A STUDY ON APPROPRIATENESS OF PACKED RED BLOOD CELLS TRANSFUSION IN A TERTIARY CARE HOSPITAL

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Abstract

Blood is scarce resource that can be used for saving lives. The goal is to provide this resource appropriately for the specific deficiencies. The main aim of the study was to assess the appropriateness of packed red blood cells in various departments of a tertiary care hospital.

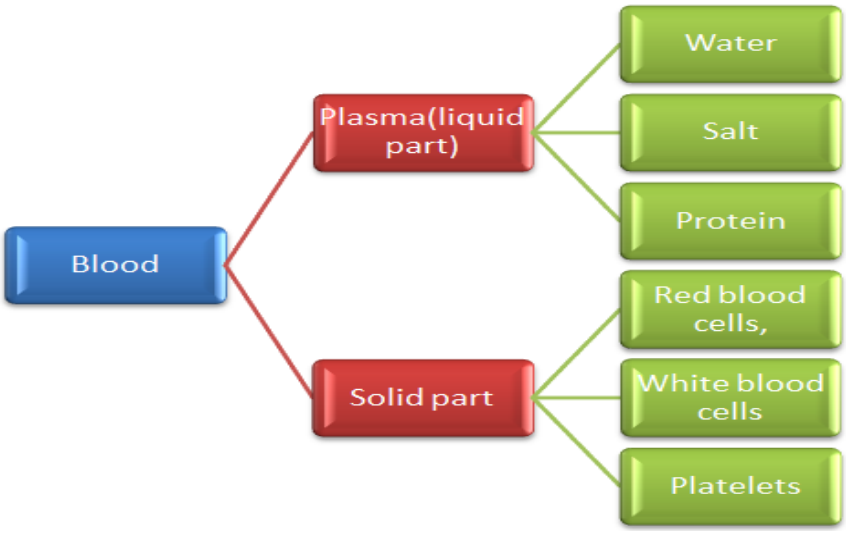
METHODS: A total of 1000 patients were included in the study. A structured excel sheet was made to analyze the various parameters that indicate the appropriateness of PRBC Transfusion. Statistical analysis was done using statistical software.

RESULTS: The study showed that there was quite higher rate of appropriateness in the transfusion. Out of 1000 patients who had undergone transfusion of 1-unit PRBC,952 transfusions were appropriate in which 776 episodes were considered appropriate as the hemoglobin levels are less than or equals to 8gm/dl. Hence, a total of 95.2% of transfusion was appropriate.

CONCLUSIONS: The overall rate of appropriate PRBC transfusion was quite higher 95.2%. Continuous medical education and practices among doctors and staff can maintain this rate and help in providing quality services to patients.

INTRODUCTION

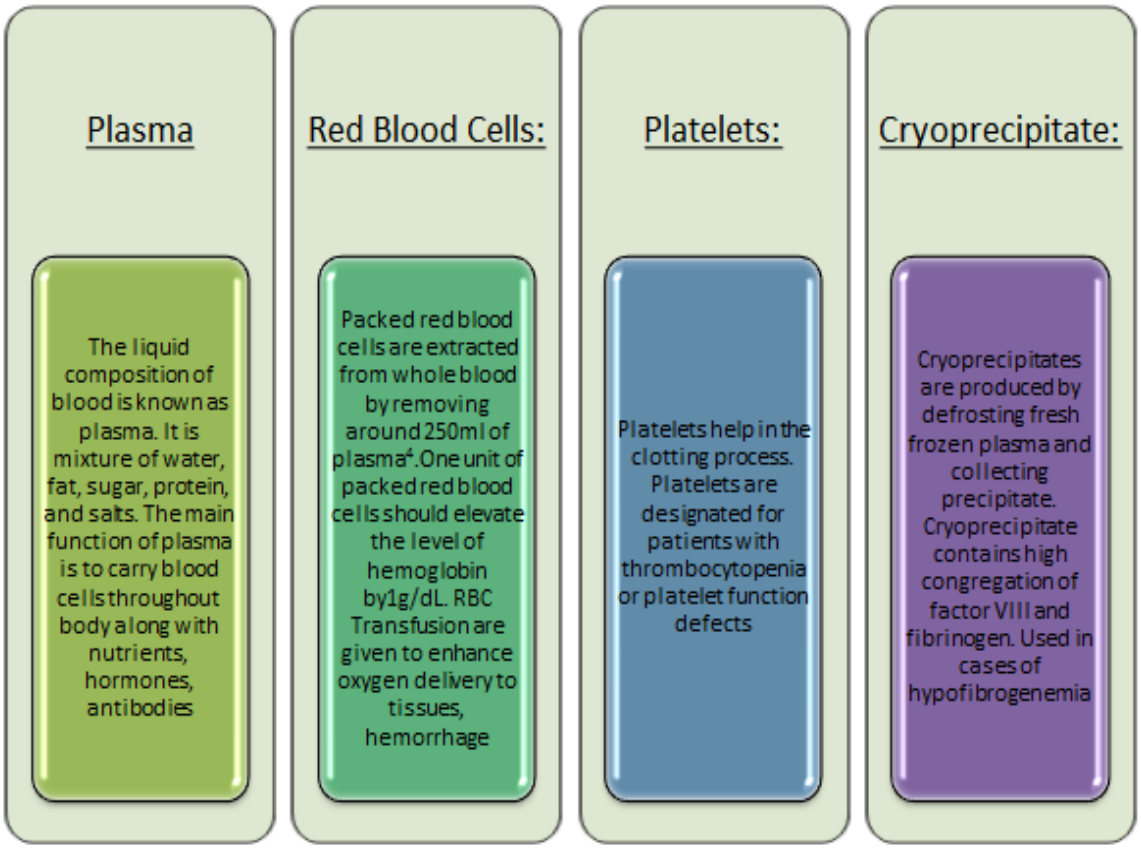
Blood is a fluid that is persistently circulating in the body to provide nutrition, oxygen, and waste removal1. Blood is mainly fluid that contains many cells and proteins that make it thicker than water1.



