Research Article

Determinants Of Blood Transfusion Knowledge And Practice Among Pediatric Nurses: Impact Of Experience, Academic Qualification, And Training Exposure

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Abstract

Objective(s): This study aims to identify the determinants of blood transfusion knowledge and practices among pediatric nurses, and to examine the impact of years of experience, academic qualification, and training exposure on their knowledge and practice levels .**Methods:** This study used a descriptive design was performed in the intensive care unit, and hematology unit of two hospitals in Baghdad and Baqubah city, Iraq from September May 18th to 25th, October 2025. A non-probability (purposive) sample of 80 nurses was selected. Nurses' knowledge was assessed using questionnaire format and observational checklist to assess nursing practice. The instrument's validity and reliability were confirmed by experts and interrater agreement. Data were analyzed by questionnaire and direct observational, and it processed using SPSS version 22.0 **Results:** The study revealed that more than one third of the studied nurses had poor knowledge and more than half of them had incompetent practice. Most of the study sample 82.5% in al-Batoul hospital and 70.0% in Ibn al-Baladi hospital were females. The age group (20-29) takes the highest percentage (67.5%, 52.5% in both hospitals), In addition, about (50.0%) are diploma and bachelor degree in both hospitals of the academic qualification, (42.5%) of the nurses who works in blood transfusion units have 1-5 years of experience in al-Batoul hospital and Ibn al-Baladi hospital (55.0%) of the nurses have 6-10 years of experience, and (45.0%, 57.5% in both hospital) of the nurses participated in blood transfusion training. No significant statistical associations were found between nurse's knowledge and practice from one hand and years' experience, academic qualification, and training exposure on the other hands $p \leq 0.05$. **Conclusions:** Training exposure and years of experience, academic qualification were the no significant predictors of safe pediatric blood transfusion knowledge and practices among nurses. **Recommendations:** The study recommends ongoing professional training programs, competency-based assessment, and mentorship programs to improve blood transfusion safety in pediatric nurses.

Keywords: Impact, Experience, Academic Qualification, Training exposure, Nurses' knowledge and practice, Blood Transfusion

1. Introduction

Blood transfusion started in 1665 with Richard Lower's animal-to-animal procedure, followed by Jean Denis's animal-to-human transfusion in 1667. James Blundell achieved the first successful human-to-human transfusion in 1818. The ABO blood grouping system was established by Karl Landsteiner in 1900, enhancing blood compatibility, and the first cross-match was conducted by Ottenberg in 1907. The Rh blood group was identified in 1940. Since 1917, whole blood has been widely used in military and pediatric cardiac surgeries [(1,2)].

Blood transfusion is an essential form of medical treatment, particularly in pediatric practice, where common illnesses are usually related to blood destruction. The ABO and Rh blood groups are critical to ensuring compatibility; however, challenges may arise in emergencies or with patients who have rare blood type deficiencies. It involves the administration of blood or blood components to replenish lost blood volume, improve oxygen-carrying capacity, and correct blood disorders [(3)].

In children, blood transfusions are commonly used for conditions such as anemia due to iron deficiency is the most common hematologic disorder, leukemia is a malignant hematopoietic disease characterized by an uncontrolled proliferation, congenital blood disorders (like β-thalassemia major presents in infancy and requires life-long transfusion therapy and sickle cell disease), and bleeding from trauma or surgery[(4,5)]. According to the Finnish Red Cross blood service, each year, 200,000 red cell components, 40,000 thrombocyte components, and 40,000 units of fresh frozen plasma are used in Finland[(6,7)].

Blood transfusions in pediatric patients, while life-saving, carry risks such as transfusion reactions, infections, and iron overload. Children are especially vulnerable due to their developing immune systems and smaller blood volumes, making careful monitoring essential[8]. Over 50% of patients in intensive care and 50% to 70% in surgical and orthopedic departments may need transfusions[9]. Blood transfusion in children requires strict adherence to protocols, including blood typing, cross-matching, and monitoring for complications. nurses play a pivotal role in ensuring this procedure's safe and effective administration. However, studies show gaps in nurses' skills and adherence to standardized practices, which can jeopardize patient safety[10,11].

