Nurses' Knowledge and Practices toward Caring for Children undergoing Blood Transfusion

Abstract:

Background Blood transfusion refers to the process of administering whole blood or blood components to a child through an intravenous needle or catheter placed in a vein as it is a constant and central component of modern health care and considered a highly effective and potentially life saving treatment especially among pediatric patients. **This study aimed to** Assess the nurses' knowledge and practices towards caring for children undergoing blood transfusion. **Research design** A descriptive research design used to carry out this study. **Setting** This study was conducted in pediatric departments and Pediatric Intensive Care Units (PICUs) at Benha University Hospital and Specialized Pediatric Hospital Benha city. **Sample** A convenient sample of nurses who working at the previously mentioned settings and convenient sample of pediatrics undergoing blood transfusion. **The tool of data collection:** Two tool was used to collect the required data. First tool: A structured questionnaire format, it consisted of three parts: Part one concerning personal characteristics of nurses. Part two concerning personal characteristics of children. Part three concerning nurses' knowledge regarding blood and blood transfusion. Second tool :Observational checklist tool, it was composed of three parts: Part one: Nursing care provided for children before blood transfusion. Part two: Nursing care provided for children during blood transfusion. Part three: Nursing care provided for children after blood transfusion. **The results of this study revealed that:** 45.5% of nurses aged 25- <30 years with mean age was 28.4± 5.48 years, while 36.4% of them had diploma of general nursing technician and 36.4% of children aged <1years and 1- <7years with mean age was 5.09± 4.38 years. Approximately slightly less than two thirds (65.2%) of nurses had satisfactory knowledge regarding blood transfusions for children and the majority (81.8%) of them had competent practice regarding blood transfusions for children. Therefore, **it was concluded that** there was highly

statistically significant relation between total knowledge score of nurses and their years of experience in pediatric blood transfusion, while there was a significant relation between total practice score of nurses and their educational level and their years of experience in pediatric blood transfusion. There was a positive correlation between total knowledge and total practice of nurses regarding blood transfusions for children. **So it recommended that** Provision of continuing education programs on regular basis is suggested in order to refresh and update nurses' knowledge, as well as reinforce proper practices related to blood transfusion in pediatric units.

Keywords: Blood transfusion, Nurses' knowledge and practice, Children

Introduction:

Blood transfusion refers to the process of administering whole blood or blood components to a child through an intravenous needle or catheter placed in a vein as it is a constant and central component of modern health care and considered a highly effective and potentially life saving treatment especially among pediatric patients ***(Betty et al., 2016)***. Blood transfusion is a tissue transplantation which can cause serious adverse reactions. These reactions may potentially delay the recovery of child or may even lead to death. The transfusion of a blood product into a child is associated with a greater risk of harm when compared to an adult. These risks may be resulted from omission of essential checks (short cuts) and perhaps an assumption of someone else is responsible for safety transfusion **(*Khalaf et al., 2017*).**

Blood transfusion is a complex multistep process involving members of several different professional groups; nurses, doctors, laboratory scientists as well as, the donors and recipients. Transfusion therapy is a process that, even when appropriately recommended and administered, involves health

risks. So, it is important to observe the blood therapy cycle that begins with the donor selection, serology and immune hematology, processing and fractionation of plasma, dispensation, transfusion and post transfusion evaluation ***(Freitas &Franceschini., 2012)*.**

Blood transfusion are given for many reasons some of which include correction of anemia, bone marrow failure, chronic diseases and haemoglobinopathies, correction of deficiencies in other blood and plasma component, such as platelets or clotting factors and replacement of blood lost during major surgical operation, trauma, hemorrhage. Red blood cells transfusions are also given to cancer patients requiring therapy and newborn babies in certain cases patients of hereditary disorders like hemophilia and thalassaemia and in cases of severe burn victims. ***(Tetteh., 2015).***