Plasma contributes half contents of the blood. Blood is transported through blood vessels (arteries and veins). It helps in prevention of clotting of blood. Blood is basically a tissue and a fluid that is pumped from heart to all parts of the body and an average person has around 5 litres of blood 2.

Blood carries oxygen from lungs to other parts of body for metabolism3.The carbon dioxide generated during the metabolism is transported back to the lungs by blood3.Blood also supplies the cells with nutrients, carries hormones, and eliminates waste products. It helps to maintain the right body temperature3.

Components of Blood: 4



Blood components are life restoring resources. Over the past years the idea of transfusion medicine has changed conclusively; with the evolution of technology, safer practices in transfusion and prominence are given to the transfusion of particular blood component5.

Transfusion of blood products takes certain inherited risks and hence it should be carried out only if it improves patient's outcome6. The effectiveness of transfusion in improving patient's outcome is unsupported by scientific evidence and its benefits have been mostly taken as granted6.Blood transfusion is reviewed appropriate when it is given to conditions where patient's condition is demanding and cannot be treated by other means of treatment7.Irrational use of transfusion continues in spite of limited availability of blood on one side and increased cost and serious risks on the other side7.

Various guidelines have been prepared for the judicious use of blood products but in spite of the guidelines there are still high rates of irrational use of blood components happening around the world7.

AIM AND OBJECTIVES

AIM

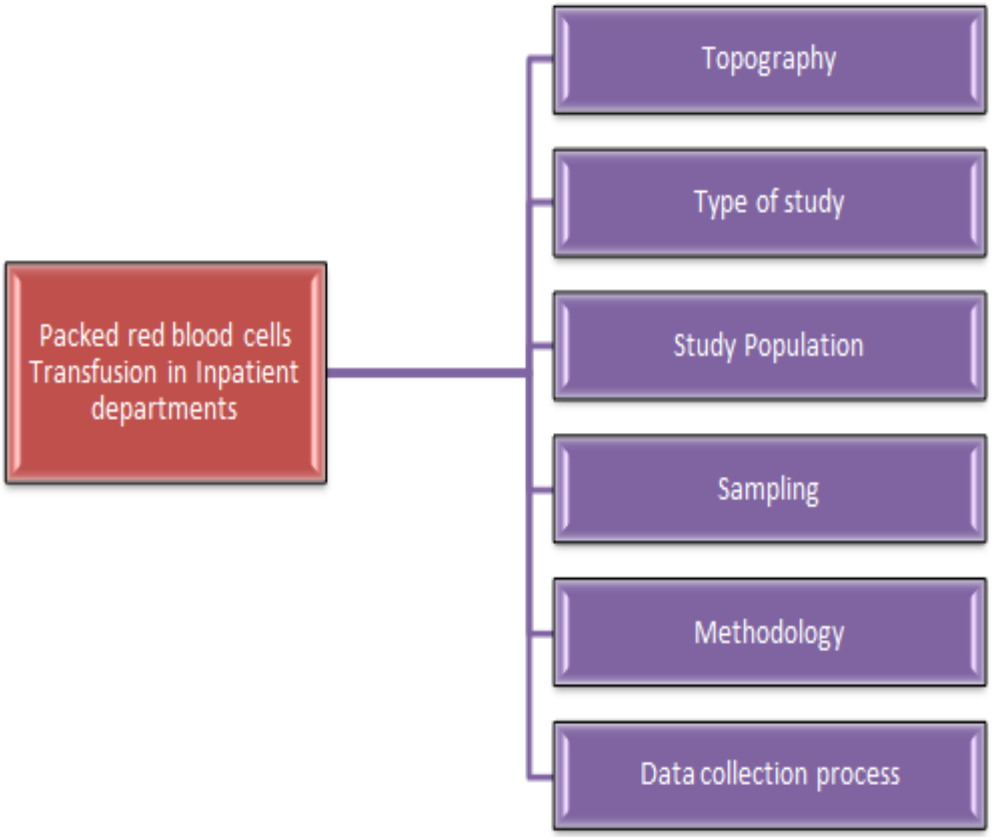
The main aim of the study is to assess the appropriateness of packed red blood cells in various departments of a tertiary care teaching hospital.

OBJECTIVE

- To assess the appropriate clinical use of red blood cells in various departments in a tertiary care teaching hospital.
- To analyze the maximum effectiveness, utility, safety of red blood cells transfusions among the clinicians and therapists
- To analyze the red blood cells utilization in a tertiary care teaching hospital

MATERIALS AND METHODS

The materials used for studying "A study on Packed red blood cells Transfusion in Inpatient departments of a tertiary care teaching hospital" are discussed as follows



Topography

The study was conducted in 1800 bedded tertiary care teaching hospital, established with the concept of providing medical facilities to the needy people.

Type Of Study

A Prospective and observational study has been carried out. It was standard based medical audit of patient care. It includes collection of data through an excel sheet.

Study Population

The study population included all inpatients who had undergone PRBC transfusion, from January 2021- March 2021 of the hospital.

Sampling Technique

All inpatients who had undergone PRBC Transfusion in the Hospital in the selected months were taken as samples.