Key stages in nursing related to blood transfusion include the decision to transfuse based on lab results and patient assessment, preparation steps before drawing blood from the blood bank, pre-transfusion actions, and post-transfusion care to ensure pediatric patient safety [12]. Nurses must review the physician's prescription, inform patients of risks and benefits, and ensure readiness of the intravenous set and pre-medications[13]. Accurate identification matching of patients with blood bags is critical to avoid errors. Pre-transfusion, verification by two certified individuals is required alongside specific checks. After transfusion begins, monitoring for reactions is essential, with the transfusion completed within four hours while administering saline and morphine as required[14].

Training models, often known as manikins, are tools used in nursing education that mimic the anatomical and physiological features of adult or pediatric patients. Training models are essential to structured clinical model activities, according to the National Council of State Boards of Nursing. They enhance psychomotor abilities and critical thinking in pediatric nursing when used in conjunction with case-based scenarios, skill stations, and imitate real clinical practice[15].

Model-based training therapies offer advantages such as adjustable difficulty levels, opportunities for repeated practice, prompt feedback provision, and the potential for personalized learning[16]. Research reveals that opportunities to practice nursing skills on real patients are frequently limited during undergraduate training. This fact may influence the competency development of newly qualified healthcare personnel, increasing the likelihood of errors and jeopardizing patient safety[17].

The most effective strategy for training novice nurses in hazardous clinical procedures is a structured training model. This model provides a low-risk, supportive learning environment where new practices can be applied, helping identify process deficiencies and promote quality improvement. Clinical learning aids are crucial for developing professional identities, acquiring nursing roles, and gaining practical skills. A well-organized exercise can improve clinical proficiency and reduce stress while enhancing confidence among nursing students [18].

The evaluation of a nurse's motivation, satisfaction, and acceptance of a pedagogical method is contingent upon their contentment with the lesson. It assesses a learner's ability to exhibit cooperative abilities in various healthcare settings while delivering outstanding service with a positive demeanor. Numerous statistics indicate that nurses often do procedures in a conventional manner, implying a divergence between scientific knowledge and practical application [19] .

Pediatric nurses preparing blood component transfusions will demonstrate advanced clinical skills and professional autonomy, working collaboratively within healthcare teams. Emphasizing the need for proper training and evidence-based guidelines, recent advancements in transfusion medicine highlight techniques like training models to enhance transfusion safety [20, 21].

Significance of the Study:

A study in Iraqi hospitals (2024-2025) revealed that 60% of pediatric nurses lacked specialized training in blood transfusion, resulting in inadequate knowledge and poor practices. Up to 32.5% of transfusions were performed without a valid medical reason. Effective training models can improve nurses' knowledge and practice, and adherence to guidelines, thereby enhancing patient safety and treatment outcomes [22]. Pediatric nurses play a pivotal role in blood transfusions, and ongoing training is essential to ensure quality care and minimize risks. The findings of this study can contribute to the development of nursing education curricula and hospital policies, promoting evidence-based knowledge and best practices in care [23].

Aim of the study:

This study aims to identify the determinants of blood transfusion knowledge and practice among pediatric nurses, and to examine the impact of years of experience, academic qualification, and training exposure on their knowledge and practice levels.

Research hypotheses:

1. **H1:** Years of experience, academic qualification, and training exposure have a statistically significant impact on pediatric nurse's blood transfusion knowledge and practice.
2. **H2:** Years of experience, academic qualification, and training exposure are significant predictors of blood transfusion knowledge and practice among pediatric nurses.

Subject & Methods:

Research design

The study was conducted using a descriptive design.

Research setting

The study was conducted in two hospitals: Al-Batoul Teaching Hospital in Baquba, Diyala, and Ibn Al-Baladi Children's and Maternity Hospital in Baghdad. Al-Batoul Teaching Hospital is a seven-story government hospital specializing in maternal and child health, and it includes a pediatric department where nurses received hands-on training in blood transfusions using a medical mannequin. Ibn Al-Baladi Children's and Maternity Hospital is a 311-bed government hospital providing specialized care for women and children. The study involved direct observation of nurses performing blood transfusions on infants in the neonatal intensive care unit, and hematology unit.

Subject

Non probability (purposive) sample was used to select 80 nurses who worked in intensive care unit and hematology unit and have at least five years of experience, Diploma academic qualification and one course training exposure.

Data collection Tool

Two tools were used in the current study as following [24,25,26].

This tool is divided into two parts as the following:

Part I: Socio-demographic Data of Nurses

The socio-demographic data section was designed to obtain basic metadata for study participants. These data included (age, sex, academic qualification, years of experience and attendance at blood transfusion training courses was included in this section).

