KNOWLEDGE OF BLOOD TRANSFUSION ADVERSE REACTION MANAGEMENT AMONG NURSES' WORKING IN TERTIARY CARE HOSPITAL

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Abstract

Background: *Blood transfusion can save lives, but its risks cannot be ignored. Improper management of transfusion-associated reactions can lead to severe consequences. Nurses, as an integral part of the transfusions process, require prompt recognition and effective management of transfusion reaction to ensure patient safety.* ***Objective*** *The objective of this study was to assess nurses' knowledge regarding the management of transfusion-associated complications in tertiary care hospitals.* ***Methodology*** *A descriptive cross-sectional study was carried out among registered nurses working in a tertiary care hospital in Rawalpindi, Islamabad. A total of 204 nurses participated through simple random sampling. The routine blood transfusion knowledge questionnaire was adapted from a previous study, and <50%, 50%-74%, or >75% of knowledge was considered poor, moderate, or high, respectively. Statistical analysis was performed using SPSS version 27 focusing on calculating means, standard deviations, frequencies, and percentages.* ***Results*** *According to the findings, the average knowledge score was 69.95% ± 19.48%, indicating their knowledge as moderate. Nurses scored 72.3% on hospital transfusion policies and 67.62% on knowledge of transfusion-related complications.* ***Conclusion:*** *The findings of this study highlight that while nurses were aware of managing transfusion reactions, there is still a lack of specialized training and a need to motivate nurses' to take part in ongoing education programs and promote enrollment in certification courses, which will eventually enhance patient outcomes by advancing best practices and expanding knowledge of transfusion safety.*

INTRODUCTION

A blood transfusion is a vital medical procedure that is commonly used in hospitals, Particularly in tertiary care settings to treat a range of life-threatening conditions, including anemia, severe blood loss from trauma or surgery, and disorders affecting blood components (Jogi et al., 2021.)However, there are risks associated with blood transfusions even though they have many advantages. One of the primary problems with transfusion therapy is adverse transfusion reactions. (ATRs), which can range in severity from minor to severe and even life-threatening (Hassan et al.

2022 & Bolcato et al., 2020).

The type and intensity of these reactions can vary from mild symptoms to potentially fatal outcomes. Transfusion reactions can be classified as immunological, non-immunological, acute, or delayed, and can be triggered by a variety of factors, including the transfusion technique, the patient's medical history, and the type of blood product used. (Suddock & Crookston, 2025). Patient Blood Management Program (PBM) programs encourage a patient-centered, evidence-based strategy to improve safety and preserve blood (Shander et al., 2022 & Yami et al., 2021). A 1993 UK survey found that misidentification is still a major factor in transfusion-related deaths (Maggs et al. 2020).

As health-professional, nurses' must be aware of the methods of handling potential complications. The early detection and management of these reactions may have a substantial impact on the patient's survival and recovery. As a result, a nurse's competence and education in addressing transfusion responses are critical (Joseph et al. 2023). Ignorance or lack of training may cause delays in recognizing reactions, enhancing the risk of significant consequences and patient damage. Nurses, as the first line of defense against transfusion-related complications, play a critical role in recognizing, treating, and avoiding blood transfusion reactions. (Joseph et al. 2023).

Enhancing nurses' knowledge of blood transfusion safety procedures and reaction control may help lower transfusion-related morbidity and mortality. In addition to informing patients about the dangers of transfusions, nurses are also in charge of offering comfort and attention in the event of a reaction. The management of adverse transfusion reactions (ATRs) demands quick action because these reactions lead to life-threatening complications, according to Ackfeld et al. (2022). Nurses must be knowledgeable about transfusion reactions and how to manage them, as they play a crucial role in transfusion safety (Bediako et al. 2021). In Pakistan, there are a few degrees associated with nursing, such as diploma (3 years), bachelor's degree (4 years), and master's degree (2–4 years) in nursing with blood transfusion being part of the curricula. To date, there is no study published assessing the knowledge of nurses regarding the management of blood transfusion-associated reactions in Rawalpindi, Islamabad. Therefore, the objective of this study was to assess the knowledge regarding the management of transfusion-associated reactions in tertiary care hospitals.

