methods in a flexible, logical, clear, and controllable manner, all,or part of it can be applied to all problems.

In general, it can be classified under the heading

of cognitive and practical skills.PSM suggests that at the core of the model, six questions must be constantly asked to guide and facilitate each step of the model.The six questions are, what, when, where, why, and how. These questions are generally known as the "5WH" or questions and/or 5W and H. 5WH play an important role in the process of thinking to identify the key elements of each phase in the PSM [10].

Methods

Study design

Pre experimental one group pre and post-test design wereused to implement this study.

Setting

The study was conducted at the hematology department in theoncology Center, which consists of eleven floors thatproviding all advanced preventive and integrated treatment services to all citizens in the governorates of the Delta and Suez Canal.Regarding hematology department is located in 10 th floor with a capacity of 70 beds in male and female wardin which diagnosis, treatment, and monitoring of all types of blood diseases in addition to hematomas, including leukemias and lymphomas were done.

Study sample

A Convenience sample of all on-duty nurses during the data collection period working at the haematology department (25 nurses) in the previously mentioned setting were included in the study.

Tools of the study

Tool (I): A Structured InterviewQuestionnaire

Part (1): Sociodemographic characteristics: which include age, gender, qualifications, and years of experience in a hospital.

Part (2): Blood transfusion nurses' knowledge questionnaire: It was adopted fromKhalaf et al., [11] and modified by the researcher, consists of three parts concerning the concepts, rules, and policies as regards, blood transfusion process, and equipment used. It was in form of 34 true or false questions.The satisfactory level of nurses' knowledge scored ≥ 80%, while the unsatisfactory level of nurse's knowledge scored <80%, the correct answer =1, and the incorrect =zero.

Tool (II): Blood Transfusion Competency Checklist:

It was adopted from [12]. and modified by the researcher,it consisted of 3 phases: preparatory phase (8 items), procedure phase (7 items), and blood transfusion reaction phase (7 items). Scoring system estimated astotal items = 22 and scored by done correctly = 1 or not done= zero. Evaluation of best nurse's practice considered to be competent level was ≥80%, while the incompetent level was <80%.

The validity of the toolstools was reviewed by a jury of seven experts in the medicine and nursing field to examineits validity and all the necessary modifications were done accordingly.

Reliability of tools all tools of the study were checked for internal consistency and tested for reliability using Cronbach alpha & test-retest methods. Reliability of used tools showed high reliability scores for Nurses' Knowledge Questionnaire, Cronbach alpha = 0.761, (r= 0.458). Blood transfusion observation checklist, Cronbach alpha = 0.864 (r= 0.587).

Pilot study

A pilot study was conducted on 10 % of the total sample to assess feasibility, shape validity and applicability, reliability of tools also calculate the needed time for data collection.

The training module

The goal of this training module was to improve nurses 'skills to implement the blood transfusion in a safe manner, based on the latest international standards. It was designed in the simple Arabic language by researchers after an actual assessment of nurses' needs. A review of the relevant international literature (nursing books, articles, periodicals, magazines, and Internet resources) on the latest practices in safe blood transfusion for patients was also used. The training unit consists of

4 sessions, including theory and practice through online training due to the spread of the COVID-19 pandemic, and it includes, explanatory videos, slideshows, photo guides, and group discussion. The training module was reviewed prior to its implementation by a committee of experts.

Intervention

The actual fieldwork started from the beginning of September 2020 until the end of December 2020. Official written permission to conduct the study was obtained from the Dean of Faculty of Nursing Mansoura university and the director of theoncology center. This was achieved after a clear explanation of the nature and purpose of the study as well as its expected outcomes.

The intervention started by interviewing the studied subject, who agreed to participate in the training unit at the above-mentioned setting. The researcher started by introducing herself to the subjects. An explanation of the aim and nature of the study were done. In case of positive verbal answer and agreement to be an active participant in the study, the researcherconfirmed the willingness of the nurses to participate by a few days before the meeting.

The nurses attended a single meeting. The meeting included four sessions, the first session included an introduction into the training unit and a pre- assessment of knowledge level and practice using study's tools, this online session lasted about 45 minutes. The second session lasted about one hour and included a presentation given by the researcher with the use of simple illustrating colored pictures.