Transfusion reactions may happen as an immune response to the blood or other components or as a non-immune response caused by a circulation overload, transfusion siderosis, or transmission of infection. Based on the onset, there are an acute or delayed transfusion reactions. Fever, urticaria, itching, headache, chills, or anaphylactic occur during or following a blood transfusion are symptoms of acute transfusion reactions. ***(Apriastini & Ariawati., 2017).*** These reactions include; those that are due to bacterial contamination, acute hemolytic reactions caused by incompatibility of the ABO system, anaphylactic reactions and fluid overload. These complications may be non-immune, and may be associated with human error; or immune, linked to the organic response mechanisms to the blood transfusion ***(Mattia & Andrade., 2016).***

Measures that nurses should be taken when a transfusion reaction is suspected are the following: immediate stop of blood transfusion, venous access kept permeable with saline solution at 0, 9%; identification of blood components at the bedside of the patient, as well as the proper administration of this component to the patient, according to a medical prescription. Also, the vital signs of the patient must be measured, and the complication must be reported to the doctor; puncture of a second venous access on suspicion of a serious transfusion reaction; the reaction must be informed to the hemotherapy service; a blood sample of the newborn must be collected and sent to the hemotherapy service as well as the blood bag and the IV infusion filter; collect and send samples of blood and/or urine must be collected and submitted to the laboratory, if requested by the doctor ***(Cherem et al., 2017).***

Blood transfusion must be done by a well-trained and qualified nursing team. Also, nurses have the competence and responsibility to plan, coordinate, supervise and evaluate hemotherapy services in health units. Nursing professionals are directly involved in the care of patients submitted to blood transfusion. These nurses must have appropriate knowledge on blood transfusion to be able to perform it safely, and intervene in any potential complications to ensure the high quality of blood and blood components collected and transfused ***(Duarte et al., 2015).***

Nurses has an important role in ensuring blood transfusion safety. Nurses must pay attention to 4 basic elements: appropriate blood, correct patient, proper procedure, and right timing. Nurses assume various roles and responsibilities in all stages of the process of a blood transfusion. It is

important for the nurse to closely observe the patient for any complications that may develop. Vital signs must be checked before, during, and after any transfusion at appropriate intervals. Early determination of a complication developing during transfusion and prompt initiation of treatment are important safety considerations ***(Beyazpınar Kavaklıoğlu et al., 2017)***

Lack of knowledge related to various aspects of blood transfusion by clinical staff, including nurses, continues to be a real threat to child's safety. As well as, any errors in practice involving remote checks at nurses' stations considered one of the main causes for life threatening of the child ***(Fergusson et al., 2012).*** Teaching and training are essential for nursing staff members to improve the quality of health care and to acquire new knowledge and skills. Educational programs are considered as means for providing nurses with theoretical and technical information needed to acquire new skills and to continually improve nursing practice ***(Gray & Illingworth., 2013).***

Significance of the study:

Blood transfusion are the most commonly essential use on pediatric departments. Nurses support the children through the entire process of blood transfusion therapy and safety of blood transfusion therapy dependent on the nurse's knowledge and practices, so it is important for the nurse to have ongoing education and training involved in the transfusion process (***Freixo et al., 2017).*** According to **Blood Bank Center in Benha Specialized Pediatric Hospital, (2017)** statistics of children who need blood transfusion were; 140 cases with chronic blood disorders, 150 cases with oncologic disorders, 5110 cases on other departments and units. In addition at Benha

University Hospital 27 cases with chronic blood diseases and pediatric patients undergoing surgical procedures and renal diseases. So that, the current study will be carried out to assess the nurses' knowledge and practices regarding caring for children undergoing blood transfusion.

Subjects and Methods:

This study aimed to assess the nurses' knowledge and practices towards caring for children undergoing blood transfusion.

The current study were portrayed under the four main designs as the following:

I. Technical design
II. Operational design
III. Administrative design
IV. Statistical design

I-Technical design:

The technical design included; research design, settings, subjects as well as tools of data collection.

Research design:

Descriptive study was used to carry out this study.

Research Settings:

This study was carried out in pediatric departments and Pediatric Intensive Care Units (PICUs) at Benha University Hospital and Specialized Pediatric Hospital Benha city.