Part 2: Nurses' knowledge about blood transfusion:

A nurses' knowledge true, false and multiple-choice questionnaire: For assessing the nurses' knowledge of blood transfusions. Eight questions were asked on the Patient preparation issues, Collect blood packs. 2. Nursing activities to initiate pre-transfusion (6 questions). 3. Post-transfusion nursing activities and issues (11 questions).

Scoring system:

The knowledge of nurses is scored at questionnaire with three assessments: Yes=2, No =1, I don't know =0. This rating was used for all items on the scales

Tool II: Blood transfusion Observational Checklist:

This tool is divided into two parts as the following:

Part II: Nurses' practices about blood transfusion:

A nurses' practices Correctly done, incorrectly done, not done: For evaluating the nurses' practices of blood transfusions. seven questions were asked on the Patient before Blood Transfusion. 2. During blood transfusion (18 questions). 3. Post blood transfusion (6 questions) and Transfusion reaction of blood transfusion (7 questions).

Scoring system:
The practices of nurses is scored at trichotomous checklist with three evaluations: Correctly done=3, Incorrectly done=2, Not done=1. This rating was used for all items on the scales

Procedures
Preparatory Phase:
This phase involved reviewing relevant local and international literature and recent studies to: Identify various aspects of the study develop research tools using books, journals, and evidence-based articles. During this phase, the researchers prepared the content for the nurses based on their specific needs.

Tools validity and reliability
The validity of the study instruments' content was assessed and reviewed by a committee of ten pediatric nursing experts at the College of Nursing, University of Baghdad, to test their suitability, relevance, sequencing, and clarity. Modifications were made based on their feedback. Cronbach's alpha coefficient was used to test the reliability of the study instruments. The reliability score for the practices was 0.8042, indicating an acceptable level of internal consistency.

Administrative Design
An official letter from the Dean of the College of Nursing at the University of Baghdad approved conducting this study. The study's objective and expected outcomes were clearly outlined.

Ethical Considerations
This study received approval from the Research Ethics Committee of the College of Nursing at the University of Baghdad and the Iraqi Ministry of Health. Ethical approval code, Ref:30, Date: 10\3\2025. After explaining the study's objective and benefits, all participants were informed of their right to participate.

pilot study
A pilot study with 10% of nurses ensured clarity and feasibility, with pilot participants included in the main sample.

Fieldwork:
The purpose of the study was simply explained to the nurses who agree to participate in the study prior to data collection. The actual work of this study started and completed within six months from May, (2025) and was completed by the end of October (2025). Data were collected by the researcher during nurse's interview 3day/week, at morning shifts in the previous mentioned settings. The questionnaires were distributed to all studied nurses, the researcher was approached each individual nurse who was selected to clarify any unintelligible questions, each nurse has completed the questionnaire in the presence of the researcher. Each questionnaire took about 10 to 15 minutes to complete. The practice was evaluated through observation during care of nurses' by using checklist. The time needed for completing the tools was about one hours for every nurse.

Data Analysis
The Statistical Package for Social Sciences (SPSS) version 22.0 to assess knowledge and practice regarding blood transfusion in pediatric nurses. Data were presented in tables. Statistical presentation and analyze of the present study was conducted using the frequencies, percentages, mean ( ), standard Deviation (SD), chi-square (X2) and Mann-Whitney U test.

Results
Table (1) Table 1 Most participants were female (82.5% study group, 70% control group). Most were in the first age group (52.5% Al-Batoul Hospital, 67.5% Ibn Al-Baladi Hospital), with mean ages 21.55 yrs (Al-Batoul Hospital) and 27.20 yrs (Ibn Al-Baladi Hospital). In Al-Batoul Hospital held a Diploma degree, while Ibn Al-Baladi Hospital held a Bachelor's degree. Most had <10 years of experience (75% Al-Batoul Hospital, 93% Ibn Al-Baladi Hospital), (55% Al-Batoul Hospital) and 42.5% (Ibn Al-Baladi Hospital) attended blood transfusion training. Most attended 1-2 training courses in the past year (85% Al-Batoul Hospital, 84.6% Ibn Al-Baladi Hospital).

Table (2): show that, more than half of the studied nurses had poor knowledge in two hospitals, 11.5% of them had

average knowledge, while 8.5% of them had good knowledge in Al-Batoul Hospital and 7.4% of them had average knowledge, while 7.1% of them had good knowledge Ibn Al-Baladi Hospital regarding blood transfusion in pediatric nurses with highly significant differences at P<0.01.