The main topics of the presentation were the problem of blood transfusion in Egypt, concepts,and issues in blood transfusion,standard guidelines, and policies. The third session was devoted to the safe practice of blood transfusion to improve the nurse's competence in this skill and lasted about 45 minutes. The fourth session was devoted to open discussion of all issues discussed in the meeting and lasted about 45mintes. At the end of the meeting, a 20-page booklet on principle issues in blood transfusion was submitted to participating nurses on wats app. group.

In order to determine the effectiveness of this training unit on nurses' knowledge and practice, nurses were interviewed after three months to fill the same questionnaire posed during the first session as post-test. The tools were administeredby the investigator (1) and the investigator (2) to collect data pre and post 3 months,the investigators are internship students who have been trained by the principal researcher to evaluate the study variables to prevent bias, then the differences in scores between the study variables were compared. The time required to complete this sheet was 15-20 minutes.

Statistical Analysis

Data entry was done using a compatible personal computer. The Statistical Package for Social Sciences (SPSS version 22.) was used. The content of each tool was coded, categorized, and then analyzed.Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means, and standard deviations for quantitative variables. Quantitative continuous data were compared by using student t-test in case of comparisons between the mean scores of the studied group before and after implementationof the module. The qualitative studied variables were compared using the Chi-square test.

We considered a statistically significant difference at * P with a value of 0.05, and the difference was highly statistically significant at **P-value ≤ 0.001.

Results

Characteristics of studied nurses

Among the 25 nurses who completed the study**,** table (1) clarified the personal characteristics of the studiednurses**.** It was clarified that the highest percentage (64%) were having less than 25 years old and 88% of them were female. The academic profile indicated that the majority (56%) graduated from technical institute of nursing. Also, it was noticed that single constituted the higher percentage (54.2%) of them. Regarding nurses' working time in hematologic department (56 %) working for less than 2 year and 56% of them having less than 2 year of experience as a registered nurse**.**

Table (1) Socio-demographic data of studied Nurse N=25

Item	n=25	%
Age:		
Less than 25year	16	64.0
25-29 years	7	28.0
30-34 year	2	8.0
Gender:		
Male	3	12.0
Female	22	88.0
Level of education:		
School of Nursing	5	20.0
Technical Institute	14	56.0
Bachelor's Degree	6	24.0
Marital status:		
Married	11	44.0
Single	14	56.0
Years of Experience as a Register Nurse		
Under 2 years	14	56.0
2-4 years	7	28.0
5-9 years	2	8.0
10-14 years	2	8.0
Years of work		
Under 2 years	14	56.0
2-4 years	7	28.0
5-9 years	2	8.0
10-14 years	2	8.0

Effectiveness of safety blood transfusion training module:

Findings of table (2) indicated a highly statistically significant difference between mean scores of nurses' knowledge and practice before and after the intervention as the nurses' mean score of knowledge post-training (29.68 ± 3.27) were higher than their pre training course scores (24.24±4.39)where p≤ 0001**

Table (2) Comparison between mean score of nurses' knowledge and practice about safety blood transfusion pre and post the training module N=25

		Mean	SD	T	P
Knowledge score	**Posttest**	29.68	3.27	7.101	**0.000****
	Pretest	24.24	4.39		
Practice score	Posttest	20.60	1.50	5.33	**0.000****
	Pretest	**18.72**	**1.98**		

Note. * (P) Significant at (p ≤ 0.05) ** (P) highly Significant at (p ≤ 0.001)*post-test (post 3 months)

Figure (2) clarified total nurses' knowledge pre/post module as regards blood transfusion process. It was verified that (80%) of the studied nurses have unsatisfactory knowledge pre training module implementation compared to (20%) post module.