Subjects:

The subject consisted of a convenient sample of nurses who working at the previously mentioned settings regardless of their age, years of experience and qualifications and convenient sample of pediatrics undergoing blood transfusion.

Tools of data collection:

Data was collected through the following two tools:-

First Tool:

A structured questionnaire format, it was developed by the researcher after reviewing a related literature and written in a simple Arabic language, it consisted of three parts:-

Part one:-Personal characteristics of nurses, it consisted of 8 questions, which included: age, gender, social status, level of education, years of experience in pediatric blood transfusion, the number of performed blood transfusions procedure in the last 6 months, training courses related to blood transfusion and number of training courses obtained in blood transfusion.

Part two:-Personal characteristics of children, it consisted of 6 questions, which included: age, gender, previous exposure to blood transfusion, number of previous exposure to blood transfusion, causes of previous exposure to blood transfusion and medical diagnosis.

Part three:-Nurses' knowledge regarding blood, it consisted of 9 questions, which included: meaning of blood, manufacture of blood, blood components, functions of blood and blood groups, etc… and nurses' knowledge regarding blood transfusion, it consisted of 27 questions, which included: meaning of blood transfusion, indications for blood transfusion,

flow rate during blood transfusion, instructions that the nurse should give to a child or family regarding to blood transfusion and complications of blood transfusion, etc…

Scoring system for nurses' knowledge:

The scoring system was divided as: The complete correct answer score (2), incomplete correct answer score (1) and wrong/ don't know score (0). According to nurses' knowledge, their total level of knowledge categorized as satisfactory if nurses scored 80% and more and unsatisfactory if nurses scored less than 80%.

Second Tool :

Observational checklist tool; which adopted from**, Cowell, (2009) and *Bartlett et al, (2017)***, it was composed of three parts:

Part one :- Nursing care provided for children before blood transfusion .

It was consisted of 22 steps, which included: check doctor's order, verify consent for transfusion is signed, prepare required equipment, obtain baseline vital signs, obtain blood product from blood bank, visually inspect blood product, use appropriate personal protective equipment and mix blood product gently, etc…

Part two :- Nursing care provided for children during blood transfusion.

It was consisted of 4 steps, which included: stay with the child and monitor symptoms of adverse reactions for the first 15 minutes, obtain vital signs every 15 minutes for 1 hour and every 30 minutes thereafter, apply nursing actions when transfusion reaction occurs and complete blood component transfusion within four hours.

Part three:- Nursing care provided for children after blood transfusion.

It was consisted of 7 steps, which included: clamp the tube infusion set and venous access catheter and disconnect tubing, dispose of empty blood bags and filter tubing in red biohazard bag and wash hands, document transfusion data and review post transfusion testing, repeat CBC, INR, etc…

Scoring system for nurses' practices:

The studied nurses' practice compared with the observational checklist sheet where (2) score was given for each step done correctly and completely, (1) score for step done correctly and incompletely and (0) score for step not done. Total scores was classified as; competent if nurses scored 85% or more and scored incompetent if nurses scored less than 85%.

II- Operational design:

The operational design composed of; preparatory phase, ethical considerations, pilot study and field work.

Preparatory phase:

A review of local and international related literature using books, articles, magazines and computer search covering all various aspects of the current research problem done in order to develop the study tools.

Tools validity and reliability:

The study tools were revised by a panel of three experts who were professor and assistant professor in the field of pediatric nursing at Benha University and Ain Shams University to determine the extent to which the items in the questionnaire will be related to each other. This phase took one month from the beginning to the end of September, 2018. Testing reliability

of proposed tool was done using Cronbach's alpha coefficient test. Test reliability for nurses' knowledge were 0.74 and test reliability for nurses' practices were 0.94.

Ethical considerations:

The researcher informed all nurses about the aim and nature of the study before their inclusion. Nurses' oral consent was obtained from nurses before participation in this study. Anonymity and confidentiality of the study subject were secured and nurses informed that the gathered data will be used for research purpose only. The study is harmless and the study subject was allowed to withdraw from the study at any time freely.