Table (3): shows that, nurses of the studied have incompetent practice in two hospitals regarding blood transfusion in pediatric with highly significant differences at P<0.01.

Table (4): This result demonstrates that there no significant association between years 'of experience, academic qualification, and training exposure and nurses' knowledge in two hospitals concerning blood transfusion in pediatric (P>0.05).

Table (5): the results reveals no significant statistical association between years' experience, academic qualification, and training exposure and nurses' practices in two hospitals concerning blood transfusion in pediatric (P>0.05).

Table (1): Distribution of Socio-Demographical Characteristics Variables and Some Related Variables with Comparisons Significant.

Characteristics	Samples	l-Batoul Hospital		Al-Baladi Hospital		C.S. (*)
	Groups	No.	%	No.	%	P-value
Sex	Male	7	17.5	12	30	CC = 0.145
	Female	33	82.5	28	70	P=0.189 NS
Age Groups	20 _	21	52.5	27	67.5	CC = 0.248
	30 _	10	25	11	27.5	
	40 _ 50	9	22.5	2	5	P=0.072 NS
	Mean ± SD	31.55 ± 8.92		27.20 ± 4.84		
Academic Qualification	School	9	22.5	4	10	CC = 0.242
	Diploma	20	50	16	40	P=0.083 NS
	Bachelor	11	27.5	20	50	

Some Related Variables	Groups	l-Batoul Hospital		Al-Baladi Hospital		C.S. (*)
	Groups	No.	%	No.	%	P-value
nber of years of experience in the hospital	1 - 5	17	42.5	15	37.5	CC = 0.278
	6 - 10	13	32.5	22	55.0	P=0.083 NS
	11 _ 15	4	10.0	2	5.0	
	> 15	6	15.0	1	2.5	
Have you participated in blood transfusion training session?	No	22	55.0	17	42.5	CC = 0.124
	Yes	18	45.0	23	57.5	P=0.263 NS
yes, how many training courses have you attended in the past year?	Non Applicable	20	50.0	14	35	CC = 0.285
	ourse	9	45.0	19	73.1	P=0.070 NS
	ourses	8	40.0	3	11.5	
	nd more	3	15.0	4	15.4	

SDCv: Socio-Demographical Characteristics Variables, SRv: Some Related Variables, CS: Comparisons Significant ,NS: Non Sig. at P>0.05; Testing based on a Contingeny Coefficient test (CC).

Table:(2) : Distribution of The Studied Pediatric Nurses' Knowledge regarding Blood Transfusion (n=80).

Domains		No.	Al-Batoul Hospital		Ibn Al-Baladi Hospital		C.S. P-value (*)
			PGMS	PPSD	PGMS	PPSD	
Knowledge		40	11.5	8.9	7.4	7.1	0.000

(*) PGMS: percentile Grad Mean of Score , PPSD: Percentile Pooled Standard Deviation HS: Highly Sig. at P<0.01; S: Sig. at P<0.05; NS: Non Sig. at P>0.05.

Table:(3) : Distribution of The Studied Pediatric Nurses' Practices regarding Blood Transfusion (n=80).

Domains		No.	Al-Batoul Hospital		Ibn Al-Baladi Hospital		C.S. P-value (*)
			PGMS	PPSD	PGMS	PPSD	
Practices		40	9.7	12.1	3.2	3.6	0.000

(*)HS: Highly Sig. at P<0.01; S: Sig. at P<0.05; NS: Non Sig. at P>0.05, CS: Comparisons Significant.

Table (4) : Relationships of years' experience, Academic qualification, and Training exposure with Nurses' knowledge

Sources of Variation (S.O.V.)	Type III Sum of Squares	d.f.	Mean Square	F-value	Sig. Levels	C.S. (*)
Academic Qualification	1216.68	2	608.34	2.752	0.085	NS
No. years of experience in Hospital	498.92	2	0.0249	1.129	0.341	NS
Training Courses	68.587	1	68.587	0.31	0.583	NS

(*) HS: Highly Sig. at P<0.01; Non Sig. at P>0.05 , CS: Comparisons Significant.