2.Material and Methods

A descriptive cross-sectional study was conducted among registered nurses at Holy Family Hospital and Rawal General and Dental Hospital, Rawalpindi, Islamabad, focused on assessing their knowledge regarding the management of blood transfusion adverse reactions. Data were collected through simple random sampling techniques. The population under study consisted of 510 nurses, from which a sample size of 224 was determined using Solvin's formula, but only 204 responded. Eligibility criteria for inclusion in the study encompassed PNC registered nurses who were willing to participate and were given a written informed consent form, which was necessary to obtain prior to participation in the study. Exclusion criteria were set to omit nursing students' and those who were not willing to participate.

The data collection instrument was a questionnaire adapted from Noor et al. (2021), with modifications to include demographic inquiries and specific questions related to knowledge on complications of blood transfusion and knowledge on transfusion policy. One point was given for each right answer. After converting the final score into a percentage, knowledge was categorized as poor, moderate, or high if the score was <50%, 50% -74%, or >75% respectively.

2.1.Data Analysis

The mean and percentages for each descriptive data were presented along with a 95% confidence interval (CI). The mean ± standard deviation (SD) was used to describe continuous data. The Statistical Package for Social Sciences (SPSS) version 27 program was used to analyze the data and determine the p-value. A simple linear regression was carried out to investigate associated factors between gender, qualification, training program, ward type, working duration, frequency of performing blood transfusions, and mean knowledge score.

2.2.Ethics

Ethics were approved from the Institutional Review Board, and all participants' autonomy, beneficence, non-maleficence, and justice in the conduct of the study were maintained.

3. Results

3.1. Characteristics

Detailed characteristics of the nurses are presented in Table 1. In brief, among the participant nurses (2.07 ± .893 years), a majority of them were female (66.7%). Most of the nurses possessed a bachelor's in Nursing (52.0%) with more than 5-10 years of working experience (49.5%); however, there was a lack of training experience related to blood transfusions in 46.6% of the participants.

Table 1. Characteristics of the participants (n = 204).

Characteristics	n (%)/Mean ± SD
Age (years)	2.07± .893
Gender: Male Female	68(33.3) 136(66.7)
Educational qualification: Diploma in nursing Bachelor's in nursing Master's in nursing	94(46.1) 106(52.0) 4(2.0)
Types of wards: Medical based Surgical based	126(61.8) 78(38.2)
Working experience: < 5 years 5-10 years >10 years	74(36.3) 101(49.5) 29(14.2)
Frequency of performing blood transfusion 0 times 1–4 times >5 times	33(16.2) 114(55.9) 57(27.9)
Previous training related to blood transfusion No Yes	95(46.6) 109(53.4)

1.1. Overall Knowledge

Based on the scoring system, the overall knowledge on complications of blood transfusion among nurses was estimated to be 69.95% ± 19.48%, which was considered a moderate level of knowledge.

Table 2. Nurses' knowledge on complication of blood transfusion based on the Routine Blood Transfusion Knowledge Questionnaire (n = 204).

Items	Correct	
	n	%
Section B: Knowledge on complications of blood transfusion		
Nursing interventions to minimize the risk of transfusion reaction		
Administration of compatible blood	166	81.4
Starting the transfusion within 20 minutes	125	61.3
Total transfusion duration not more than 4 h	147	72.1
Avoid incompatible drug/solution	160	78.4

Signs and symptoms of acute hemolytic transfusion reaction (AHTR)		
Tachycardia	147	72.1
Chest pain	115	56.4

