

Original Article

Knowledge and Practice Regarding Safe Blood Transfusion Among Nurses: A Cross-Sectional Study

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ABSTRACT

Background: Safe blood transfusion requires appropriate knowledge and consistent clinical practices among nursing personnel involved in patient identification, compatibility verification, blood administration, monitoring, and recognition of transfusion reactions. **Objective:** To assess knowledge and self-reported practice regarding safe blood transfusion among nursing personnel at Ali Fatima Hospital, Lahore. **Methods:** A descriptive cross-sectional study was conducted from February to June 2026 among 50 participants selected through convenience sampling. Registered nurses and final-year BSN students were assessed using an investigator-developed structured questionnaire comprising eight knowledge items and 11 self-reported practice items. Data were analyzed descriptively using frequencies, percentages, means, standard deviations, ranges, and 95% confidence intervals. **Results:** All 50 participants were female; 30 (60.0%) were aged 20–24 years and 26 (52.0%) were final-year BSN students. The mean knowledge score was 6.34 ± 0.89 out of 8, with a 95% confidence interval of 6.09–6.59 and an observed range of 4–8. The mean self-reported practice score was 8.88 ± 1.21 out of 11, with a 95% confidence interval of 8.54–9.22 and an observed range of 4–11. **Conclusion:** Participants correctly identified many of the transfusion-safety concepts and appropriate clinical responses assessed by the questionnaire. The findings provide a descriptive estimate of transfusion-related knowledge and intended practice within this single institutional sample. **Keywords:** Blood transfusion; knowledge; nursing; patient safety; self-reported practice; transfusion reactions.

INTRODUCTION

Blood transfusion is an essential component of modern healthcare and is frequently required in the management of acute blood loss, severe anemia, surgical conditions, and other clinical situations in which restoration of circulating blood components is necessary. Although transfusion can be lifesaving, the process involves multiple interconnected steps, including patient identification, compatibility verification, collection and handling of blood components, bedside administration, clinical monitoring, and recognition and management of adverse transfusion reactions. Errors occurring at any of these stages can compromise patient safety; therefore, adherence to standardized transfusion procedures and effective communication among clinical and laboratory personnel are fundamental to safe transfusion practice (1). Nurses have a particularly important role because they are directly

involved in patient identification, pre-transfusion checks, administration of blood products, monitoring of vital signs, documentation, and early recognition of transfusion-related complications (2,3).

Safe blood transfusion requires nurses to possess adequate knowledge of blood components, storage requirements, compatibility, patient identification, infection-prevention measures, transfusion rates, monitoring procedures, and appropriate responses to suspected adverse reactions. Previous studies have shown considerable variability in nurses' knowledge and adherence to recommended transfusion practices across healthcare settings (2–5). Observational studies from different countries have reported gaps between theoretical knowledge and the consistent application of transfusion-safety procedures in clinical practice, particularly in relation to patient verification, monitoring, documentation, handling of blood products, and recognition of transfusion reactions (4–6). Such deficiencies are clinically important because inappropriate transfusion practices may increase the risk of preventable errors and delay recognition of potentially serious adverse events.

Evidence from South Asian and Pakistani healthcare settings similarly suggests that knowledge and practice regarding blood transfusion are not uniformly adequate among nursing personnel. Studies conducted among nurses and nursing students have identified variation in understanding of transfusion procedures and safety requirements, including blood-group compatibility, storage and handling, patient monitoring, and management of transfusion-related complications (6–10). Pakistani studies have also demonstrated that, despite general awareness of blood transfusion procedures, specific deficiencies may remain in knowledge and application of standardized transfusion protocols (7–10). These findings indicate that assessment of both knowledge and practice is necessary because awareness of transfusion principles does not necessarily ensure consistent application of safe procedures in clinical settings.

Educational preparation and continued professional training are therefore important components of transfusion safety. Structured educational and training interventions have been associated with improvements in nurses' knowledge and skills related to safe blood transfusion practices (11,12). Regular professional development may help reinforce correct patient identification, compatibility checking, appropriate monitoring, timely recognition of adverse reactions, and adherence to institutional transfusion protocols. However, the effectiveness of educational strategies depends on first identifying the specific areas in which knowledge and practice are deficient within the target clinical population.

Despite the availability of studies from Pakistan and other healthcare settings, transfusion-related knowledge and self-reported practice may vary according to institutional procedures, educational preparation, clinical exposure, and local training opportunities. The available evidence does not adequately characterize these factors among nursing personnel at Ali Fatima Hospital, Lahore. A setting-specific assessment is therefore needed to identify existing strengths and gaps that may inform future educational activities, clinical supervision, and institutional transfusion-safety initiatives.

