Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i2.4238

KNOWLEDGE AND PRACTICES OF NURSES REGARDING BLOOD TRANSFUSION IN A PUBLIC SECTOR HOSPITAL, PAKISTAN

Yasir Ali[1]*, Saeeda Khan[2], Javid Ali[3], Khizra Ejaz[4], Kanwal Fatima[5], Sidra Qayyum[6], Muhammad Younas[7], Syed Umar Farooq[8]

[1*]MSN at Ziauddin University, Faculty of Nursing and Midwifery, Karachi, Pakistan
ORCID: 0009-0006-6284-9546
[2]MSN Scholar at Ziauddin University, Faculty of Nursing and Midwifery, Karachi, Pakistan
ORCID: 0009-0006-7699-7806
[3]Ismail Nursing Institute, Sawat, Pakistan
[4]Principal at Vision Institute of Nursing and Allied Health Sciences, Muzafargarh, Pakistan
[5]MSN Scholar at SONAM, Aga Khan University, Karachi Pakistan
[6]Registered Nurse at Aga Khan Hospital in Emergency Department, Karachi, Pakistan
[7]Allied Institute of Nursing and Health Sciences, Karachi, Pakistan
[8]MSN Student at SONAM, Aga Khan University, Karachi Pakistan

***Corresponding Author:** Yasir Ali
*MSN at Ziauddin University, Faculty of Nursing and Midwifery, Karachi, Pakistan
ORCID: 0009-0006-6284-9546
Email: yrose638@gmail.com

Abstract

Background: Blood transfusions shown to be effective life-saving treatment in clinical settings; it also has unfavorable effects. All Nurses play a significant part in the blood transfusion procedure. The simulated training emerged as a crucial component across all levels of nursing experience.

Objective: The study's objective was to evaluate nurses' transfusion-related knowledge and skills.

Methodology: Descriptive cross sectional study design was used in a public sector hospital form July to October, 2023, calcultated sampel size was 88 while convenient sampling technique was used, the data was collected thorugh a validated structrued quesitoanire involved questioning nurses about their knowledge and practices related to blood transfusions. All the Registered Nurese above the 18 years with valid PNC Liscne were included while Nurses with below than 18 years, Nursing Supervisors, Head Nurse/In-charges, Nursing Internee, and Student nurses were excluded from this study.

Results: In terms of demographics 50% of the participants were male and 50% were female. The participants' age distribution was approximately normal with an average age of 29.2 and a standard deviation of 4.3. In response to questions concerning the blood group types that acts as the universal donor, 60% of the surveyed nurses possess knowledge, 17% provided incorrect responses, and 22% lacked an idea. When asked whether a patient displays fever and chills during a transfusion, 53.41% of the nurses who participated in the survey reported knowing, 19.32% gave false information, and the remaining respondents (27.27%) were unsure of what to do in such a scenario.

Conclusion: The study's findings demonstrated that the nurses' mean knowledge score was approximately satisfactory. Nevertheless, the conclusions' inability to be broadly applied was negatively impacted by the small amount of research on the topic. Furthermore, because this study was carried out in a public sector hospital, its findings cannot be applied to other hospitals. Because of this, comparable research with a larger population and sample size have to be carried out.

Keywords: *Knowledge, Practices, Nurses, Blood transfusion, Public Sector Hospital,*

Introduction:

In recent times, transfusions of blood and blood components have shown to be life-saving treatments and are frequently effective in clinical settings. Although blood transfusion is a complicated procedure that comprises more than 70 steps, it is very similar to mistakes [1]. The main requirement for the entire health care delivery system is safe blood transfusion. Even though transfusion risk is gradually declining due to advancements in transfusion management, non-hemolytic adverse transfusion reactions (ATRs) are nevertheless common. Carefully monitoring and confirming each step is necessary to prevent errors and guarantee traceability. The association of several levels of medical experts, such as physicians, laboratory personnel, and most crucially, nurses, is desired for safe blood transfusion [2]. In the process of blood transfusion, nurses are essential one. Pre-transfusion sampling, obtaining blood from blood banks, gathering blood products, delivering the transfusion, and monitoring patients' vital signs prior to, during, and following the transfusion events are all included in their duties [3]. Errors in clinical practice can consequently have serious and occasionally detrimental effects on patients.

