Effectiveness of an Educational Program on Improving Nursing Care for Thalassemia Patients Undergoing Blood Transfusion

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Abstract

Background: Thalassemia is a genetic disorder that disrupts hemoglobin production, leading to severe anemia. Beta-thalassemia major patients often require lifelong blood transfusions. Nurses play a crucial role in managing these transfusions, but gaps in knowledge and practice can lead to complications. This study assessed the impact of an educational program on nurses' knowledge and skills regarding thalassemia and blood transfusion protocols. Methods: A quasi-experimental study was conducted at the Jin Pediatric Hematology-Oncology Center in Duhok City, Iraqi Kurdistan. The sample included 20 nurses. The program consisted of four sessions (two theoretical and two practical). Data collection instruments included a socio-demographic sheet, a knowledge questionnaire, and a skills checklist. Pre- and post-intervention knowledge and practice scores were analyzed using paired t-tests and chi-square tests. Results: The educational program significantly improved nurses' knowledge of thalassemia ($P < 0.00$) and transfusion protocols, with the mean knowledge score increasing from 5.2 ± 2.09 to 8.05 ± 1.82. Practice scores also showed statistically significant improvements ($P < 0.002$).

Correlations between total knowledge and practice scores, as well as with nurses' experience and educational level, were statistically significant. Conclusion: The study demonstrated that an educational program can enhance nurses' knowledge and practices in managing thalassemia patients undergoing blood transfusions. Continued education and targeted interventions are essential to improving the quality of care for these patients.

Keywords: Beta-thalassemia, Blood Transfusion, Nursing Education, Thalassemia Care, Patient Outcomes.

Introduction

Thalassemia is one of the most common inherited conditions globally, representing a significant public health challenge. This disorder is caused by a genetic defect affecting the genes responsible for hemoglobin production. Hemoglobin, a protein crucial for oxygen transport, consists of two types of chains: alpha and beta. Mutations in the genes responsible for beta-chain production result in beta-thalassemia, a condition characterized by ineffective red blood cell production and subsequent anemia (Aksu & Unal, 2021). Infants with thalassemia major appear healthy at birth, but severe anemia typically manifests within their first year. Other symptoms may include facial bone deformities, fatigue, growth retardation, difficulty breathing, and jaundice (Shafie et al., 2020; Deepak et al., 2017).

Management of beta-thalassemia major requires regular blood transfusions, typically every three to four weeks, along with iron chelation therapy to remove excess iron from the body. These

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Significance | This study highlights the importance of nursing education in improving patient care and safety during blood transfusion procedures.

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treatments significantly improve patient outcomes (Shafie et al., 2020; Abu Shosha, 2014). However, the lifelong need for transfusions and chelation poses a substantial burden not only on individuals and their families but also on the healthcare system (Abd Alsemia Elewa & Abd Elshahed Ahmed Elkattan, 2017).

Blood transfusion has been a critical medical intervention since the 19th century, with millions of patients receiving blood products annually. According to the World Health Organization, around 9 million people in 90 countries benefit from blood transfusions each year (Bolton-Maggs, 2017). Despite advancements in transfusion technology, significant risks and complications persist, primarily due to human error. Serious Hazards of Transfusion (SHOT) data reveal that approximately 70% of adverse events during transfusion are linked to incorrect procedures (Flood & Higbie, 2016). Given their direct involvement with patients, nurses play a pivotal role in ensuring the safety and effectiveness of transfusions. Therefore, ensuring that nurses possess adequate knowledge and skills in transfusion protocols is critical to improving patient outcomes (Elhy & Kasemy, 2017; Noor et al., 2021).

This study aims to assess the impact of an instructional program on enhancing the quality of nursing care for thalassemia patients undergoing blood transfusions. Specifically, it seeks to evaluate nurses' knowledge of thalassemia and blood transfusion protocols, develop and implement an educational program, and measure its effectiveness in improving nursing care.

Materials and Methods

Study Design

A quasi-experimental design was employed in this study to evaluate the impact of an educational program on nursing care during blood transfusions for thalassemia patients. The research was conducted at the Jin Pediatric Hematology-Oncology Center in Duhok City, Iraqi Kurdistan, a specialized facility providing care for pediatric patients with hematological and oncological conditions. The study was carried out over a three-month period, from November 1, 2023, to February 1, 2024.

Study Sample

The sample comprised all 20 nurses working at the Jin Pediatric Hematology-Oncology Center during the study period. These nurses, who worked across various hospital wards, provided direct patient care and willingly consented to participate in the research.

Instrumentation

The researcher developed a questionnaire based on an extensive literature review and subject to validation by multiple referees. The tools were organized into three parts:

Socio-demographic Data Sheet: This section collected information on nurses' age, gender, education level, and years of experience.