METHODOLOGY

Study tool: The tool was an excel sheet made by using hospital standards, review of literature from books, journal, world wide website and published research studies. It contains two components

1. Demographics consist of age, gender

2. Paramaters like clinical specialty, consultant name, indication for transfusion, clinical diagnosis, pre transfusion hemoglobin level, number of units transferred, post transfusion hemoglobin.

DATA COLLECTION PROCESS

Step 1.

A formal permission was obtained from director of the hospital to carry out the study.

Step 2.

Permission was obtained from Blood bank officer to take inpatient transfusion records from various departments.

DATA ANALYSIS TECHNIQUE

The study involves review of patient data; hence the statistical analysis is descriptive. Microsoft excel is used for statistical analysis and data are expressed in numbers and percentage.

RESULTS

Age of Patients Who Had Undergone PRBC Transfusion:

Table No: 1 Showing the age of patients who had undergone transfusion

Age	No of patients	Percentage
Below 1year	24	2.4%
1-10 years	92	9.2%
11-20 years	118	11.8%
21-30 years	108	10.8%
31-40years	131	13.1%

41-50years	136	13.6%
51-60years	132	13.2%
61-70years	164	16.4%
71-80years	62	6.2%
81-90years	30	3%
91-100years	3	0.3%
Total	1000	

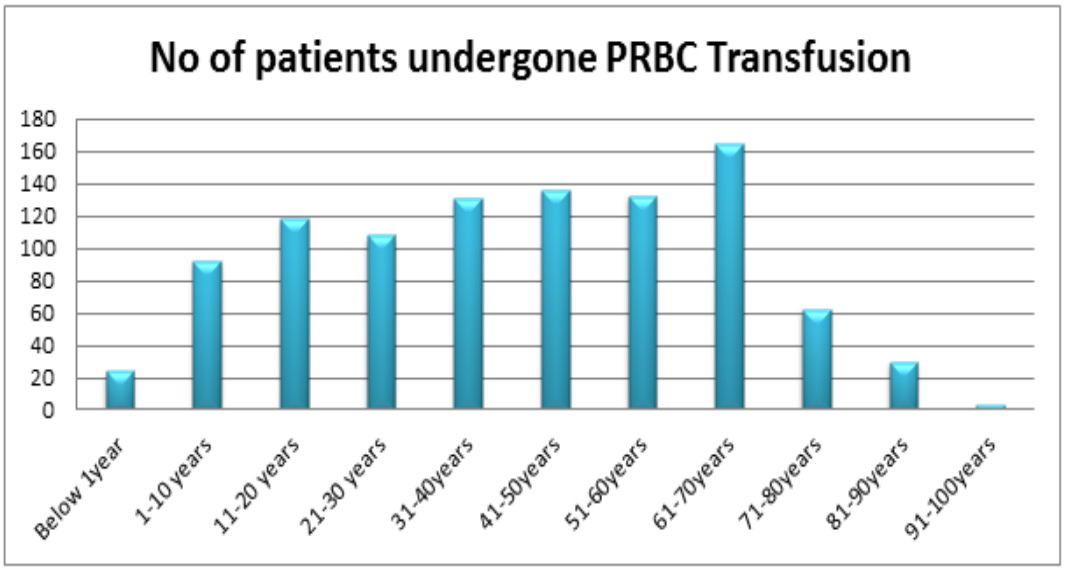


Figure No: 1 Showing the number of patients undergone PRBC Transfusion

The above table and figure depict that the highest age group which had undergone PRBC Transfusion was 61-70 years

Gender:

Table No: 2 Showing the gender distribution of patients who had undergone PRBC Transfusion

Gender	**Number**	**Percentage**
Female	417	42.7%
Male	583	58.3%
Total	1000	

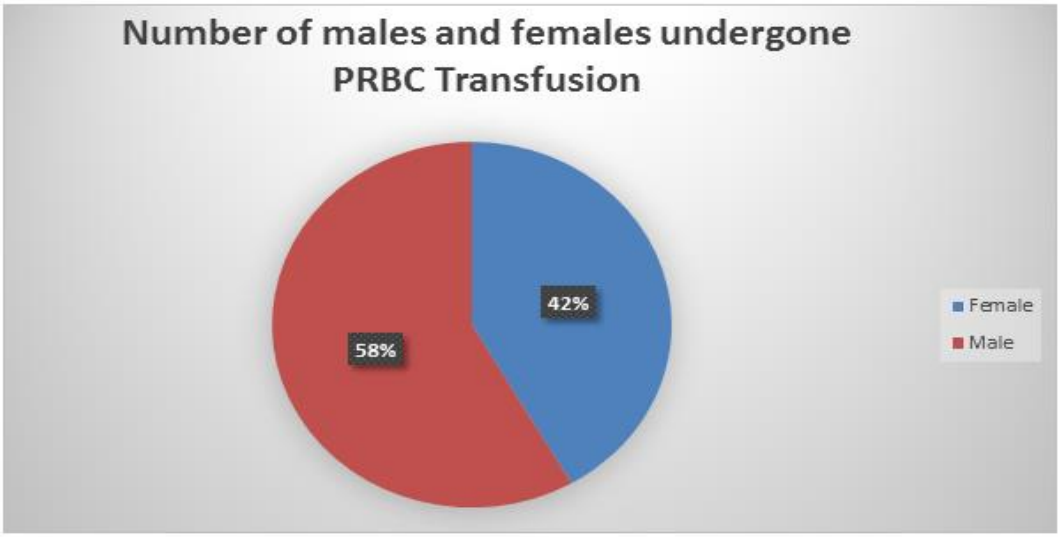


Figure No: 2 Showing the gender distribution of patients who had undergone PRBC Transfusion

The above table and graph depicts that male patients who had undergone transfusion was 42% and Female patient who had undergone transfusion was 58%.