There were 278 instances of unsuitable blood components being transfused, according to the 2014 Serious Hazards of Transfusion (SHOT) report; 156 (56.1%) of these cases occurred in the clinical area, and the rest cases occurred in the laboratory area. Human error was the primary cause of the blood reaction, including patient misidentification during sampling or at the start of blood transfusion, the improper blood units being collected from packing sites, and the late patient information on blood sample or blood request forms [4]. These are frequently connected to the ineffective nurse interventions or the nurse's ignorance of the blood transfusion procedure. Chronicled Knowledge is an individual's comprehension of the topic—in this case, blood transfusion—in our context. Since knowledge serves as the foundation for actions, a lack of knowledge can result in poorer performance and judgment. Previous research conducted in the Arab world has shown that nurses' knowledge of blood transfusion is slightly lacking. Healthcare workers' lack of knowledge or expertise may compromise the safety and efficacy of blood transfusions, even in the face of extensive study and reevaluation of policies and procedures [5]. As a result, when carrying out the procedure, healthcare workers—especially nurses—must always be competent and cautious [6]. The main requirement for the entire health care delivery system is safe blood transfusion. While transfusion risk has been steadily decreasing due to advancements in transfusion therapy, non-hemolytic adverse transfusion reactions (ATRs) continue to be common [7]. Transfusions of blood are an essential part of patient care. Acute or delayed transfusion reactions, however, are possible side effects of blood transfusion therapy [8]. Any adverse event connected to transfusion that happens during or after the transfer of blood or its components is referred to as a transfusion response. Acute hemolytic transfusion reaction (AHTR), allergic reaction, febrile non-hemolytic transfusion reaction (FNHTR), fluid overload, transfusion-related acute lung injury (TRALI), anaphylactic reaction, and metabolic reactions are examples of acute transfusion reactions (ATRs) that happen during or within 24 hours post transfusion [9]. Blood transfusion is a risk-free operation that has the potential to save lives. The healthcare system is severely strained by the significant risk of infection transmission posed by transfusion-transmitted pathogens.1–7 but has dramatically reduced mortality and morbidity. Pakistan is a populated developing nation of more than 180 million, receives more than 1.2 million donations yearly. The underdeveloped transfusion system in Pakistan is now being developed [10]. A blood transfusion can save a patient's life. It is frequently necessary to maximize blood levels, halt

severe bleeding, or provide blood beforehand in order to improve the patient's condition before surgery. Blood transfusion has many advantages, but it can also have major side effects, such as infectious and noninfectious problems that can occasionally be fatal. Effective donor screening, infectious illness testing and pathogen inactivation procedures have reduced the danger of infectious complications over the past few decades. Even with all of the screening techniques used to guarantee safe blood transfusions, noninfectious responses can still occur. [11].

A blood transfusion reaction could be a life-threatening event if nurses do have not proper knowledge of the blood transfusion can harm the patient and can be life-threatening, Nurses can play a vital role during blood transfusion efficiently with the updated knowledge, which can be used for different kinds of medical conditions e.g. Cancer, anemia, hemophilia, thrombocytopenia, sickle cell anemia, pregnancy, and bleeding disorders [12]. Blood transfusion could be a life-threatening or fatal condition for the patient and nurses must know the protocol of blood transfusion that prevents, and avoid such reactions. Findings of this study most of the nurse's basic knowledge gaps and protocols are related to blood transfusion. Deficient knowledge of blood transfusion protocol must be added to the nursing curriculum. Improvement of nurses' knowledge skills and assessment should be checked to improve good quality care during a blood transfusion under the supervision of nursing managers [13]. The lack of adequate information about blood transfusions among nurses highlights the need for targeted educational interventions and continuous professional development programs to improve nurses' understanding and ensure the safe and effective administration of blood transfusions [14]. The nursing team is responsible for data inspection to prevent errors, informational interviews regarding blood transfusion, identification of transfusion reactions, and procedural documentation, nurses are essential to the certification of blood transfusion safety [15]. This study was planned to evaluate the knowledge and practices of nurses regarding blood transfusion in a public sector hospital, Pakistan.