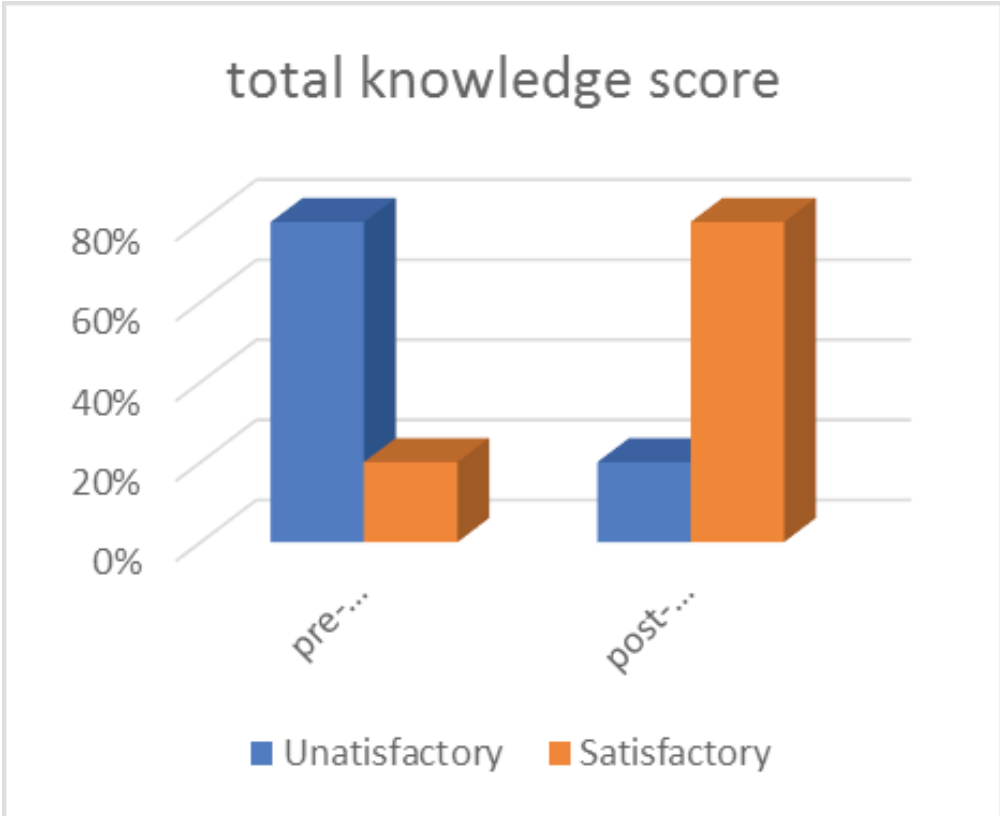

Figure 2. Nurses' level of knowledge about blood transfusion pre and post the training module N=25

N.B Satisfactory level ≥ 80%, Unsatisfactory level <80%

Figure (3) showed total nurses' practice pre/post- module implementationregarding blood transfusion.It was clarified that, overall score of satisfactory practice post-implementation of training module was highest percentage (92%) compared with (68%) before implementation.

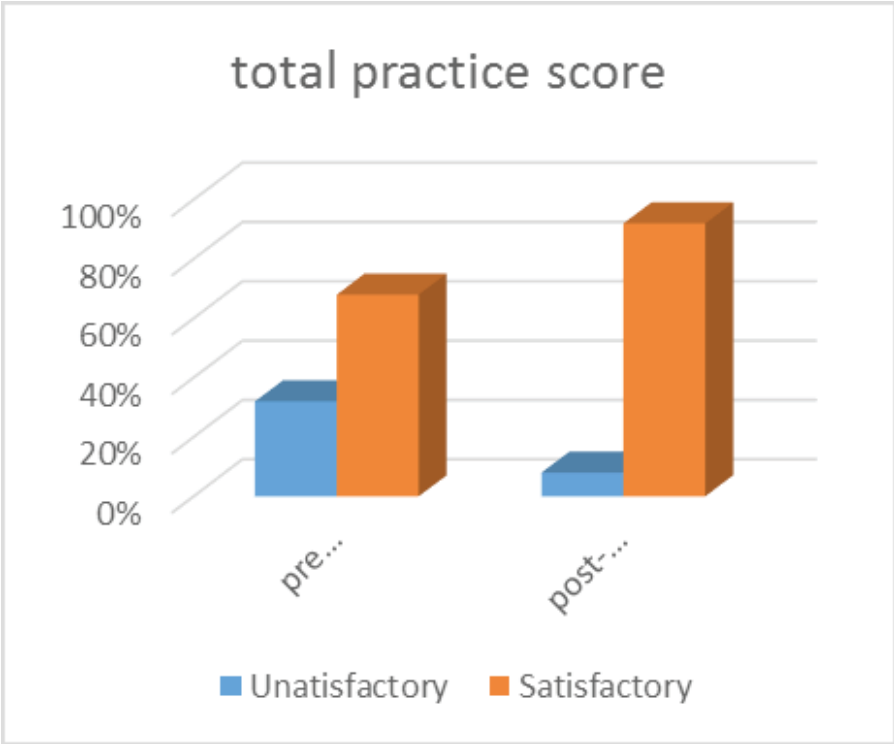

Figure 3. Nurses' competency level of practice in blood transfusion pre and post the training module N=25