Knowledge Questionnaire: Written in basic Kurdish, this questionnaire assessed the nurses' knowledge of thalassemia, including its types, causes, diagnostic methods, management strategies, complications, and the importance of blood transfusions. The scoring system categorized knowledge levels as poor (<50%), fair (50% to <75%), or good (≥75%).

Skills Evaluation Checklist: Based on a literature review, this checklist evaluated nursing skills during different phases of blood transfusion (preparatory, during, and post-transfusion) and patient assessment. Each step was scored as correct (2 points), inadequate (1 point), or incorrect/not performed (0 points), with performance levels categorized as poor (<50%), fair (50% to <75%), or good (≥75%).

Reliability and Validity of Instruments

The reliability of the tools was assessed using test-retest methodology, yielding a reliability coefficient of 0.81, indicating strong internal consistency. Validity was ensured by presenting the instruments to a panel of five experts in pediatrics and nursing for review and feedback.

Implementation of the Educational Program

The educational program spanned two weeks and consisted of four sessions, including two theoretical and two practical components. Each session lasted 50-60 minutes. The sessions covered essential topics related to thalassemia and blood transfusion protocols, with the use of instructional methods such as lectures, group discussions, video demonstrations, and presentations. The researchers provided recaps of previous sessions and outlined the objectives for each upcoming session.

Ethical Considerations

Approval for the study was obtained from the Ethical Committee of the General Directorate of Health in Dohuk Governorate, as per Order No. 201123, issued on November 29, 2023.

Data Analysis

Data were analyzed using SPSS version 19. Frequencies, percentages, correlation coefficients, chi-square tests, and paired t-tests were employed to determine the statistical significance of variables. A p-value of <0.05 was considered statistically significant, while a p-value >0.05 was deemed non-significant.

Results

The demographic characteristics of the nurses participating in the study are shown that 25% of the nurses were between the ages of 44 and 51, with an average age of 39.9 ± 11.76 years. Most nurses (65%) had completed nursing school, and 40% had worked in hematology units for over ten years (Table 1).

The mean scores for knowledge about different forms of thalassemia increased from 0.75 ± 0.44 before the program to 1.5 ± 0.51 after the program. Similarly, knowledge of diagnostic procedures improved from 0.6 ± 0.68 to 1.0 ± 0.73. There was also an increase in knowledge regarding the care and instructions given to patients, from 1.0 ± 0.46 to 1.4 ± 0.6. Furthermore, knowledge

about thalassemia complications increased significantly from 0.5 ± 0.69 to 1.0 ± 0.56, and knowledge regarding the importance of blood transfusions improved from 0.7 ± 0.66 to 1.3 ± 0.57. However, knowledge of the causes and effects of blood transfusions did not show notable improvement, with scores increasing from 1.15 ± 0.59 to 1.2 ± 0.52 for causes, and from 0.5 ± 0.61 to 0.65 ± 0.67 for effects. Overall, the nurses' average knowledge scores increased from 5.2 ± 2.09 before the program to 8.05 ± 1.82 after the program, with all knowledge items showing statistically significant differences (P < 0.00) (Table 2).

In terms of nursing practice, statistically significant improvements were observed in all assessed areas before and after the program (P < 0.002) (Table 3). Vital sign measurements, for instance, improved from 0.25 ± 0.55 to 0.6 ± 0.50. The nurses' practices during and after blood transfusions also showed significant improvements across several phases, with pre-program scores of 0.9 ± 0.79, 0.55 ± 0.6, and 0.45 ± 0.69 increasing to post-program scores of 1.35 ± 0.59, 0.85 ± 0.37, and 0.85 ± 0.67, respectively. However, no improvement was noted in nurses' practices regarding the assessment of body systems, with scores decreasing from 0.3 ± 0.47 to 0.1 ± 0.22. Overall, nurses' total practice scores improved significantly from 2.15 ± 1.75 before the program to 3.7 ± 1.03 after its implementation (Table 3).

Statistically significant relationships between the overall knowledge and practice scores of nurses before and after the program were revealed (r = 0.45 and 0.55, respectively; P < 0.05 for both) (Table 4). In addition, total knowledge and practice scores were found to be statistically correlated with age, years of experience, and educational level (r = 0.26, 0.51, and 0.62, respectively), with significant P-values of <0.36, <0.021, and <0.004, respectively. Statistically significant correlations were also found between nursing practice scores and both educational level and years of experience (r = 0.53 and 0.54, respectively; P < 0.016 and <0.015, respectively) (Table 5).

Prior to the program, 37.1% of the nurses had a good level of knowledge about thalassemia and blood transfusions, which increased to 57.5% post-program. Similarly, the percentage of nurses with a good level of practice rose from 21.5% to 37% after the program (Figure 1).