Methodology

The knowledge, attitudes, and practices of nurses about blood transfusion in tertiary care hospitals in Pakistan were assessed using a descriptive cross-sectional study methodology. The study duration was four months form July to October, 2023, target population for the current study was nurses of selected study settings. The sample size was calculated through Open Epi with a 95% confidence interval with a population of 547, and the calculated sample size was 88 while convenient sampling technique was used. Following taking consent forms from the participants; data was collected thorugh a validated structrued quesitoanire [16]. A closed-ended questionnaire was used with nominal questions while their confidentiality and anonymity were preserved.

The language of the questionnaire was English. It involved questioning nurses about their knowledge and practices related to blood transfusions. A well-structured, closed-ended questionnaire with nominal structure was used as the research instrument to collect the data; Part-1: Covered personal information like name, age, gender, department, designation, and institute of work. Part 2: Focused on knowledge related to blood transfusion. Part 3: Explored practices associated with blood transfusion. All the Registered Nurese above the 18 years with valid PNC Liscne were included while Nurses with below than 18 years, Nursing Supervisors, Head Nurse/In-charges, Nursing Internee, and Student nurses did not include in this study. Software called SPSS version 21.0 was used to analyze the data and frequency % percentage was used for demographic data and the level of perception and experience regarding active learning strategies was calculated. Permission for data collection will be obtained from the tertiary care hospital. Data was obtained from staff nurses of selected tertiary care hospital, who had experience more than one year and who voluntarily participated in this study after signing consent form while their information were kept confidential.

Result

Table 1: Demographic Characteristics of the Study Participants

Variables	Frequency (N)	Percent %

Age(Mean=29.2 SD ±4.3)		
20-25	19	21.59
25-30	32	36.36
30-35	32	36.36
35-40	5	5.68
Gender		
Male	44	50
Female	44	50
Education		
RN Diploma	27	30.68
Generic BSN	26	29.55
Post RN BSN	30	34
MSN	5	5.60
Marital Status		
Married	55	62.50
Unmarried	33	37.50
Experience		
Less than 1 year	41	47%
1 to 5 year	35	40%
More than 5 years	12	14%

Table 1 displays the results of the research participants' demographic factors, including age, gender, education level, and marital status. The average age of the study participants was 29.2 with a standard deviation of 4.3. Off the total participants (n=88), 21.59% (n=19) were aged between 20-25 years, 36.36% (n=32) were aged between 25-30 years, 36.36% (n=32) were aged between 30-35 years and 5.68% (5) were aged between 35-40 years. Concerning gender, 50% (n=44) were males and 50% (n=44) were females participated in the study. Out of the total participants, 30.68% (n=27) of the participants from RN Diploma, 29.55% (n=26) from Generic BSN, 34% (n=30) of participants from Post RN BSN and 5.60% (n=5) of the participants from Master of Science in Nursing (MSN). On the basis of marital status, 62.50% (n=55) of the participants were married while 37.50% (n=33) were unmarried. Based on years of experiences in the relevant field less than one year respondents were 47% (n=41), 1 to 5 year of experience respondent were 40%(n=35) while 14% (n=12) respondents had experience more than 5 years.