Pilot Study:

A pilot study was carried out during September, 2018 involved 10% of the sample size (6 nurses) to test feasibility and applicability of the study tools. All participants in the pilot study were included in the sample, where no radical modifications were carried out in the study tools as revealed from the pilot study.

Field work:

The data was collected from nurses who attended in the previously mentioned settings according to the work load of nurses. The actual field work was carried out from the beginning of June, (2018) up to the end August, (2018). Nurses' oral consent were obtained from them before participation in this study. The title, objectives, tools and the study technique were explained for each nurse to obtain their approval and cooperation which is needed for conducting this study. Each nurse was individually interviewed using the questionnaire for assess nurses' knowledge regarding blood transfusion and the average time required for

completion of each questionnaire was around 15-20 minutes. The researchers observed the nurses' practice regarding blood transfusion during their actual practices with children and was observed by using observational checklists three times and taking average of observation (nurses was not be aware that the researcher was observed their practice).The time needed to fill- in each observational checklists ranged from 20-25 minutes. The work of researcher was carried out three days/week during morning and afternoon shift by rotation from the previously mentioned settings, this day was Sunday, Tuesday and Wednesday. The data collected through three months.

III-Administrative design:

An official letters were obtained from the Dean of Faculty of Nursing, Benha University concerned the title, objectives, tools and the study technique was illustrated to the administrators of the previously mentioned settings to obtain their approval and cooperation which is needed for conducting this study.

IV- Statistical design:

Data collected were organized, arranged, analyzed and tabulated by using an electronic computer and statistical analysis was done by using Statistical Package for Social Sciences (SPSS version 20), Which was used frequencies and percentages for qualitative descriptive data, and chi-square coefficient (X^2) was used for relation tests, mean and the standard deviation was used for quantitative data, Pearson correlation coefficient (r) was used for correlation analysis and degree of significance was identified.

The observation difference and associations were considered as the following: (p-value)

highly statistically significant difference (HS) $P < 0.001$

statistically significant difference (S) P <0.05

no statistically significant difference (NS) P >0.05

Results:

Table (1): Percentage distribution of the studied nurses regarding their personal characteristics (n= 66).

Items	No.	%
Age/ years		
▪ <٢٠	3	4.5
▪ 20- <25	10	15.2
▪ 25- <30	30	**45.5**
▪ ≥٣٠	23	34.8
Mean ± SD 28.4± 5.48 years		
Gender		
▪ Male	3	4.5
▪ Female	63	**95.5**
Social status		
▪ Single	6	9.1
▪ Married	57	**86.4**
▪ Divorce	1	1.5
▪ Widowed	2	3.0
Educational level		
▪ Diploma of general nursing technician	24	**36.4**
▪ Technical institute of nursing	21	31.8
▪ Bachelor in nursing science	21	31.8
Years of experience in pediatric blood transfusion		
▪ < 1 year	8	12.1

▪ 1- <3	10	15.2
▪ 3- <5	6	9.1
▪ ≥٥	42	**63.6**
Mean ± SD 5.04± 3.31		
The number of performed blood transfusions procedure in the last 6 months		
▪ 1- 4 times	34	51.5
▪ 5-8	12	18.2
▪ 9-12	1	1.5
▪ >١٢	19	28.8
Training courses related to blood transfusion		
▪ Yes	28	42.4
▪ No	38	**57.6**
Number of training courses obtained in blood transfusion		
▪ Once	15	**53.6**
▪ Two	11	39.3
▪ Three	1	3.6
▪ Four	-	-
▪ Five	-	-
▪ ≥٦	١	3.6

Table (1) revealed personal characteristics of the studied nurses, it was evident that more than two fifth (45.5%) of nurses aged 25- <30 years with mean age was 28.4± 5.48 years, while the almost (95.5%) of the nurses were female, the majority (86.4%) of them were married and more than one third (36.4%) had diploma of general nursing technician. Regarding experience of nurses in pediatric blood transfusion, it was observed that less than two thirds (63.6%) of them had more than five years of experience in

pediatric blood transfusion, while more than half (57.6%) of them reported no previous training courses related to blood transfusion and more than half (53.6%) obtained one course in blood transfusion.