|		
	124	60.8
Hypotension	168	82.4
Nausea/vomiting		
Nursing management of AHTR (acute hemolytic transfusion Reaction)		
Stop blood transfusion	169	82.8
Keep vein open with Normal Saline	131	64.2
Check patient's vital signs	170	83.3
Notify doctor and begin emergency treatment	162	79.4
Actions to do for delay in starting blood transfusion	141	69.1
Usual presenting complaint of mild transfusion reaction	103	50.5
First action to take in mild allergic reaction	109	53.4
Commonest cause of fatal transfusion reactions	71	34.8
Complication of rapid administration of cold blood	138	67.6
Section C. Knowledge of transfusion policy		
Availability of written policy for blood transfusion in the ward		
No	21	10.3
Yes	155	76.0
Do not know	28	13.7
Reading the policy		
No	35	17.2
Yes	140	68.6
Not indicated	29	14.2
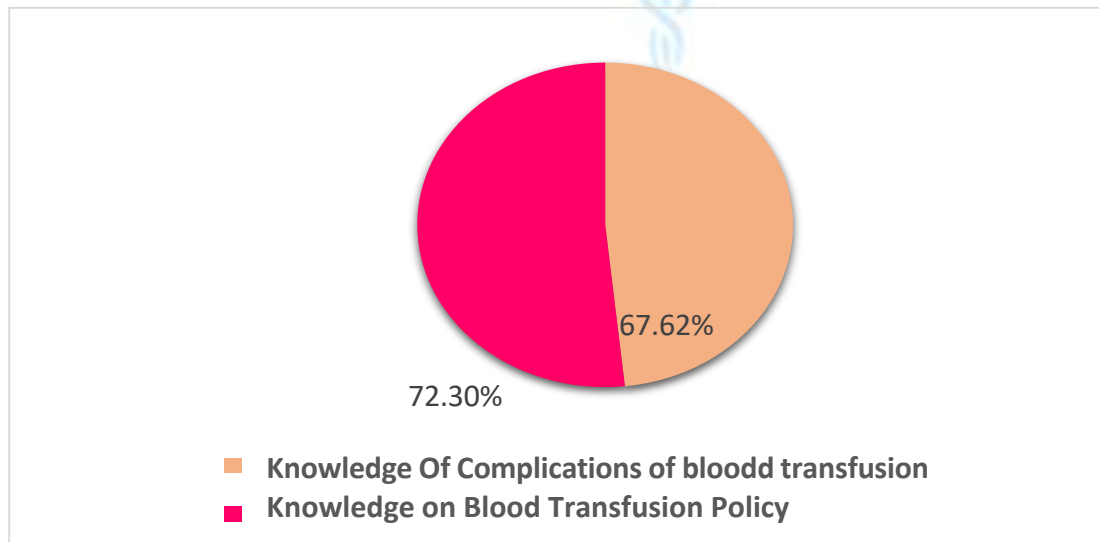
Figure 1. Nurses' knowledge in different sections

1.2. Knowledge on Complications of Blood Transfusion

Although nurses had a moderate level of knowledge (73.2%) on interventions to minimize the risk of transfusion reactions as well as signs and symptoms of acute hemolytic transfusion reaction (AHTR) (67.8%), they had a high level of knowledge (77.4%) on how to manage AHTR (Table 2). Overall, in this category, the nurses had a moderate knowledge level (67.62%) (Figure 1).

1.3. Knowledge on Blood Transfusion Policy

Nurses overall level of knowledge scored 72.30% (Table 2, Figure 1), indicating a moderate level of knowledge regarding the availability of a written policy on blood transfusion and its readability.

1.4. Association between Knowledge Score and Characteristics of the Nurses

There was no significant difference in knowledge scores between genders (p = 0.868), educational qualification (p = 0.063), types of wards (p = 0.675), and previous training related to blood transfusion (p = 0.103). Interestingly, work experience showed a significant association with knowledge scores, where nurses with 5–10 years of experience had a significantly higher knowledge score (b = 0.044, 95% CI = 0.005–0.084, p = 0.028) compared to those with less than 5 years of experience. Furthermore, the frequency of performing blood transfusions was significantly associated with better knowledge. Nurses who performed blood transfusions 1–4 times had a significantly higher knowledge score (b = 0.052, 95% CI = 0.011–0.092, p = 0.013) compared to those who had never performed blood transfusions. However, performing more than five transfusions was not significantly associated with a higher knowledge score (p = 0.984).

Table 3. Associated factors of knowledge score by Simple Linear Regression model (n = 204).

