

A Cross-Sectional Study of Utilization of Blood and Blood Components in a Tertiary Care Hospital in Chengalpattu District, Tamil Nadu.

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KEYWORDS

Blood and blood components, Blood centre, Crossmatching and transfusion Ratio, Transfusion index

ABSTRACT:

Introduction Blood centre plays a vital role in patient blood management by providing blood and blood components. Patient blood management comprises of approaches to diagnose, treat and improve the outcome of the individual. Blood transfusion is one important aspect of patient blood management which has a major positive impact in outcome of patients. Blood is a scarce resource and has to be administrated judiciously. Blood transfusion risk versus benefits has to be assessed before initiating blood transfusion. The auditing of usage of blood components has to be done on periodic basic in order assess the utilization of blood products across various department. It is mandatory to monitor and assess the pattern of utilisation of blood components. The objective of this study is to determine the pattern of utilisation of blood and blood components in a tertiary care hospital in Chengalpattu District, Tamil Nadu.

Objectives: The objective of this study is to determine the pattern of utilisation of blood and blood components in a tertiary care hospital in Chengalpattu District, Tamilnadu.

Methods: This was a retrospective Cross-Sectional study conducted in the Blood centre, Department of Pathology, Karpaga vinayaga institute of medical sciences and Research centre in Tamil Nadu from July 2023 to December 2023. Data of all the blood and blood components issued from the blood centre at Karpaga vinayaga institute of medical sciences and Research centre during the two years study period (January 2021- December 2022) were collected and analysed.

Results: In this current study, total of 3279 blood and blood components reservation request over the period of 2 years were received. Out of which 2167 units of blood and blood products were issued with a monthly average of 90 Units. The most common blood group for which blood products were issued was O Positive (48.5 %). Most of the blood transfusion was observed in the age group of 20-40 years of age i.e., 971 units which accounts to 44.89%. Maximum utilized blood products were PRBC-1475 units (68%) followed by whole blood 483 units (22%) while the least utilized was Platelet concentrates/ random Donor Platelets which constituted for 3%. The most common indication for transfusion of blood component was Anemia (54.17%). Overall CT ratio was 1.53. Overall TI of 0.6 indicated appropriate blood utilisation.

Conclusions: This study highlights the pattern of utilisation of various blood and blood components in a tertiary care hospital. Developing the appropriate blood transfusion policy in each hospital after discussing with the clinicians helps in strengthening the appropriateness of usage of blood



components. Periodic assessment of pattern of utilisation has to be done to maintain the quality of the blood centre. This also enables internal quality control for better functioning of blood bank. Educational and training sessions should be conducted to the clinicians will further strengthen the blood transfusion practices.

1. Introduction

Blood is a body fluid comprises of various cellular components and nutrients. Blood is essential for transportation of oxygen to the cells. In the early 19th century, Dr. James Bundell who was an obstetrician, performed the first blood transfusion for the patient with Post Partum hemorrhage which turned out to be successful. Dr. James Bundell with help of his two colleagues named Leacock and Goodridge introduced blood transfusion in practice [1]. Blood transfusion is in practice since early 19th century, but there is no substitute for human blood till date. We still depend on voluntary blood donors for blood and Blood products.

Whole blood once donated is separated into various blood components. The blood components include Packed red blood cells, Platelet concentrates, Fresh frozen Plasma, leucocytes and cryoprecipitate. Preparation of blood components depends on the requirement of various blood components based on which the whole blood is collected in different types of bags. In the year 1950-1960, blood component preparation came into practice to maximize the benefit out of whole blood [2]. The major advantages of blood component therapy is transfusion of desired blood components to patient based on their need rather than overloading the patients. Another advantage is appropriate storage of blood components and hence increasing the shelf life of those components. If Anti-coagulant preservative solution CPDA-1 (Citrate Phosphate Dextrose Adenine) is added to Packed red blood cells and stored at 2-6° C, its shelf life is 35 days. If Additive solution like SAGM (Saline Adenine Glucose Mannitol) is added to the PRBC and stored at 2-6° C, then its shelf life is extended upto 42 days [2]. If not added, it is stored only for 35 days. In order to avoid wastage of blood products, FIFO (First in First out) is followed in most of the blood centre except in some special situation. The periodic audit of usage of blood and blood components is essential to assess the utilization of blood products across various department. It is essential to monitor and assess the pattern of usage of blood components. Crossmatching ratio and Transfusion Index are taken as quality indicators to assess the appropriate

utilisation of blood components [3,4]. Periodic Audit of usage of blood components helps in assessing the quality of blood product utilisation.