Table (2): Percentage distribution of the studied nurses' knowledge regarding blood (n=66)

Items	Complete Correct Answer		Incomplete Correct Answer		Don't know/ Wrong Answer	
	No.	%	No.	%	No.	%
▪ **Meaning of blood**	48	72.7	1	1.5	17	25.8
▪ **Manufacture of blood**	45	68.2	1	1.5	20	30.3
▪ **Blood components**	66	**100.0**	0.0	0.0	0.0	0.0
▪ **Functions of blood**	62	**93.9**	4	6.1	0.0	0.0
▪ **Blood groups**	65	**98.5**	0.0	0.0	1	1.5
▪ **Function of red blood cells**	4	6.1	54	**81.8**	8	12.1
▪ **Functions of white blood cells**	26	39.4	40	60.6	0.0	0.0
▪ **Function of platelets**	57	**86.4**	1	1.5	8	12.1
▪ **Functions of plasma blood**	53	**80.3**	1	1.2	12	18.2

Table (2) demonstrated nurses' knowledge regarding to blood, it was clear that all (100%) of nurses had complete correct answer regarding blood components, in addition the vast majority (93.9%) of them had complete correct answer regarding functions of blood and almost (98.5%) had complete correct answer regarding blood groups, respectively on the other hand the majority of the nurses (81.8%) had incomplete correct answer regarding function of red blood cells, while the majority of them (86.4% & 80.3%) had complete correct answer regarding function of platelets and functions of plasma blood.

Table (3): Percentage distribution of the studied nurses' practices regarding care of children undergoing blood transfusions (Pre-Transfusion preparation) (n=66)

Items	Complete Correct Done		Incomplete Correct Done		Don't Done	
	No.	%	No.	%	No.	%
▪ **Check doctor's order**	66	**100.0**	0	0.0	0	0.0
▪ **Ascertain if specimen for typing and cross match is necessary**	54	**81.8**	0	0.0	12	18.2
▪ **Explain to family and child signs of transfusion reaction**	21	31.8	33	50.0	12	18.2
▪ **Verify consent for transfusion is signed and on chart**	54	**81.8**	12	18.2	0	0.0

▪ **Send request for blood product to blood bank**	66	**100.0**	0	0.0	0	0.0
▪ **Prepare required equipment readily available at bedside**	21	31.8	45	**68.2**	0	0.0

Table (3) indicated nurses' practices regarding caring for children undergoing blood transfusions, it was evident that all (100%) of nurses done complete correct practice regarding check doctor's order and send request for blood product to blood bank, while the majority (81.8%) of them done complete correct practice regarding ascertain if specimen for typing and cross match is necessary and verify consent for transfusion is signed and on chart. On the other hand, the more than two thirds (68.2%) of nurses done incomplete practice regarding prepare required equipment readily available at bedside.

Discussion:

As regards to personal characteristics of the studied nurses, the current study revealed that, more than two fifth of the studied nurses aged 25- <30 , while the almost of them were female. This result accordance with the study done by ***Abd Elhy & Kasemy., (2017)*** which entitled "Nurses' knowledge assessment regarding blood transfusion to ensure patient safety" who reported that, more than half (55.2%) of the studied nurses were at the age 30 year old and more than three quarters(76%) of the studied nurses were female .

Regarding the level of education of the studied nurses, the current study revealed that, the more than one third of the studied nurses had diploma of general nursing technician. This result disagree with the study

done by ***Khalaf et al., (2017)*** which entitled **"**Effect of training program on nurses' competent practices towards children receiving blood transfusion" who reported that, the more than half of nurses (60%) had diploma of general nursing technician.

As regards to years of experience in pediatric blood transfusion, the current study revealed that, less than two thirds of the studied nurses had more than five years of experience in pediatric blood transfusion. This result accordance with the study done by ***Abd Elhy & Kasemy, (2017)*** who reported that, less than two thirds (63.6%) of the studied nurses had experience more than five years.