Table 2: Knowledge of Blood Transfusion

SNO	Statement	Correct n(%)	Incorrect n(%)	Don't Know n(%)
1.	"Which blood group is a universal donor?"	53 (60.2)	15 (17.0)	20 (22.7)
2.	"How often can a person donate blood?"	46(52.2)	20(22.7)	22(25)
3.	"How long can RBCs be stored after collection?"	31(35.23)	19(21.6)	38(43.18)
4.	"At what temp are the RBCs stored in blood bank?"	38(43.18)	23(26.14)	27(30.68)
5.	"What are the instructions given to the patients before starting the blood transfusion?"	31(35.2)	32(36.4)	25 (28.4)
6.	"What diseases can be transferred through blood transfusion?"	44(50.0)	25(28.4)	19(21.6)
7.	"What will you check before starting blood transfusion?"	47(53.41)	17(19.32)	24(27.27)
8.	"Which is the most common cause of blood transfusion reactions?"	38(43.18)	39(44.32)	11(12.50)
9.	"What precautions will you take for yourself before starting transfusion?"	48(54.5)	24(27.3)	16(18.2)
10.	"What will you monitor during blood transfusion?"	42(47.73)	25(28.41)	21(23.86)

Table 2 shows the 10 question regarding knowledge of staff nurses regarding blood transfusion. Total mean of knowledge of blood transfusion of correct responses was 4.7 (47.5%), incorrect response was 2.7 (27%) and mean of the respondent for don't know was 2.55 (25.5%).In response to questions concerning the blood type that acts as the universal donor, 60% of the surveyed nurses had knowledge, 17% provide incorrect responses, and 22% lack an idea about the blood group that serves as the universal donor. 52.27% of the surveyed nurses were knowledgeable, 22.7% provided incorrect

responses, and 25%lack an idea about how often a person can donate blood. 43.18 % of the surveyed nurses possess knowledge, 26.14% provided incorrect responses, and 30.68%lack an idea about the temperature at which RBCs can be stored in the blood bank. Out of all the participants, 54.5% were knowledgeable, 27.3% responded incorrect answers, and the remaining 18.2% were unsure about the precautions they should take for themselves before starting transfusion.

Table 3: Practices regarding blood transfusion

S. No	Questions	Correct n(%)	Incorrect n(%)	Don't Know n(%)
11	"How often do you monitor the patient?"	48(54.55)	24(27.27)	16(18.18)
12	"During blood transfusion should the patient be within your eyesight at all times?"	56(63.64)	23(26.14)	9(10.23)
13	"How soon should the blood be given to the patient after issue?"	46(52.27)	20(22.73)	22(25)
14	"Can you refrigerate the blood bag again after it is issued, if there is a delay in administration?"	31(35.23)	19(21.59)	38(43.18)
15	"How fast can you transfuse blood to the patient?"	38(43.2)	23(26.1)	27(30.7)
16	"How is the blood treated before transfusing to patients on chemotherapy?"	31(35.23)	32(36.36)	25(28.41)
17	"Can we transfuse blood to HIV positive patient?"	44(50)	25(28.41)	19(21.6)
18	"What will you do if the patient shows signs of fever and chills?"	47(53.41)	17(19.32)	24 (27.27)
19	"You notice that 2hrs after transfusing of properly matched blood, the patient starts having tachycardia, hypotension and dyspnea. What is the first thing you will do?"	38(43.18)	39(44.32)	11(12.50)
20	"Human error is the commonest cause of mismatched blood transfusion. What can be the most probable reason?"	48(54.55)	24 (27.27)	16 (18.18)
21	"Is there a need for informed consent before blood transfusion?"	42(47.73)	25(28.41)	21(23.86)
22	"What is the final step to ensure ABO compatibility?"	48(54.55)	24 (27.27)	16 (18.18)
23	"If there was a cloudy/foamy appearance in the blood bag, what should you do?"	56(63.64)	23(26.4)	9(10.23)
24	"While hooking the blood bag, if you accidently double punctures the blood bag and it starts leaking, what is the right thing to do?"	38(43.2	39(44.3)	11(12.5)
25	"About an hour after beginning properly matched blood transfusion, you observe that the patients shows signs of itching and rashes. This patient has no fever, has tachycardia, blood pressure is normal, and has normal color urine. How will you treat this patient?"	48(54.55)	24 (27.27)	16 (18.18)

Table 3 displayed the fifteen practice questions survey related to blood transfusion including about blood transfusion, such as blood type, adverse reaction following blood transfusion, patient monitoring, handling blood bags, and pre- and post-transfusion precautions.