Table (2): Relationships of years' experience, Academic qualification, and Training exposure with Nurses' **Practices**

Sources of Variation (S.O.V.)	Type III Sum of Squares	d.f.	Mean Square	F-value	Sig. Levels	C.S. (*)
Academic Qualification	**110.895**	**2**	**55.448**	**1.2**	**0.320**	**NS**
No. years of experience in Hospital	**175.017**	**2**	**87.509**	**1.893**	**0.173**	**NS**
Training Courses	**0.0813**	**1**	**0.0813**	**0.002**	**0.967**	**NS**

(*) HS: Highly Sig. at P<0.01; Sig. at P<0.05; Non Sig. at P>0.05.

Discussion

Table (1) the study found that females made up the majority of participants, with 82.5% in the Al-Batoul Hospital and 70.0% in the Ibn Al-Baladi Hospital, reflecting typical gender trends in nursing. These findings align with previous research in Iraq[27], which also noted that most of participants were female. The majority of staff in both groups are young, with over half in the first age group. The Al-Batoul Hospital average age is around 21.55 years, while the Ibn Al-Baladi Hospital is about 27.20 years. This younger demographic reflects organizational trends and highlights the focus on early-career development. This demographic pattern aligns with previous research in Iraq and Egyptian[26,28], which also reported most subjects aged (25-29) years having the highest and a significant association at P<0.05. The study showed that 50% of the Al-Batoul Hospital held a diploma, while 50% of the Ibn Al-Baladi Hospital had a bachelor's degree, highlighting educational differences between groups. Understanding these differences is important, as education can impact skills and behaviors relevant to the study. These findings differ from previous research in Iraq [29], who found that 66.0% of participants had a diploma from a nursing technical institute. Most Al-Batoul and Ibn Al-Baladi Hospitals nurses were new to nursing, with 75% and 93% respectively. The predominance of less experienced nurses highlights the need for workforce development and ongoing training, as experience level can affect patient care, teamwork, and adaptability. This finding aligns with previous research in Iraq[30], who found that 27.3 of nurses had one to five years of experience. The study found that 55% of participants in the Al-Batoul Hospital and 42.5% in the Ibn Al-Baladi Hospital participated in blood transfusion training, indicating that interventions like training can boost engagement. To improve participation further, addressing barriers like scheduling issues and lack of awareness is suggested. These findings contradict with previous research in Turkey[31], who reported that over half of the nurses had prior transfusion training. The study found that most nurses have 1 to 5 years of experience, with 57.1% in the Al-Batoul Hospital and 92.0% in the Ibn Al-Baladi Hospitals, indicating many are early in their careers. This limited experience may affect their skills and confidence, highlighting the need for ongoing training and mentorship. These findings align with previous research in Iraq[32], who reported that less than 5 years of experience often correlates with less proficiency in blood transfusion safety.

Table (2) As regards to nurses' knowledge regarding blood transfusion in pediatric for both hospitals, the current study shows that half of the studied nurses had poor knowledge, nearly third of them had average knowledge, while, third had good knowledge regarding blood transfusion in pediatric. Similarly, previous research in brazil[33],who revealed that nurses' overall blood transfusion knowledge scores had been poor to moderate in general.

Table (3) as regards to nurses' practices regarding blood transfusion in pediatric for both hospitals, the current study shows that, half of the studied nurses had incompetent practice blood products transfusion in pediatric with significant difference (P=0.05). This finding was in the same line with previous research in Egyptian[34],who revealed that the majority of nurses showed unsatisfactory level of practice regarding to management of patients undergoing blood transfusion

Table (4,5) the study results demonstrate that years' of experience, Academic Qualification, and training exposure associate with nurses' knowledge. In addition, there is a no significant association with nurses' practices, this the nurses have affected their compliances to standard precautions, thus more years of employment, high qualification, and more

training lead to more experiences, training which finally influences on nurses' practices. The present study results agree with previous research in Egyptian[35], study who revealed that there are no significant association between nurses` knowledge, practice and their characteristics (Academic qualification, experience years and training) about blood transfusion. In addition, contradicts with another study done by previous research in Egyptian[36], who find that there is a significant association between the Nurses' Information and the years of employment, qualification, and training. Previous research in India[37], were indicating positive relation between the practices and the years of experience, qualification, training as a nurse.

Conclusion

Nurses with more clinical experience, high academic qualifications, and prior training exposure demonstrated significantly better knowledge and safer practice regarding pediatric. Among these factors, training exposure and years of experience were the significant predictors of competent practice.

Recommendations

The study recommends ongoing professional training programs through workshops, conferences, competency-based assessment, and mentorship programs. Update nursing curricula and national guidelines to improve blood transfusion safety in pediatric nurses.

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