Discussion

Study Sample's Nurses' Characteristics

The majority of the study participants were between 44 and 51 years old, with 40% of them having more than ten years of experience. This finding aligns with previous studies, which often report a concentration of experienced nurses in older age groups (Elkattan, 2013). The fact that 65% of the nurses had completed nursing school reflects the general trend of nursing qualifications in this population. The small percentage of nurses holding a diploma and

the lack of appointments to the Ministry of Health's staff might explain this phenomenon. These findings contrast with those of Marouf (2013), who reported that more than half of the study participants held nursing diplomas, with a significant portion also having obtained a bachelor's degree or additional qualifications in other specialties.

Regarding years of experience, the current study found that 40% of the nurses had more than ten years of experience, which is consistent with the research of Elkattan (2013), who also observed a predominance of experienced nurses in the study sample. This could be attributed to the fact that the majority of the nurses were within the 44–51 age range, making it likely that they had accumulated years of experience throughout their careers.

Knowledge and Practice Levels of Nurses

Nurses play a critical role in ensuring safe blood transfusions, making it essential for them to possess thorough knowledge of blood components, their usage, potential adverse effects, and necessary care protocols. The current study revealed significant improvements in both knowledge and practice among nurses following the educational program on thalassemia and blood transfusions. This improvement may be attributed to several factors, including the program's clear and simple language, its relevance to the nurses' work, and the reinforcement of previously learned concepts. These findings align with those of Aslani et al. (2020), who also noted that education programs can enhance nurses' ability to manage blood transfusions safely and effectively, even though gaps may still exist in some aspects of their knowledge. Khouri (2020) also highlighted the importance of continuing education for nurses, emphasizing that it enhances their capacity to provide high-quality care. Furthermore, Hijji et al. (2022) noted that nurses need to possess the required knowledge to prevent and detect adverse transfusion reactions, a critical aspect of patient safety. Before the educational program, nurses in the current study had inadequate knowledge, which can be attributed to insufficient coverage of these topics in nursing school curricula, a shortage of nursing staff, and a lack of ongoing education related to caring for patients with thalassemia (Aslani et al., 2020). This finding underscores the necessity for more targeted educational initiatives. In terms of practice, the study showed statistically significant improvements in vital sign monitoring and the nurses' role during the various phases of blood transfusion. These improvements can likely be attributed to the educational program's positive influence. Prior to the intervention, the nurses' practice was often inadequate, a problem noted in other studies as well, such as those by Deborah and Corcoran (2016) and Alomar (2012), who found that many nurses demonstrated suboptimal performance in patient management. The educational program provided much-needed guidance, which likely contributed to the improvements observed in this study.

Table 1. shows the distribution of the study's (20) nurses' characteristics.

Variables	No.	%
Age (in years):		
20 - 27	4	20.0
28 - 35	4	20.0
36 - 43	3	15.0
44 -51	5	25.0
52 - 59	4	20.0
Mean ± SD		39.9 ± 11.76
Educational level		
Nursing school	13	65.0
Nursing diploma	7	35.0
Years of experience		
1 - 5	7	35.0
5 - 10	5	25.0
More than 10	8	40.0

Table 2. Level of nurses' knowledge regarding thalassemia and blood transfusion pre/post program implementation (n=20)

Items	Pre intervention Mean ± SD	Post intervention Mean ± SD	Paired t test	P-value
Types of thalassemia.	0.75± 0.44	1.5 ± 0.51	5.25	0.000
Causes of thalassemia.	1.15± 0.59	1.2 ± 0.52	0.37	0.716
Methods of diagnosis.	0.6 ± 0.68	1.0 ± 0.73	2.37	0.028
Management and instructions given to patients.	1.0 ± 0.46	1.4 ± 0.6	2.37	0.028
Complications of thalassemia.	0.5 ± 0.69	1.0 ± 0.56	2.51	0.021
Importance of blood transfusion.	0.7 ± 0.66	1.3 ± 0.57	2.45	0.024
Side effects of blood transfusion.	0.5 ± 0.61	0.65 ± 0.67	0.9	0.38
Total knowledge	5.2 ± 2.09	8.05 ± 1.82	6.19	0.000