Blood is a scarce resource has to be administrated judiciously. Blood transfusion service plays an inevitable role in patient management by provision of various blood components. Patient Blood management comprises of various aspect of diagnosis and treatment modalities to improve the hemodynamic status of the individual. Blood transfusion is one important aspect of patient blood management which has a major positive impact in outcome of patients [5].

2. Objectives

The objective of this study is to determine the pattern of utilisation of blood and blood components in a tertiary care hospital in Chengalpattu District, Tamilnadu.

3. Methods

The periodic audit of usage of blood and blood components is essential to assess the utilization of blood products across various department. It is essential to monitor and assess the pattern of usage of blood components.

IEC approval was obtained (Reference Number: KIMS/UG/08/11/2023). This is a retrospective Cross-Sectional study conducted in the Blood centre, Department of Pathology, Karpaga vinayaga institute of medical sciences and Research centre in Tamil Nadu from July 2023 to December 2023. Data of all reserved and issued blood and blood components from the blood bank of Karpaga vinayaga institute of medical sciences and Research centre during the two years study period (January 2021- December 2022) were collected and analysed. Blood units were issued for the patients admitted in the wards of the departments of General Medicine, Paediatrics, Obstetrics & Gynaecology, General Surgery and Orthopaedics in Karpaga Vinayaka institute of medical sciences and Research centre were included in this study. Records of all blood units issued to any other hospital other than Karpaga vinayaga institute of medical sciences and Research centre and records of all blood units procured from any other blood



bank other than the blood bank of Karpaga vinayaga institute of medical sciences and Research centre are excluded from the study. Using the blood centre registers, retrospective data was collected which includes age, blood groups of recipients, the department wise blood components issued.

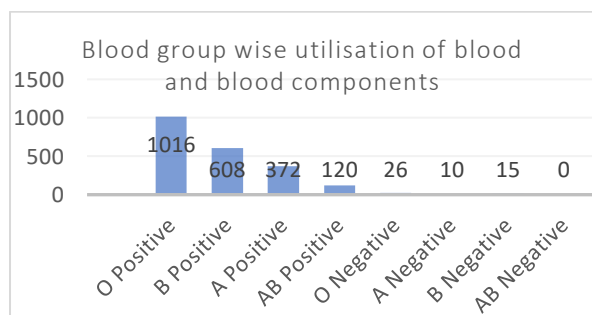
From the collected data, in order to evaluate the appropriateness of utilisation of blood and blood components we used the following quality indicators as follows [3,4]

- Cross-match to transfusion ratio (C/T ratio) = Number of blood components cross-matched/number of blood components transfused. C/T ratio of 2.5 and below was considered indicative of significant blood usage.
- Transfusion Index (TI) = Number of blood components transfused/Number of patients cross-matched. A value of 0.5 or more was considered indicative of significant utilisation of blood components.

4.Results

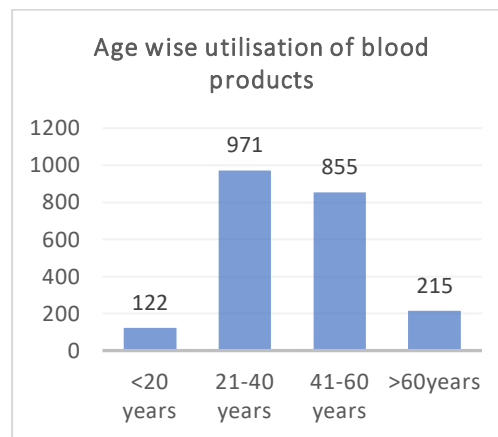
Data of monthly reservation and issue was calculated periodically. In the current study, we have received 3279 PRBC reservation request over the period of 2 years. Out of which 2167 units of blood products were issued with a monthly average of 90 Units. The most common blood group (Figure-1) for which blood products were issued was O Positive (48.5 %) followed by B Positive (28.62%). AB negative blood unit was not utilized.