Indication for Transfusion:

Table No: 3 Showing the various indications for PRBC transfusion:

Indication for blood transfusion	**No: of patients**	**Percentage**
Anemia	223	22.3%
Pre-operative	160	16%
Postoperative	202	20.2%
Bleeding	57	6%
Dialysis	161	16%
Leukemia	2	0.2%
Thalassemia	183	18.3%
Sepsis	12	1.2%
Total	1000	100%

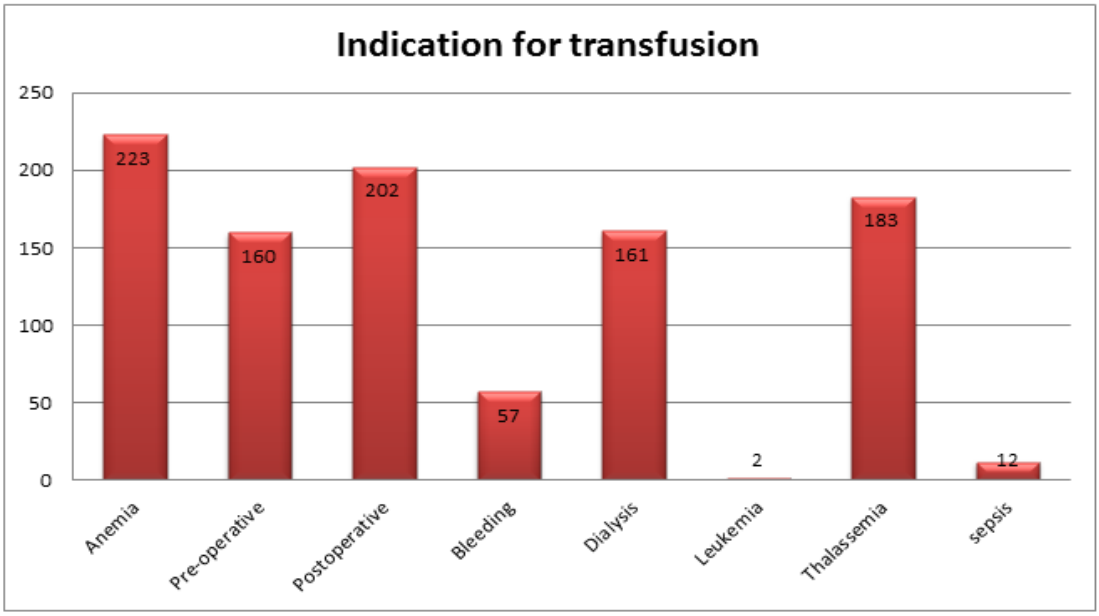


Figure No: 3 Showing the various indications for PRBC transfusion

The above table and graph depicts that among the various indications anaemia (223) was the most indicated reason for PRBC Transfusion while least indicated was leukaemia (2).

Clinical Specialties:

Table No: 4 Showing the various clinical departments that had undergone PRBC Transfusion

Department name	No: of transfusions
Cardiology	5
Gastroenterology	75
General medicine	146
Geriatrics	52
Medical oncology	20
Nephrology	114
Paediatrics	214
Pulmonology	5
Rheumatology	3
Neurology	3
Cardiovascular thoracic surgery	16
ENT	9
Surgical Gastroenterology	14
General surgery	75
Neurosurgery	83
Obstetrics and gynaecology	76
Orthopaedics	53
Paediatric surgery	5
Plastic surgery	7
Surgical oncology	3
Urology	19
Vascular surgery	3

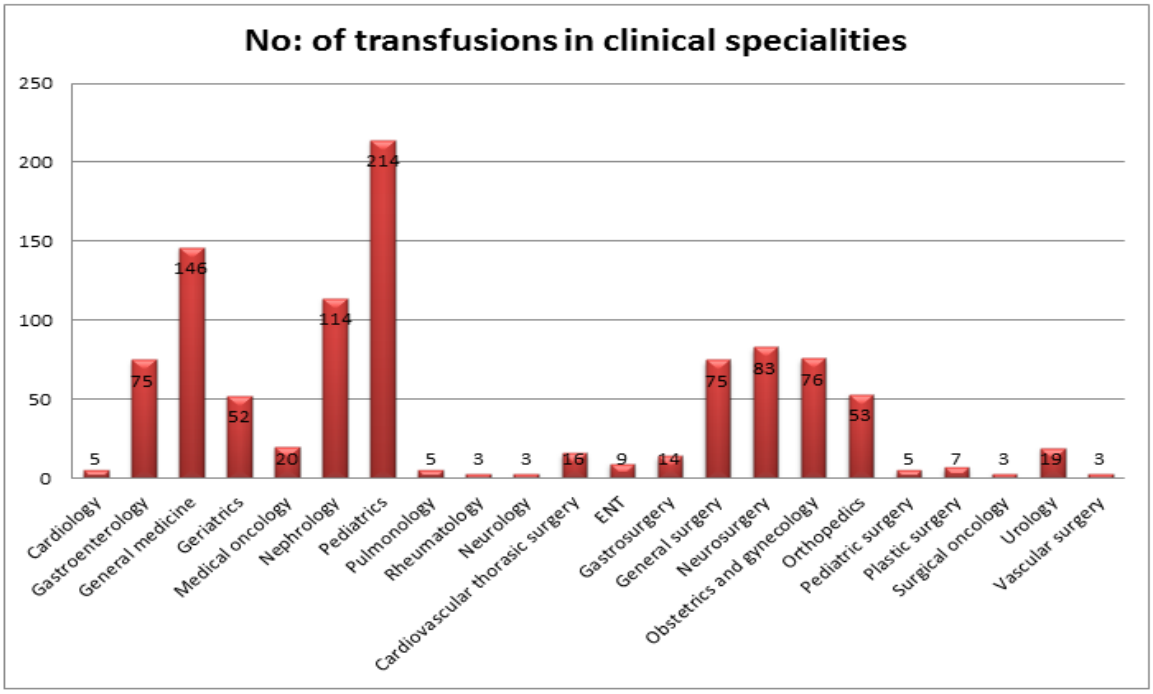


Figure No: 4 Showing the various clinical departments that had undergone PRBC Transfusion