Regarding inquiries about how frequently you monitor patients during blood transfusions Of the nurses surveyed, 54.55 %(n=48) were knowledgeable, 27.27%(n=24) gave false answers, and the remaining participant 18.8%(n=16) were unsure about how often to check on the patient. When asked whether a patient displays fever and chills during a transfusion, 53.41 %(n=47) of the nurses who participated in the survey reported knowing, 19.32% (n=17) gave false information, and the remaining respondents 27.27% (n=24) were unsure of what to do in such a scenario. Majority 54.55% (n=48) of all the participants, were knowledgeable, 27.27% (n=24) gave false answers, and 18.18% (n=16) of the participants, or 16 people, were uncertain about the most likely cause of mismatched blood transfusions, which is human error. Of the total participants in the study, 63.64% (n = 56) correctly answered the question concerning what to do if the blood bag seemed cloudy of foamy, 26.4% offered erroneous responses, and the remaining 10.23% (n = 23) were unsure of what to do.

Discussion

The goal of the current study was to assess the degree of blood transfusion knowledge and practice among nurses. Because of their direct patient interactions, nurses are the most crucial human link in the several-step procedure for transfusion of blood. They must be theoretically and practically knowledgeable of the various steps involved in blood transfusion in order to protect patient safety. In order to promote and integrate content for a long-term training program and to place more emphasis on blood transfusion in nursing curricula, the aim of this study was to assess nurses' knowledge and practice regarding blood transfusion in the Pakistani context. The most crucial elements of the team

are the nurses of the whole human series engaged in the multistep blood transfusion process. This is a result of their intimate relationship with the patients. Their theoretical and practical knowledge sufficient expertise is necessary to guarantee persistent protection. In the end, the most crucial aspects of patient care are their disposition, awareness of the situation, and use of fundamental information. According to a recent Indian study, nurses having 1 to 4 years of experience fared statistically better than nurses having one year of experience. In terms of the total number of accurate responses, ICU nurses performed worse than hematology-oncology ward nurses. Even though nurses with 1 to 2 years of experience performed better, only 9.9% of nurses answered 80% of the questions correctly [16]. Current study findings showed that nurses with one to five years of experience answered the question about blood transfusion knowledge 40% correctly, whereas nurses with less than a year of experience answered the question 47% correctly. Only 14% of nurses with over five years of experience performed the worst. This implied that novice nurses' first-year practical experience puts them on par with more seasoned nurses in terms of safety.

A comparable study carried out in India revealed that this was untrue with regard to theoretical understanding of blood transfusion. They seemed to lose sight of the principles of blood grouping, blood products, donation, collection, and managing as their expertise grew (some of the topics examined in the Transfusion-Knowledge area) [17]. In contrast, a study conducted in Turkey among 100 nurses showed that only a limited applicant had marks greater than 50% [18]. One of the recent study showed in Ghana that 63% had done at least five blood transfusions, more than 90% held a minimum of a diploma in midwifery or nursing and 46% had never taken a blood transfusion course. In each of the four categories where blood transfusion knowledge was assessed, the mean score was 29 and 54% of the respondents scored lower than the mean. 53% was the highest total knowledge score. This indicates that the clinical guidelines for blood transfusion established by Ghana's National Blood Service were not adequately followed by nurses in terms of safe blood transfusion practices [19]. In the current study the mean score of the knowledge of blood transfusion for correct response was 47.5% the average score of the study participants for the knowledge for incorrect response was 27%. The score for blood transfusion knowledge was 25.5% for the response of don’t know.