N.B *Competent practice ≥80%, Incompetent practice <80%.

Table (3) showed a relation between total scores of nurses' practice and knowledge as regard safe transfusion before/after module implementation, it was clarified that there were a highly statistically significant positive relation between scores of nurses' practice and knowledge after-module implementation (r=0.745, P<0.000**).

Table (3) correlation between Total scores of Nurses' Knowledge and Practice as regard safety Blood Transfusion before/after-training module N=25

	Nurse's Knowledge &practices before training	**Nurse's Knowledge & practicesafter - training**
r	0.671	0.745
P-value	0.000**	0.000**

Note. * (P) Significant at ($p \leq 0.05$) ** (P) highly Significant at ($p \leq 0.001$) * post-test (post 3 months)

Table (4) showed that there was no statistically significant difference between knowledge and practice (score) with Socio demographicvariables.

Table (4) Association between pre-implementation knowledge and practice score with Socio *demographic variables N=25*

*N.B*Satisfactory level ≥ 80%, Unsatisfactory level <80%

N.B *Competent practice ≥80%, Incompetent practice <80%.

Items	Total score level of Knowledge				X2	P	Total score level of practice				X2	P
	Unsatisfactory		satisfactory				Competent		Incompetent			
	N	%	N	%			N	%	N	%		
Age												
Less than 25years	14	56.0	2	8.0	3.348	0.187	7	28.0	9	36.0	4.607	0.100
25-29years	4	16.0	3	12.0			0	0.0	7	28.0		
30-34 years	2	8.0	0	0.0			1	4.0	1	4.0		
Gender												
Male	1	4.0	2	8.0	4.640	0.031	0	0.0	3	12.0	1.604	0.205
Female	19	76.0	3	12.0			8	32.0	14	56.0		
Level of education												
School of nursing	5	20.0	0	0.0	1.935	0.380	3	12.0	2	8.0	2.525	0.283
Technical institute	11	44.0	3	12.0			3	12.0	11	44.0		
Bachelor's degree	4	16.0	2	8.0			2	8.0	4	16.0		
Years of experience												
Under 2	12	48.0	2	8.0	8.929	0.030	6	24.0	8	32.0	3.007	0.391
2-4	6	24.0	1	4.0			1	4.0	6	24.0		
5-9	0	0.0	2	8.0			0	0.0	2	8.0		
10-14	2	8.0	0	0.0			1	4.0	1	4.0		
Years of work												
Under 2	12	48.0	2	8.0	8.929	0.030	6	24.0	8	32.0	3.007	0.391
2-4	6	24.0	1	4.0			1	4.0	6	24.0		
5-9	0	0.0	2	8.0			0	0.0	2	8.0		
10-14	2	8.0	0	0.0			1	4.0	1	4.0		

Discussion

The current research work aimed to evaluate the effectiveness of a training module about safety blood transfusion on nurses' competence.

The present study indicated that most of the studied nurses (88%) were female, the majority of them (56%) were graduated from the technical institute of nursing.

The above-mentioned findings come in accordance with [13] who explained that the majority of studied participants were female that have a higher nursing degree. This may be due to the fact that our Arab societies still recognize nursing as a female act, and the reason for this is cultural considerations. This result supported by [14]who reported that the minority of study sample sex ware male and the percentage of the female nursing staff more than (90%).

In order to implement a training module to improve nurses' knowledge and practice regarding safe blood transfusion process, it was critical to evaluate their practice and knowledge level. In relation to the knowledge level of studied nurses, the findings of this study indicated that most nurses had satisfactory knowledge level about the blood transfusion post-training module compared to minor satisfactory knowledge level pre- implementation. Where the nurses' mean score of knowledge post-training (29.68 ± 3.27) were higher than their pre-training course scores (24.24±4.39) where p≤ 0001**. From the above results, we can accept hypothesis (1) " Nurses will have a higher knowledge score post implementing the training module than pre-implementation".