Concerning training courses that attended in blood transfusion, the current study revealed that, more than half of the studied nurses did not attend any preceding training courses related to blood transfusion and more than half of them obtained one course in blood transfusion. This result disagree with the study done by ***Khalil et al., (2013)*** which entitled **"**Impact of implementing a designed nursing intervention protocol on nurses' knowledge and practice regarding patients undergoing blood transfusion" revealed that, the majority of the studied nurses did not attend any training courses related to blood transfusion. From the researcher point of view, the decreasing number of training courses of the nursing is due to lack of financial means of blood transfusion services, training and education are essential for all nursing staff involved in the transfusion procedure because the increasing number of training courses have a positive effect on the practice of nurses as the nurses develop new skills and competence practice that will minimize transfusion errors.

Concerning nurses' knowledge towards blood and it's components, the current study revealed that, all of the studied nurses had complete correct answer regarding blood components, while the majority of nurses had complete correct answer regarding the functions of platelets and plasma blood and the vast majority of them had complete correct answer regarding functions of blood. This result agree with the study done by ***Aslani et al., (2010)*** which entitled "Nurses' knowledge of blood transfusion in medical training centers of Shahrekord" who reported that, almost of nurses (95.7%) had complete correct answer regarding to question of the blood and blood components, while this result disagree with the study done by ***Shamshirian et al., (2017)*** which entitled "knowledge and awareness of nursing students on blood transfusion" who reported that, less than one quarter (22.45%) of the studied nurses had correct answer regarding to the questions towards blood and it's components.

In addition to this result disagree with the study done by ***Hijji et al., (2013)*** which entitled "Knowledge of blood transfusion among nurses, Journal of Clinical Nursing" who found that, the majority of the studied nurses had incorrect answer regarding to the questions towards blood and its components. From the researcher point of view, training skilled nurses with adequate knowledge about blood and it's components can reduce the potential risks of blood transfusion. Moreover, hospital costs will be significantly reduced, because production and storage of blood components is a very costly process for blood centers and hospitals.

As regards to nurses' practices towards pre-transfusion preparation, the current study revealed that, the majority of the studied nurses performed correct practice regarding ABO compatibility test and verify consent for

blood transfusion. This result disagree with the study done by ***Freixo, (2017)*** who found that, over half (55%) of the studied nurses don't perform correct practice regarding ABO compatibility test and verify consent for blood transfusion. From the researcher point of view, the nurses must perform ABO compatibility test and verify consent before transfusion of blood to reduce potential hazards for the child.

Conclusion:

Based on the findings of the current study, the following is concluded:

Approximately slightly less than two thirds (65.2%) of nurses had satisfactory knowledge regarding blood transfusions for children, while the majority (81.8%) of nurses had competent practice regarding blood transfusions for children. There was highly statistically significant relation between total knowledge score of nurses and their years of experience in pediatric blood transfusion, on the other hand, there was a significant relation between total knowledge score of nurses and their educational level and their age. Moreover, there was a significant relation between total practice score of nurses and their educational level and their years of experience in pediatric blood transfusion. There was a positive correlation between total knowledge and total practice of nurses regarding blood transfusions for children.

Recommendation:

Based on the results of the study it was recommended that:

1. Most of nurses were not familiar with the recent developments in the transfusion process, so the nurses should receive appropriate training on transfusion therapy.
2. Provision of continuing education programs on regular basis is suggested in order to refresh and update nurses' knowledge, as well as reinforce proper practices related to blood transfusion in pediatric units.
3. Continuous supervision and evaluation for nurses is needed to determine any defect related to knowledge or practices related to blood transfusion in pediatric units.
4. Policies and strategies for hospital related to blood transfusion must be setting, applied and placed in a well visible place at the hospital as well as at the all pediatric units.
5. Further studies are needed to contribute to improve nursing research and teaching, in order to generate new knowledge on nursing practices related to blood transfusion in pediatric units.
6. Recent research on nursing care in transfusion therapies, aimed to produce new knowledge on this field, will contribute to the training of nurses at the different levels of formation (undergraduate, graduate and post-graduate studies), resulting in the provision of appropriate child care during the blood transfusion procedure.