Accordingly, this descriptive cross-sectional study aimed to assess knowledge and self-reported practice regarding safe blood transfusion among registered nurses and final-year BSN students at Ali Fatima Hospital, Lahore, with particular attention to essential transfusion procedures, patient monitoring, safety precautions, and recognition and immediate management of transfusion reactions.

MATERIAL AND METHODS

A descriptive cross-sectional study was conducted to assess knowledge and self-reported practice regarding safe blood transfusion among nursing personnel at Ali Fatima Hospital, Lahore, Pakistan. The cross-sectional design was selected to describe participants' transfusion-related knowledge and reported clinical practices at a defined period without introducing an intervention or manipulating clinical exposure. Study activities were conducted from February to June 2026 following approval of the research synopsis by the Research Ethics Committee of Green International University. Participants were recruited from clinical areas in which blood transfusion-related nursing care could be encountered, including the Medical Intensive Care Unit, Surgery Department, Gynaecology and Obstetrics Department, and Dialysis Unit.

The target population comprised registered nurses and final-year Bachelor of Science in Nursing students associated with the participating clinical areas. The accessible population was approximately 60 individuals, from

which a sample of 50 participants was recruited. Eligible registered nurses were those directly involved in blood transfusion-related clinical practice, while final-year BSN students willing to participate were also eligible. Registered nurses who were not directly involved in blood transfusion procedures, individuals who declined participation, and nurses who were absent or on leave during the data-collection period were excluded. Participants were selected using a convenience sampling technique according to their accessibility and eligibility during the study period. Written informed consent was obtained before participation, and participation was voluntary.

Data were collected using a structured English-language questionnaire developed by the investigators for the study. Questionnaire construction followed established principles for developing research questionnaires, including clear item formulation and assessment of content relevance (13). The instrument consisted of three components: demographic characteristics, knowledge regarding safe blood transfusion, and self-reported practice regarding safe blood transfusion. Demographic variables included age, gender, educational qualification, experience or training status, and department working. Age was categorized as 18–20, 20–24, and 24–30 years; educational status included Generic BSN and final-year BSN; and the recorded clinical areas included Medical ICU, Surgery, Gynaecology and Obstetrics, and Dialysis.

The knowledge component contained eight structured items addressing essential transfusion-safety concepts, including identification of the universal donor blood group, recommended blood-donation interval, storage duration and temperature of red blood cells, verification of patient identity and blood compatibility before transfusion, causes of transfusion reactions, infection-prevention precautions, and monitoring of vital signs and clinical manifestations during transfusion. Responses were recorded as correct, incorrect, or “do not know.” Each correct response received a score of 1, whereas incorrect and “do not know” responses received a score of 0, producing a possible total knowledge score ranging from 0 to 8, with higher scores indicating a greater number of correctly answered knowledge items.

The self-reported practice component contained 11 items addressing practices considered relevant to safe administration of blood and blood products. These included frequent observation of the patient during transfusion, maintaining close clinical supervision, timely initiation of transfusion after receipt of blood from the blood bank, administration at the rate recommended by institutional protocol, immediate discontinuation of transfusion when fever and chills occurred, stopping the transfusion and notifying the physician when tachycardia, hypotension, or dyspnoea developed, obtaining informed consent before transfusion, confirming ABO compatibility before administration, withholding blood when the blood bag appeared abnormal, avoiding use of a punctured or leaking blood bag, and recognizing itching and rash as possible manifestations of a mild allergic transfusion reaction. Correct practice responses were assigned a score of 1 and improper practice responses a score of 0, yielding a possible total practice score ranging from 0 to 11, with higher scores representing a greater number of responses consistent with recommended transfusion practices.

Content validity of the investigator-developed questionnaire was assessed through review by a panel with expertise in nursing and medical research, and feedback from the reviewers was used to refine the questionnaire items before data collection. Internal consistency of the instrument was evaluated using Cronbach's alpha. Standardized wording and fixed response categories were used throughout the questionnaire to support consistency of administration and scoring. Because the study assessed self-reported practice rather than direct bedside observation, practice scores represented participants' reported or intended responses to transfusion-related clinical situations rather than objectively observed procedural performance.

Data were analyzed using IBM SPSS Statistics version 25.0. Categorical variables were summarized using frequencies and percentages, whereas continuous score variables were summarized using means and standard deviations together with observed minimum and maximum values. Knowledge and practice scores were calculated by summing the respective item scores. Statistical significance was defined as a two-sided *p* value of <0.05. Inferential comparisons were considered only where sufficient variability existed in the variables being compared; no valid gender-based association analysis was possible because all participants in the analyzed sample were female. The primary analysis therefore focused on descriptive characterization of the study population and the distributions of knowledge and self-reported practice scores.