The above table and graph depicts that among the various departments that undergone PRBC transfusions, Paediatrics (214) was the department with a greater number of transfusions while the least PRBC transfusions was in the departments of Rheumatology, Neurology, Surgical oncology and vascular surgery (3 in all).

Classification of according to medical and surgical specialties:

Medical specialties:

Table No: 5 Showing medical specialties that undergone PRBC transfusions

Department name	**No: of transfusions**	**Percentage**
Cardiology	5	0.7
Gastroenterology	75	12
General medicine	146	23
Geriatrics	52	8.1
Medical oncology	20	3.1
Nephrology	114	18
Pediatrics	214	34
Pulmonology	5	0.7
Rheumatology	3	0.4
Neurology	3	0.4
Total	637	100 %

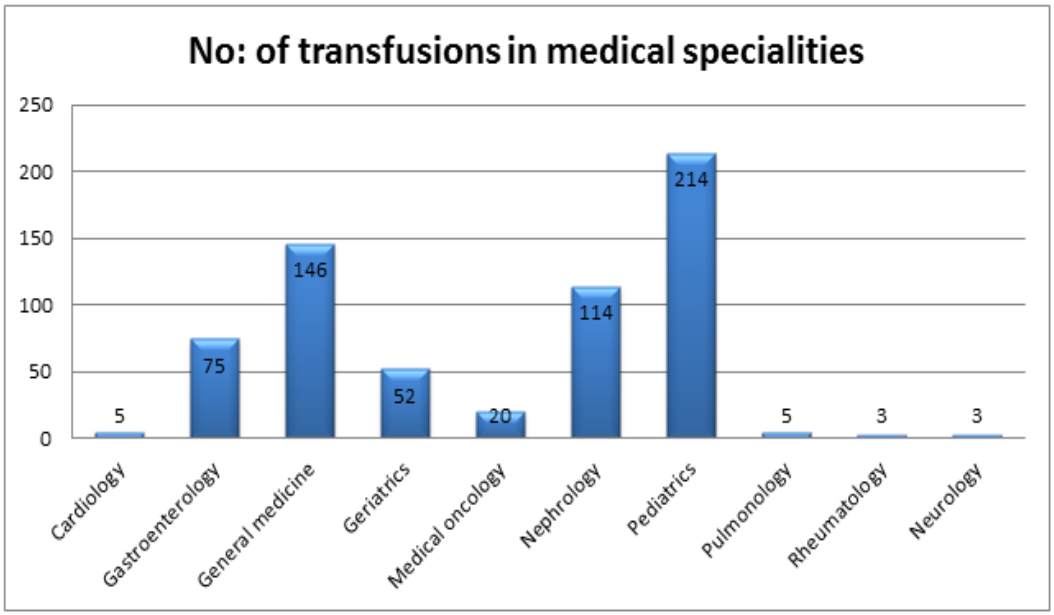


Figure No: 5 Showing medical specialties that undergone PRBC transfusions

The above table and graph depicts that among the medical specialties' pediatrics (214) had the greatest number of transfusions while Rheumatology and Neurology had the least PRBC Transfusion with 3 in each department.

Surgical specialties

Table No: 6 Showing the surgical specialties that have undergone PRBC Transfusions

Department	**No: of transfusions**	**Percentage**
Cardiovascular thoracic surgery	16	4.4
ENT	9	2.4
Surgical Gastroenterology	14	3.8
General surgery	75	21
Neurosurgery	83	23
Obstetrics and gynecology	76	30
Orthopedics	53	15
Pediatric surgery	5	1.3
Plastic surgery	7	2
Surgical oncology	3	1
Urology	19	5.2
Vascular surgery	3	1
Total	363	100 %

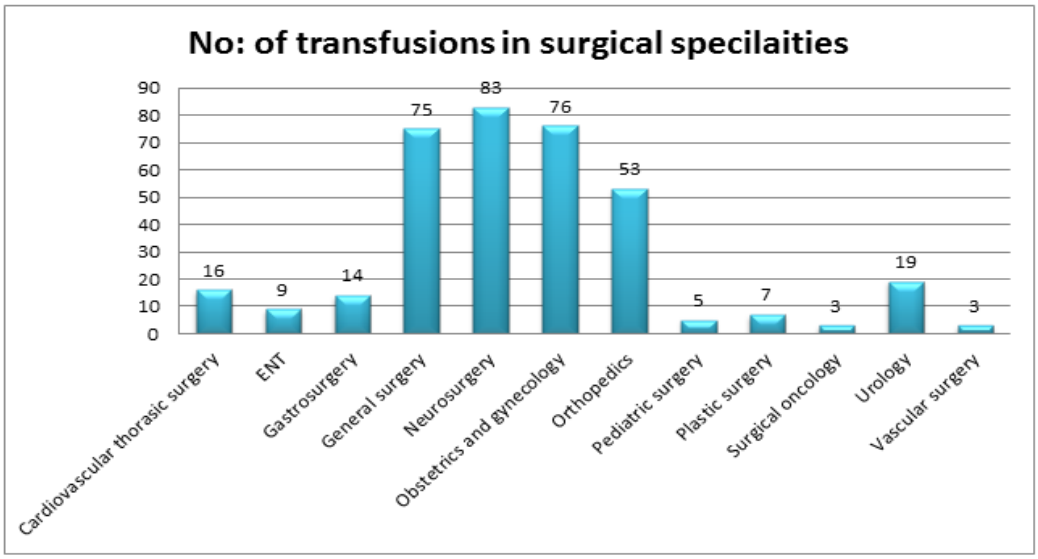


Figure No: 6 Showing the surgical specialties that have undergone PRBC Transfusions