Variables	ba (95% CI)	p-Value
Age (years)	0.038 (0.009,0.068)	0.012
Gender: Male Female	-0.004 (-0.056,0.047)	0.868
Educational qualification: Diploma in nursing Bachelor's in nursing Master's in nursing	-0.047(-0.098,0.003)	0.063
Types of wards: Medical based Surgical based	-0.012 (0.066,0.043)	0.675
Working experience: < 5 years 5-10 years >10 years	0.044 (0.005,0.084)	0.028
Frequency of performing blood transfusion 0 times 1–4 times >5 times	0.052 (0.011,0.092)	0.013
Previous training related to blood transfusion No Yes	0.044 (-0.009,0.097)	0.103

2. Discussion

Life-saving procedures like blood transfusions necessitate careful attention to procedure and detail. Any mistakes made during these processes could seriously endanger the patients' health (Lancaster et al., 2021). Although complications and mortality related to blood transfusions are significant, many of these issues can be prevented since they are often linked to procedural errors (Raval et al., 2020).

A study assessing nurses' knowledge regarding the management of transfusion associated reactions was carried out in a tertiary care hospital in Rawalpindi, Islamabad, with an overall knowledge score of 69. 95% ± 19. 48%. The results showed that nurses

employed in these hospitals had a moderate level of knowledge. This finding is consistent with a related study carried out in Malaysia, where nurses showed a moderate level of knowledge with an overall score of 54.9% ± 7.6% (Mohd Noor et al. 2021). Nurses in this study demonstrated a moderate level of knowledge (73.2%) with regard to certain aspects of blood transfusion knowledge, such as minimizing the risk of transfusion reactions as well as signs and symptoms of acute hemolytic transfusion reactions (AHTR) (67.8%). Their reported understanding of the symptoms of acute hemolytic reactions was 86.8%, which is in line with results from a Peshawar study (Subhan et al. in 2024). An investigation by Bediako (et al., 2021) revealed that over half of the participants (58%) lacked adequate understanding of blood transfusion-related complications. According to the study findings (Encan et al., 209) nurses lacked adequate knowledge regarding the management of acute hemolytic transfusion reactions (AHTR). In contrast, the current study found that 77.4% of participants had a high level of knowledge regarding the management of acute hemolytic transfusion reactions (AHTR). Likewise, a study conducted in Malaysia revealed that 80.1% of nurses had a high degree of expertise in managing AHTR. According to the current study, 68.6 % of nurses said they had read the written transfusion policy, and 76.0% said they were aware of it. The Malaysian study, on the other hand, revealed a greater degree of awareness, with 89.0% of respondents having read the policy and 91.0% being aware of it. Similar to this, a study carried out in Bangladesh revealed that only 20% of nurses knew about a written transfusion policy, whereas 70.91% did not (Miah et al., 2023). The need for better education and training programs to improve safe transfusion practices is further highlighted by the fact that nearly half (46.6%) of the nurses in this study had never received any prior training related to blood transfusion. According to the study conducted in Iraq by (Muhammad et al., 2021), it emphasized the gap in transfusion practice training courses. And highlighted the importance of administrative support in making such education possible. (Mohammad et al., 2021 & Ellahi et al., 2024). Hospital administrations must be proactive in identifying and meeting nurses educational needs in relation to

blood transfusions, according to the study that promotes the creation and distribution of policies regarding blood transfusion procedures in hospital units in order to guarantee adherence to best practices (Moparthi KP et al. 2024 & Khan N et al. 2023).

3. Conclusion

The study highlights that although nurses have a moderate level of knowledge, they were well aware of methods to reduce transfusion reactions. However, there is still a lack of specialized training, which compromises patient safety by delaying the identification and treatment of adverse reactions. To guarantee high-quality patient care, nurses' clinical competency must be improved through organized training programs and ongoing professional development. Reducing the risk associated with blood transfusions and improving patient outcomes are the ultimate goals of addressing these educational deficiencies.

Limitations:

The study assessed nurses' theoretical knowledge but did not assess their long-term retention, as it was conducted in tertiary care hospitals in Rawalpindi and Islamabad, which limited its applicability to other healthcare settings in Pakistan.

Recommendations:

To increase nurses' proficiency and self-assurance in handling transfusion-related reactions,
Nurses' should be motivated to take part in ongoing education programs and promote enrollment in certification courses. Hospitals and other healthcare facilities should regularly conduct workshops, use simulation-based training, and use case-based learning. Furthermore, incorporating evidence based recommendations into standard procedures and encouraging an ongoing learning culture can greatly enhance patient safety.

Conflict of interest
The authors declare no conflict of interest.

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