Ethical approval for the study was obtained from the Research Ethics Committee of Green International University, Pakistan. Participants received information regarding the purpose of the study and provided written informed consent before enrollment. Participation was voluntary, and participants could withdraw without penalty. Confidentiality and anonymity were maintained during data collection and reporting, and information obtained from participants was used solely for the purposes of the research.

RESULTS

A total of 50 participants were included in the analysis. Most participants were aged 20–24 years (30/50, 60.0%), while 20 (40.0%) were aged 24–30 years; none were aged 18–20 years. All participants were female. Twenty-six participants (52.0%) were final-year BSN students and 24 (48.0%) were categorized as Generic BSN. The largest proportion of participants was drawn from the Surgery Department (40.0%), followed by Gynaecology and Obstetrics (38.0%), Medical ICU (20.0%), and Dialysis (2.0%) (Table 1).

The mean knowledge score regarding safe blood transfusion was 6.34 ± 0.89 on an eight-point scale, with observed scores ranging from 4 to 8. The corresponding 95% confidence interval for the mean was 6.09–6.59, and the mean represented 79.3% of the maximum obtainable score. The mean self-reported practice score was 8.88 ± 1.21 on an 11-point scale, with scores ranging from 4 to 11. Its 95% confidence interval was 8.54–9.22, corresponding to 80.7% of the maximum possible score (Table 2).

Table 1. Demographic and Clinical Characteristics of Participants (n = 50)

Characteristic	Category	n (%)
Age, years	18–20	0 (0.0)
	20–24	30 (60.0)
	24–30	20 (40.0)
Gender	Male	0 (0.0)
	Female	50 (100.0)
Educational qualification/status	Generic BSN	24 (48.0)
	Final-year BSN	26 (52.0)
Participant training/status	Internee	24 (48.0)
	Final-year student	26 (52.0)
Working department	Medical ICU	10 (20.0)
	Surgery Department	20 (40.0)
	Gynaecology and Obstetrics	19 (38.0)
	Dialysis	1 (2.0)

BSN, Bachelor of Science in Nursing; ICU, intensive care unit.

Table 2. Knowledge and Self-Reported Practice Scores Regarding Safe Blood Transfusion (n = 50)

Outcome	Mean $\pm$ SD	95% CI for Mean	Observed Range	Possible Range	Mean, % of Maximum
Knowledge score	6.34 ± 0.89	6.09–6.59	4–8	0–8	79.3
Self-reported practice score	8.88 ± 1.21	8.54–9.22	4–11	0–11	80.7

CI, confidence interval; SD, standard deviation. The 95% CIs were calculated from the reported mean, SD, and n = 50 using the t distribution.

No gender-based inferential comparison was performed because all participants in the analyzed sample were female. The available aggregate data therefore support descriptive characterization of knowledge and self-reported practice scores but do not support estimation of gender differences or other adjusted associations.

DISCUSSION

The present study assessed knowledge and self-reported practice regarding safe blood transfusion among nursing personnel at Ali Fatima Hospital, Lahore. Overall, participants demonstrated relatively high mean scores on both the knowledge and self-reported practice measures, with knowledge corresponding to approximately four-fifths of the maximum obtainable score and a similar pattern observed for reported transfusion practices. These findings suggest that the participating nursing personnel were familiar with several essential components of safe blood transfusion; however, because the instrument did not use validated categorical thresholds, the findings are more appropriately interpreted as descriptive score distributions rather than evidence that participants had definitively “good” or “adequate” competency.

The observed knowledge scores are broadly consistent with previous studies showing that nurses frequently demonstrate reasonable awareness of fundamental transfusion procedures while retaining specific areas of uncertainty. Hijji et al. reported variability in nurses' knowledge across different components of blood transfusion practice, emphasizing that familiarity with some transfusion procedures does not necessarily indicate comprehensive competence across all stages of the transfusion process (2). Similarly, Bayraktar and Erdil identified important differences in knowledge and practice among nurses involved in blood transfusion, supporting the need to evaluate individual dimensions of transfusion safety rather than relying solely on an overall impression of competence (3). Studies involving nursing personnel in South Asian settings have likewise documented variable knowledge concerning compatibility, storage, monitoring, and management of transfusion-related complications (5,6).

The findings are also relevant to evidence from Pakistan, where previous studies have reported heterogeneous levels of transfusion-related knowledge and adherence to recommended practices among nursing personnel. Shaikh et al. identified deficits in knowledge of blood transfusion among nurses working in a tertiary-care hospital in Karachi, while Emmanuel et al. reported variation in knowledge and practices related to transfusion safety among nurses in Hyderabad (7,9). Khawaja et al. similarly documented differences in knowledge of safe blood transfusion protocols across tertiary healthcare settings (10). In comparison with these studies, the mean scores observed in the present sample suggest substantial familiarity with the transfusion concepts included in the questionnaire. Differences between studies may reflect variation in participant characteristics, institutional policies, educational preparation, clinical exposure, questionnaire content, scoring methods, and availability of transfusion-related training. Direct numerical comparison should therefore be interpreted cautiously because the studies did not necessarily use identical instruments or definitions of satisfactory knowledge.