The above table and graph depicts that among the various surgical specialties, Neurosurgery had the greatest number of PRBC Transfusions (83) while least transfusion was in Surgical oncology and Vascular surgery with 3each.

Pre Transfusion Hb:

Table No: 7 Showing the distribution of patients according to the Pre transfusion Hemoglobin levels

Pre-Transfusion Hb level	Number	Percentage
0-8gm/dl	776	78%
9-15gm/dl	224	23%
Total	1000	

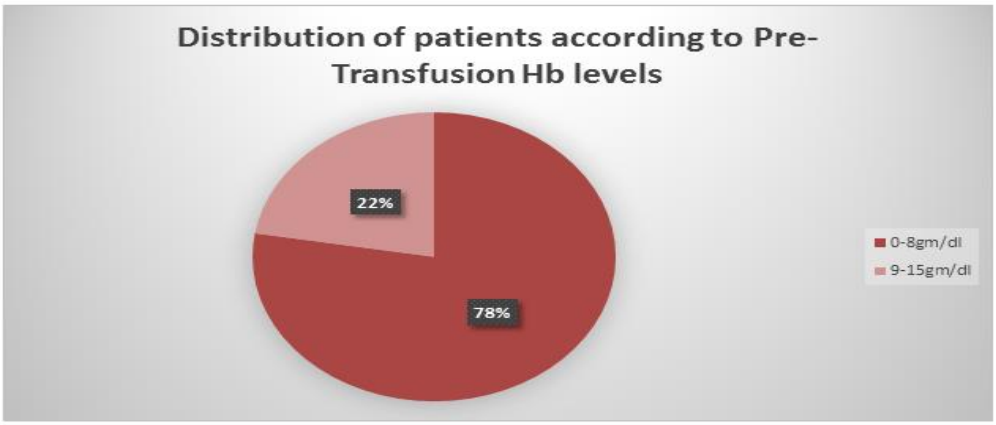


Figure No: 7 Showing the distribution of patients according to the Pre transfusion Hemoglobin levels

The above table and graph depicts that among the distribution of patients according to their pre hemoglobin levels 78% of patients had Hb between 0-8g/dl and 22% of patients had Hb between 9-15gm/dl

Number of Transfusions Considered Appropriate and Inappropriate Based on Guidelines:

Table No: 8 Showing the appropriate and inappropriateness of PRBC Transfusions

Criteria	Appropriate	Inappropriate	Percentage
Hb<8g/dl	776		78%
Hb>8g/dl with signs/symptoms/co morbidity/impending blood loss	176		18%
Number of transfusions when Hb>8g/dl without any cause in algorithm		48	5%

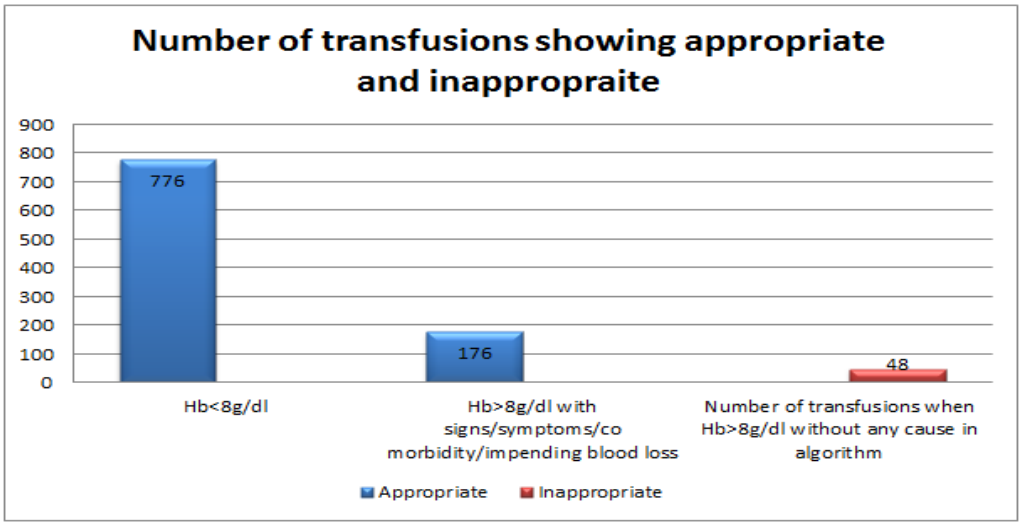


Figure No: 8 Showing the appropriate and inappropriateness of PRBC Transfusions

The above table and graph depicts that among the criteria 78% of the transfusions was considered appropriate and 18% was Hb <8g/dl with signs and symptoms.5% of transfusion was appropriate as it does not match the criteria

REASONS FOR INAPPROPRAITE TRANSFUSION

Table No: 9 Indications for inappropriate transfusion

Indication for Inappropriate Transfusion	Number of patients	Percentage
Anemia	25	52%
Before surgery	17	35%
Post-surgery	1	2%
Sepsis	5	11%
Total	48	100 %