This finding agreed with [5] who concluded that, before the educational intervention, most of the nurses had insufficient knowledge, However, it improved significantly in the post-intervention phase, and this applies to all relevant areas of knowledge. This come along with a study done by Kaur et al. [15] who clarified that , the mean knowledge score in the pre-training assessment was poor while in the post-training assessment the mean knowledge level was good, the difference was statistically significant. This is in harmony with [16] who concluded that approximately three fourth of the participants had a low knowledge level, the mean score was 23.45 (S. D= 5.76). Whereas in post-test, more than half of the participants achieved a high knowledge level. The mean score was 48 (S.D = 6.48) which clarified an improvement in the knowledge level of the participants after the training program.

When evaluating the impact of a training module for safe blood transfusion on nurses' competence practice. The study findings indicated a highly statistically significant difference between mean scores of nurses' practice before and after the training module where the nurses' mean score of practice post-training (20.60 ± 1.50) were higher than their pre training course scores (18.72±1.98). Where p≤ 0001**.

This poor practice clarified among the study nurse's pre-module implementation is associated with unsatisfactory knowledge previously mentioned among them. Poor knowledge and practice together are sure to have a negative impact on the quality of nursing practice given by the studied nurses.In general, the current study indicated that the training module on safe blood transfusion was effective in improving knowledge and practice among the studied nurses.

The present study findings come in the same line with [17] who demonstrated that pre the intervention, most of nurses have a poor practice in blood transfusion skills, while post the intervention the majority of them provided good practice. It could be due to the lack of nurse motivation, hospital facilities and recourses and the lack of training courses which help them to perform standardized nursing practice.

This effect was further confirmed by interventional studies by [1] who revealed in their studies that continuous nursing training programs for nurses improve their practice and knowledge level.

Additionally, the present study findings were supported by [13] those who found that most of the nurses' knowledge was insufficient regarding blood transfusion process, which would prevent them from providing professional nursing care during the transfusion process. In addition, Cabinda, and others [18] stated that training and education are fundamental for all personnel involved

in the transfusion process because it reduces transfusion errors.

Based on the previous results, we can accept the second hypothesis " Nurses will have a higher practice score post implementing the training module than pre-implementation.

When analyzing the relation between sociodemographic variables and nurse's knowledge and practice, the present study revealed that, there was no statistically significant relationship or difference between the knowledge and practice (score) of the nurses with sociodemographic variables pre-training module.

Similarly, there was no correlation in the nurse's knowledge or practice in relation to their age, years of experience, and educational level in the pre- transfusion in hospital in a study applied by [6].This result was incongruent with [19] who stated that nurse's level of education and years of experience both influence nurses' level of practice. The results of the study were contrary to the third hypothesis, so the researcher could not accept the hypothesis that was proposed at the beginning of the study.

As regards the relationship between participant' practice and knowledge, the results of the current study clarified that there were a highly statistically significant positive relation between nurses' practices and knowledge as regards safe blood transfusion post-module implementation (r=0.745, P<0.000**).The study emphasized that a positive relation existed between the nurses' knowledge and practice scores.

Similar findings come along with this result and stated that insufficient nurses' knowledge about blood transfusion was reflected in unsatisfactory practice andstrong significant relations was found between nurses' level of knowledge and their practices regarding blood transfusion procedure ([13]).

Conclusion

The studied nurses showed improvement in their knowledge and scores of their practices about safe blood transfusion after implementing the training module. There was a positive association of high statistical significance between the knowledge and practice of the nurses as regards safe blood transfusion post-module implementation (r=0.745, P<0.000**).

Recommendations

Ongoing in-service training for nurses to improve their knowledge and practice level. Evidence-based practices for blood transfusion should be integrated into the nursing curriculum.

Competing Interest : The authors declare that they have no competing interests.

Financial support: No funding sources were provided

Acknowledgment : The researcher wishes to extend great thanks and appreciation to all those who assisted in conducting and completing this study.

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