The question of knowledge regarding “universal blood group donor" tested the theoretical knowledge of the nurses, with most of them (53%) answering correctly. In contrast, an Indian study found that the biggest number of nurses (82%) answered the question incorrectly. Remarkably, the question that tested their theoretical knowledge and had the most frequent cause of blood transfusion reaction was the question with the most incorrect responses (39%). This was unexpected because the concept of the Rh antigen was unfamiliar to a number of nurses. On the contrary, a research indicated that nurses obtained over 70% on questions about Rh antigens and blood grouping which put their knowledge of theory to the test. 47% of participant responded correctly to the question regarding dealing with the patient shows sign of fever and chills during blood transfusion. Similarly in Malaysia Noor, H, .et al found highest score of practical knowledge (80%) among nurses working in ICU and MICU. The question about how quickly blood is transfused to patients tested the practical comprehension of 27% of respondents.

Employee education is now a crucial component of any effective hospital transfusion program. It is the duty of nurses to keep up to date on their transfusion knowledge and abilities. Another study revealed that MBBS doctors' pre- and post-training ratings on blood transfusion practices and understanding had improved by 34.4%. This probably applies to nurses as well. Training that is rigorous, focused, and repetitive should be used to keep their knowledge current [20]. One another study confirmed that practical training program was proposed to stop knowledge from deteriorating over time. Nurses who work in areas such as the hematology-oncology ward, emergency room, intensive care unit, and outpatient therapy must receive focused training on a regular basis [21]. In the current research, the practices of nurses involved in blood transfusion were examined. Of the nurses, 63.64% correctly answered the question "what to do if the blood bag seemed cloudy or foamy," 26.4% offered an inaccurate response, and 10.23% were unsure of how to proceed. Similarly, research findings showed the majority of nurses lacked adequate understanding about the process of

transfusing blood [22]. This result is supported by other findings, which showed that inadequate nurses' understanding of blood transfusion was mirrored in subpar practices [23].

Conclusion

Blood transfusion is a topic that nurses and senior nursing students are not sufficiently knowledgeable with, which emphasizes the need for quick and efficient training programs in this area. The governing bodies must to act right now, putting in place policies to guarantee maximum participation as well as training programs to provide the requisite knowledge about blood transfusions. To enhance the nurses' existing knowledge and expertise, frequent medical education activities should be implemented. Nursing staff should be regularly tested on their knowledge of blood transfusions using questionnaires, and those who are deficient in any area should be updated**.** The implementation of this measure can be vital in minimizing human errors in the practices of blood transfusion.