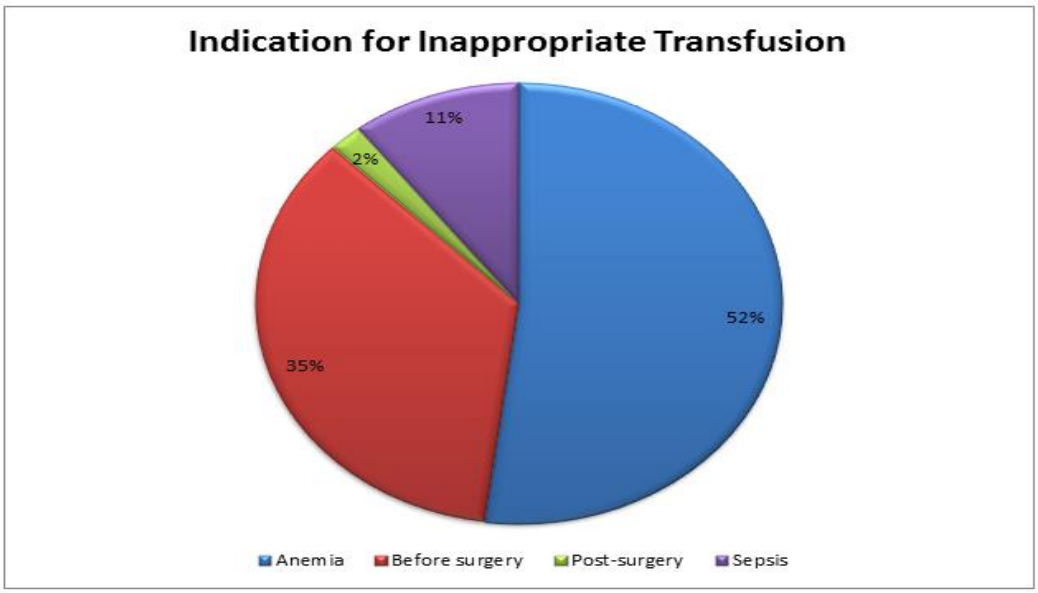


Figure No: 9 Indications for inappropriate transfusion

The above table and graph depicts that the transfusion that are not appropriate according to the criteria. Among the indications anaemia is the most indicated reason for inappropriate transfusion (52%)

DISCUSSION

Blood is a scarce resource that are indicated to achieve fast increase in the level of oxygen levels to the tissues. Blood products like RBC's have supreme importance in treating various medical and surgical conditions and in order to ensure the optimum use of resources there should be mechanism to see these resources are used appropriately. The inappropriate use of blood components not only result in wastage of resources but also will lead to unnecessary transfusion reactions.

The study carried out by Aseem K Tiwari, Ankita Ratan et al on Audit of Clinical Use of Red Blood Cells in a Tertiary Care Setting: An Algorithmic Approach in 2017 found that out of 764 patients who had RBC transfusion during the study period of 4 months in various departments. Among 764 patients, 265 (34.6%) were female and 499 (65.3%) were male patients. A total of 1024 transfusions were recorded. Cardiac surgery was the department with maximum and respiratory medicine with minimum use of red blood cell transfusion. Of the 1024 transfusions, 760 were considered appropriate since the patients had a hemoglobin of 8 g/dl or lower19. In 164/264 RBC units, although the hemoglobin was more than 8 gm/dl, the transfusion was deemed appropriate because of patient symptoms, comorbidity or imminent bleeding. Therefore, a total of 924 (90.23%) transfusions were considered appropriate19. In the current study also we took the same hemoglobin trigger criteria to check the appropriateness of the PRBC transfusion. A total of 776 episodes with hemoglobin less than or equals to 8g/dl is considered appropriate in this study. Further 176 episodes transfused at a rate of more than 8g/dl is considered appropriate because of symptomatic anaemia, comorbidity, blood disorders, and imminent blood loss. The remaining (5%) was considered inappropriate as there was no significant indication according to criteria.

The study carried out by Megala Chandrasekar, Vignesh Balakrishnan et al on Audit of clinical use of blood products in a tertiary care hospital in 2021 found that out of 1500 units of packed red blood cell transfusions, majority of the study subjects which was in the age group of 40 and 60 years. Most of the transfusions was done in surgical departments like orthopaedics and obstetrics and gynaecology. The pre-transfusion hemoglobin levels of the patients were in the range of 6–7 gm% 65.9% of the patients had appropriate PRBC transfusion based on the guideline and the remaining 34% had inappropriate blood transfusion. According to the guidelines, PRBC transfusion was indicated for patients with Hb less than 7 gm%20. In study the effective usage of blood components was analysed by comparing the number of units crossmatched and number of units transfused. Transfusion probability and the transfusion index was analysed to see the effective usage of blood.

The study carried out Murali Krishna Bogi, Sudhir Kumar Vujhini et al on retrospective analysis of packed red blood cell transfusion in tertiary care hospital in southern India in 2017 found that maximum indication of PRBC transfusion was in the department of nephrology and highest utilization was for elective surgeries21. The overall appropriate rate in the hospital was 62.4% which is quite lower comparing to this study. The highest appropriateness was in department of haematology with 88%. Whereas the lowest was in department of neurosurgery 52%. While in this study the highest appropriateness was in the department of paediatrics and lowest was in geriatrics.