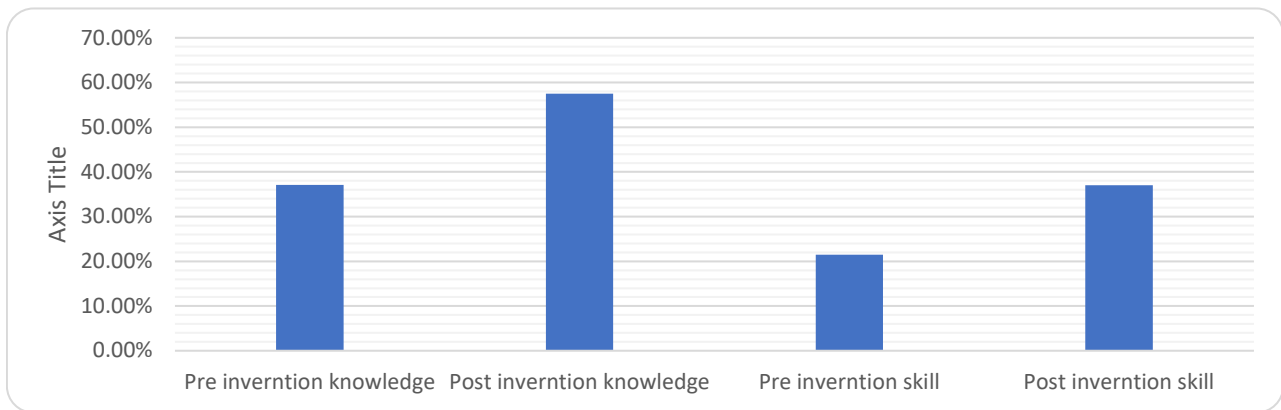**Table 3.** Level of nurses' practice pre/post program implementation (n = 20)

Items	Pre intervention Mean ± SD	Post intervention Mean ± SD	Paired t test	P-value
Assessment of the body systems.	0.3 ± 0.47	0.1 ± 0.22	2.03	0.56
Measuring of vital signs.	0.25 ± 0.55	0.6 ± 0.50	2.1	0.049
Nursing role in preparatory phase of blood transfusion.	0.9 ± 0.79	1.35 ± 0.59	2.27	0.035
Nursing role during blood transfusion phase.	0.55 ± 0.6	0.85 ± 0.37	2.35	0.03
Nursing role after blood transfusion.	0.45 ± 0.69	0.85 ± 0.67	2.18	0.042
Total practice	2.15 ± 1.75	3.7 ± 1.03	3.94	0.002

Table 4. Correlation between the total knowledge and practice scores of nurses before and after the program's implementation (N=20)

Total Knowledge Score		Total Practice Score	
Pre program and Post program correlation		Pre program and Post programcorrelation	
r	P	r	P
0.45	0.045	0.55	0.82

Table 5. Correlations between total nurses' knowledge score, total practice scores, and age, level of education , and years of experience post program implementation (n=30)

Items	Age		Level of education		Years of experience	
	r	p	r	p	r	p
Total knowledge scores	0.26	0.36	0.51	0.021	0.62	0.004
Total practice scores	-0.1	0.8	0.53	0.016	0.54	0.015

Figure 1. Total level of nurses' knowledge and practice /post program implementation

Correlations Among Nurses' Age, Experience, Education, and Knowledge and Practice Scores

The current study found statistically significant correlations between years of experience, educational attainment, and overall knowledge and practice scores prior to the implementation of the educational program. This finding is consistent with previous research by Deborah and Corcoran (2016), which found a positive correlation between nurses' education, practice, and the quality of care provided to patients. In particular, the level of education was shown to influence the standard of care, suggesting that better-educated nurses deliver higher-quality services.

After completing the educational program, the study indicated statistically significant positive relationships between years of experience and improvements in both knowledge and practice. Shafik and AbdAllah (2015) confirmed this finding, showing that nurses with more years of experience tended to demonstrate higher levels of knowledge and improved practices. Additionally, the study revealed a significant association between nurses' total knowledge and practice scores, indicating that higher levels of knowledge led to better practice. This finding aligns with Hunter (2011), who emphasized that while nurses may acquire a wide range of skills, it is crucial for them to apply those skills in clinical settings for meaningful patient outcomes.

The results of this study highlight the critical role of education in enhancing nurses' knowledge and practice, particularly concerning blood transfusion and thalassemia care. The correlations between experience, education, and practice further underscore the importance of targeted, ongoing professional development to ensure high standards of patient care.

Conclusion

This study demonstrated that implementing an educational program significantly improved both the knowledge and practices of nurses caring for thalassemia patients undergoing blood transfusions. Nurses' understanding of critical aspects, such as thalassemia management and transfusion protocols, increased, as evidenced by notable score improvements in knowledge and practice assessments. The findings underline the importance of continuous professional development, especially for nurses with varying levels of education and experience, to ensure consistent and high-quality patient care. Additionally, the program's success suggests that such educational interventions can effectively address gaps in practical skills and theoretical knowledge. However, the persistence of certain deficiencies, such as those related to blood transfusion effects and body system assessment, points to the need for more targeted education and follow-up training. Overall, enhancing nurses' knowledge and skills through structured programs contributes to better patient outcomes and minimizes risks associated with blood transfusion, ultimately improving healthcare quality for thalassemia patients.

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