References

1. McClelland, D. (2002). Contributed to the "Handbook of Transfusion Medicine." Available in Wiley Online Library.
2. Hogg, G., Pirie, E. S., & Ker, J. (2006). Discussed the use of simulated learning to enhance safe blood transfusion practices. Published in Nurse Education in Practice, 6(4), 214-223.
3. Delaney, M., Wendel, S., Bercovitz, R. S., Cid, J., Cohn, C., Dunbar, N. M., Tinmouth, A. (2016). Examined transfusion reactions, focusing on prevention, diagnosis, and treatment. Published in The Lancet, 388(10061), 2825-2836.
4. Smith, F. C., Donaldson, J., & Pirie, L. (2010). Examined the knowledge of pre-registration adult nurses regarding safe transfusion practices, presenting results of a 12-month follow-up study. Published in Nurse Education in Practice, 10(2), 101-107.
5. Hijji, B., Parahoo, K., Hussein, M. M., & Barr, O. (2013). Explored the knowledge of blood transfusion among nurses. Published in the Journal of Clinical Nursing, 22(17-18), 2536-2550.
6. Yaddanapudi, S., & Yaddanapudi, L. N. (2019). How to design a questionnaire. *Indian journal of anaesthesia*, *63*(5), 335.
7. Saha, S., Krishna, D., Prasath, R., & Sachan, D. (2020). Incidence and analysis of 7 years adverse transfusion reaction: a retrospective analysis. *Indian Journal of Hematology and Blood Transfusion*, *36*, 149-155.
8. Bhattacharya, P., Marwaha, N., Dhawan, H.K., Roy, P. & Sharma, R.R. (2011) Transfusion-related adverse events at the tertiary care center in North India: an institutional hemovigilance effort. Asian Journal of Transfusion Science, 5, 164–170.
9. Borhany, M., Anwar, N., Tariq, H., Fatima, N., Arshad, A., Naseer, I., & Shamsi, T. (2019). Acute blood transfusion reactions in a tertiary care hospital in Pakistan-an initiative towards haemovigilance. *Transfusion Medicine*, *29*(4), 275-278.
10. Akhter, N., Samad, A., Nudrat, F., Umme, H., Maliha, A. and Sabeen, F., 2019. Acute blood transfusion reaction in a tertiary care hospital in Southern Punjab, Pakistan. *Int J Comm Med Pub Health*, *6*, pp.1416-21.
11. Lal, J.M., Hasan, M. and Ali, N., 2022. Frequency and types of transfusion reactions in pediatric population: A report from a tertiary care center in Pakistan. *Iraqi Journal of Hematology-Volume*, *11*(2), p.171.
12. Yami A, Darbandi A, Saber E, Tabrizi Namini M, Gharehbaghian A. Assessment the knowledge of blood transfusion in Iranian nurses of Tehran's hospitals. Transfusion Medicine. 2021 Dec; 31(6):459-66.
13. Ali, H., Zafar, S.N., Masroor, M., Khan, I., Khan, G.N., Jabeen, A. and William, A., KNOWLEDGE OF PROTOCOL AND HAZARDS OF BLOOD TRANSFUSION AMONG NURSES IN TERTIARY CARE HOSPITALS IN KARACHI, PAKISTAN.
14. Shaikh, M.H., Bibi, A. and Ali, R., 2023. Nurse's Knowledge Regarding Blood Transfusion in a Tertiary Care Hospital Karachi, Pakistan: Nurse's Knowledge Regarding Blood Transfusion. *NURSEARCHER (Journal of Nursing & Midwifery Sciences)*, pp.19-23.

15. Majeed, H., Parveen, K., Hussain, M., Afzal, M. and Gilani, S.A., 2020. Assessment of nurses' practices regarding blood transfusion. *Merit Res J Med Med Sci*, *8*(8), pp.396-402.
16. Panchawagh, S. J., Melinkeri, S., & Panchawagh, M. J. (2020). Assessment of knowledge and practice of blood transfusion among nurses in a tertiary care hospital in India. *Indian Journal of Hematology and Blood Transfusion*, *36*, 393-398.
17. Talati, S., Gupta, A. K., & Jain, A. (2016). Knowledge and awareness among nurses regarding the blood transfusion services and practices in a tertiary care teaching hospital. *Asian journal of transfusion science*, *10*(2), 166-168.
18. Baryaktar N, Erdil F (2017) Blood transfusion knowledge and practice among nurses in Turkey (abstract). J Intraven Nurs 23(5):310–317
19. Bediako, A. A., Ofosu-Poku, R., & Druye, A. A. (2021). Safe blood transfusion practices among nurses in a major referral center in Ghana. *Advances in Hematology*, *2021*.
20. Shakor, S. Q., & Salih, H. S. (2020). Blood Transfusion Knowledge and Practices Among Nurses in Kirkuk City Hospitals. *Mosul Journal of Nursing*, *8*(1), 14-24.
21. Brown, M., & Brown, C. (2023). Improving nurses' blood transfusion knowledge and skills. *British Journal of Nursing*, *32*(11), 522-525.
22. Ibrahim,s., El-Sayed,e., &Khalil,a., (2019). Effect of implementing educational program about safety blood transfusion on the nurse's knowledge and practice .2019; .Int. J. Adv. Res. 7(9), 1067-107.
23. Vaghar .,I.M.m(2018).The Impact of an Educational Program on Blood and Blood Products Transfusion on Nurses' Level of Knowledge and Performance. Journal of Medicine and Life. 2018; 11 (3): JulySeptember. 238–242