RECOMMENDATIONS

The main aim of the study was to find the appropriate usage of red blood cells and it is found that 95.2% of the transfusion was appropriate and 5% was inappropriate transfusion. The following are some of the recommendations to be carried out based on this study:

- Geriatrics was the department with higher number of inappropriate transfusions followed by General medicine therefore identifying the root cause of the problem and conducting proper education/ training programs would help in resolving these issues.

- While writing the blood request forms, writing clinical indication more specifically helps in analyzing data more efficiently.

- Conducting seminars or CME programs along with transfusion medicine helps in enhancing and educating the hospital's transfusion guidelines and practices.

LIMITATIONS OF STUDY

This prospective study conducted to evaluate the appropriateness of PRBC Transfusions in a tertiary care teaching hospital. This study had certain limitations also.

They are Listed as Follows:

- The main limitation of this prospective study was lack of time, if there is more time then more study population can be analyzed.

- Patients admitted to ICU's and Emergency are excluded which is a limitation of this study

- Re Auditing was not done to check whether there is any improvement compared to the initial findings.

CONCLUSION

This study addressed that transfusion audits are quality improvement tools that aims at assessing the quality of blood components transfusion against the transfusion guidelines. The main aim of the study was to assess the appropriateness of packed red blood cells in various departments of a tertiary care hospital Inappropriate RBC transfusions represent an increasing health risks on patients as well as declining quality of healthcare. Inappropriate transfusion carries a lot of risk of transfusion transmitted diseases therefore it should be transmitted only in conditions associated with morbidity or mortality. Most of the reasons for inappropriate transfusions fall under the lack of guidelines in hospitals or due to lack of knowledge regarding the transfusion guidelines. In spite of all the guidelines and protocols there is still a high rate of appropriateness reported across countries. As blood is a scarce resource, we must use it judiciously.

REFERENCES

1. WEB MD: The heart health: reference: An overview
https://www.webmd.com/heart health/ reference/summary_20190518
2. Britanica: Health and medicine : Medicine https://www.britannica.com/science/blood-transfusion;health and medicine/ medicine/ blood transfusion /reference_20180129
3. https://www.ncbi.nlm.nih.gov/books/NBK279392/Informedhealth.org/what does blood do/ August 29, 2019/Cologne, Germany: Institute for Quality and Efficiency in Health Care (IQWiG) 2006
4. Sharma S, Sharma P, Tyler LN. Transfusion of blood and blood products: indications and complications. American family physician. 2011 Mar 15;83(6):719-24.
5. Sharif M, Saxena A, Singh S, Manchala S, Jafri N. Blood Component Transfusion in a Tertiary Care Hospital. Indian journal of pediatrics. 2020;87(5):339.
6. https://www.ncbi.nlm.gov/pmc/articles/PMC4260298
7. PrasanthB K, Anusha AS, Begum R. Evaluation of Blood Ordering Practice For Packed Red Blood Cells in A Tertiary Care Hospital. International Journal of Blood Transfusion. 2018 Oct 30;1(1):1.
8. WHO: The hospitals: An overview https://www.who.int/health-topics/hospitals/World health organization/hospital/overview_20190520
9. ASQ :Auditing: About auditing https://asq.org/quality-resources/auditing;ASQ;About auditing; Quality resources pdf_20201015
10. AAPC: Medical auditing: what is medical auditing https://www.aapc.com/medical-auditing/medical-auditing.aspx;medical auditing; what is medical auditing_20201112
11. Healthengine:blood function:compositon of blood: https://healthengine.com.au/info/blood-function-and-composition#C3;health engine; composition of blood
12. Yaddanapudi S, Yaddanapudi LN. Indications for blood and blood product transfusion. Indian journal of anaesthesia. 2014 Sep;58(5):538.
12. Liumbruno G, Bennardello F, Lattanzio A, Piccoli P, Rossetti G. Recommendations for the transfusion of red blood cells. Blood transfusion. 2009 Jan;7(1):49.
13 Cortés Buelvas A. Anemia and transfusion of red blood cells. Colombia Médica. 2013 Oct;44(4):236-41.
14. Blumberg N, Heal JM, Phillips GL. Platelet transfusions: trigger, dose, benefits, and risks. F1000 medicine reports. 2010;2.
15. Liumbruno G, Bennardello F, Lattanzio A, Piccoli P, Rossetti G. Recommendations for the transfusion of red blood cells. Blood transfusion. 2009 Jan;7(1):49.
16. Yaddanapudi S, Yaddanapudi LN. Indications for blood and blood product transfusion. Indian journal of anaesthesia. 2014 Sep;58(5):538.
17. Tiwari AK, Ratan A, Arora D, Aggarwal G, Mehta SP, Setya D, Acharya DP. Audit of clinical use of red blood cells in a tertiary care setting: An algorithmic approach!. Global Journal of Transfusion Medicine. 2017 Jul 1;2(2):109.
18 Suddock JT, Crookston KP. Transfusion reactions. StatPearls [Internet]. 2020 Aug 10.
19. Tiwari AK, Ratan A, Arora D, Aggarwal G, Mehta SP, Setya D, Acharya DP. Audit of clinical use of red blood cells in a tertiary care setting: An algorithmic approach!. Global Journal of Transfusion Medicine. 2017 Jul 1;2(2):109
20. Chandrasekar M, Balakrishnan V, Ponnaiyan A, Ramachandran T. Audit of clinical use of blood products in a tertiary care hospital. Journal of Hematology and Allied Sciences. 2021 May 31;1(1):22-7.
21. Bogi MK, Vujhini SK, Kumar KM, Bonagiri S. Retrospective analysis of packed red blood cell transfusion in tertiary care hospital in Southern India. Perspect Med Res. 2019;7:44-50.