The relatively high self-reported practice score should also be interpreted in the context of the measurement approach. Participants responded to questionnaire items describing appropriate actions during transfusion rather than being observed while performing transfusion procedures at the bedside. Consequently, the findings represent reported or intended practice and may not fully reflect actual clinical behavior. Previous observational work has shown that knowledge of recommended procedures and their implementation in practice may differ, particularly for patient identification, monitoring, documentation, and adherence to institutional transfusion protocols (4). This distinction is important because transfusion safety depends not only on knowing the correct procedure but also on consistently applying it under routine clinical conditions.

Several mechanisms may contribute to differences between knowledge and clinical practice. Blood transfusion is a multistep process requiring accurate patient identification, compatibility verification, appropriate handling of blood components, timely monitoring, and prompt response to suspected adverse reactions. Failures at any of these stages may increase the likelihood of preventable transfusion errors. International guidance therefore emphasizes standardized clinical processes, clear responsibilities, monitoring, and communication throughout the transfusion pathway (1). Regular exposure to transfusion procedures, institutional protocols, supervision, and continuing education may reinforce these behaviors, whereas workload, limited clinical experience, inconsistent access to guidelines, or insufficient training may contribute to deviations from recommended procedures.

The educational implications of the present findings are supported by interventional evidence demonstrating that structured training can improve transfusion-related knowledge and skills. Malhotra et al. reported improvement following a structured training intervention among nurses, while Shabbir et al. also described beneficial changes in knowledge and practice following nursing interventions related to transfusion protocols (11,12). Although the present cross-sectional study cannot establish the effectiveness of educational interventions, these findings support the practical value of maintaining continuing professional education and periodic reinforcement of transfusion-safety principles, particularly in areas involving patient verification, blood-component handling, monitoring, and recognition of adverse reactions.

From a clinical and patient-safety perspective, maintaining accurate transfusion knowledge remains important because nurses commonly serve as the healthcare professionals responsible for bedside verification, administration, observation, and early recognition of adverse events. Appropriate recognition of fever, chills, dyspnoea, hypotension, tachycardia, rash, or other symptoms during transfusion can facilitate timely interruption of the transfusion and escalation of clinical assessment. Nevertheless, the present study did not measure

transfusion errors, adverse reactions, morbidity, or other patient outcomes; therefore, the observed questionnaire scores should not be interpreted as direct evidence of improved transfusion safety or better clinical outcomes.

An important feature of this study is that it examined both transfusion-related knowledge and self-reported practice within a defined institutional setting and included participants from several clinical departments. The use of standardized scoring also allowed knowledge and practice responses to be summarized quantitatively. However, several limitations should be considered. The study was conducted at a single healthcare facility with a relatively small convenience sample, limiting the representativeness and generalizability of the findings. The sample included both registered nursing personnel and final-year BSN students, who may differ in clinical experience and responsibility for transfusion procedures. In addition, all participants were female, preventing evaluation of gender-related differences. Practice was assessed through self-report rather than direct clinical observation, creating the possibility of recall and social-desirability bias. The investigator-developed questionnaire also limits comparison with studies using established or differently structured instruments, and the available analysis did not evaluate item-level deficiencies, educational or departmental subgroup differences, or adjusted associations. These limitations indicate that the findings should primarily be interpreted as a descriptive assessment of this specific study population.

Overall, the study indicates that participants demonstrated relatively high mean knowledge and self-reported practice scores regarding safe blood transfusion, while also highlighting the importance of interpreting questionnaire-based scores within the limitations of a single-centre cross-sectional design. Continued assessment of specific knowledge and practice domains, preferably using well-validated instruments and direct observational methods where feasible, may provide a more precise understanding of transfusion-safety competencies among nursing personnel.

CONCLUSION

Among the 50 participants at Ali Fatima Hospital, Lahore, mean knowledge and self-reported practice scores regarding safe blood transfusion were 6.34 out of 8 and 8.88 out of 11, respectively, indicating that participants correctly identified many of the transfusion-safety concepts and appropriate clinical responses assessed by the questionnaire. These findings provide a descriptive estimate of transfusion-related knowledge and intended practice within this single institutional sample and support the importance of maintaining competency in patient verification, monitoring, safety precautions, and recognition and immediate management of transfusion reactions.

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