Figure-1: Blood group wise utilisation of blood and blood component



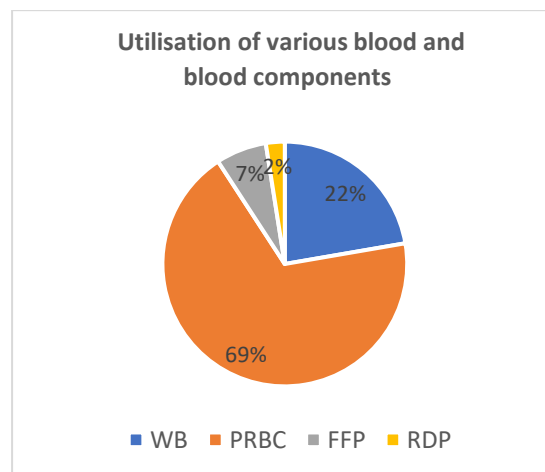
In Figure -2 as mentioned, most of the blood transfusion is observed in the age group of 20-40 years of age i.e., 971 units which accounts to 44.89%. Least was in the age group less than 20 years i.e.,122 units which accounts to 5.64%.

Figure-2: Age wise utilisation of blood products



The usage of blood and blood products (Figure -3) constituted of PRBC 1475 units (69%), Whole blood 483 units (22%), Fresh frozen plasma 145 units (7%) and Platelet concentrates/ random Donor Platelets 54 units (2%). Majorly utilized blood product was packed red blood cells which constituted for 69% and least utilized was Platelet concentrates/ random Donor Platelets which constituted for 3%.

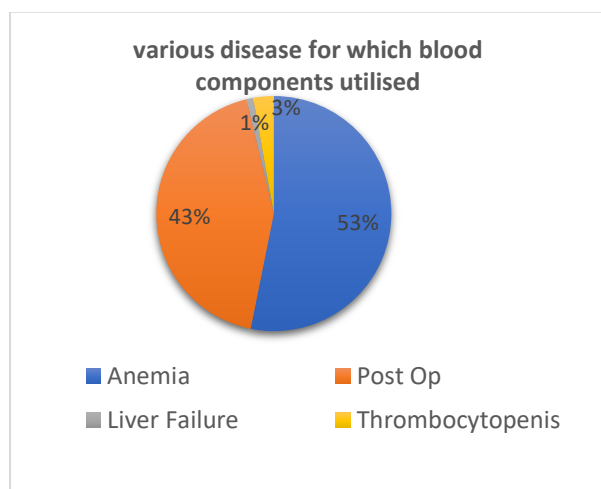
Figure-3: Utilisation of various blood and blood components



As mentioned in Figure 4, The most common indication for blood transfusion was Anemia (54.17%). This study provides the insight about utilization of PRBC among various departments in the hospital.



Figure-4: various disease for which blood components utilised



In Table 1, Overall CT ratio was 1.53, with Surgery having the highest CT ratio of 2.075538 and Paediatrics having the lowest CT ratio of 0.083333. Overall TI Packed red blood cells and whole blood was 0.6, with General Medicine having the highest TI of 0.85 and lowest TI in paediatrics of 0.08. overall TI of 0.6 indicated appropriate blood utilisation. Majority of blood and blood components PRBCs are utilized in obstetrics and Gynaecology department i.e., 1267 units which accounts to 58.46%. The least utilization is observed in paediatrics department i.e., 2 units which accounts to 0.09 %.

Table-1: Crossmatching Ratio (CT ratio)/ Transfusion Index (TI):

Departments	Blood & Blood units transfused(n)	Blood & Blood units crossmatched(n)	Cross match transfusion Ratio (CT Ratio)	Transfusion Index (TI)
OBG	1267	1950	1.5:1	0.6
Surgey	451	753	1.6:1	0.6
Medicine	355	417	1.1:1	0.8
Ortho-paedics	92	157	1.7:1	0.6

Paediatrics	2	2	01:01	1
Total	2167	3279	1.5:1	0.6

3. Discussion

Blood transfusion services is an integral part of treatment modality. The whole blood is collected from voluntary non remunerated blood donors. Whole Blood is separated into various blood components like packed red blood cells, platelet concentrates (Random Donor platelets) and Fresh Frozen plasma [2]. This is considered as allogenic blood transfusion. Blood transfusion is done in case of emergency situation or in chronic illness. Acute illness includes any road traffic accident or any major blood loss during surgery. Various blood and blood components are transfused after Some chronic illness patients such as chronic kidney disease or Thalassemia patient require repeated blood transfusion. According to Drugs and cosmetic Act, Blood and blood components are considered as a drug. The aim of blood transfusion should be able to bring a positive impact on the physiological status of the patient. Risk vs benefit analysis should be done before initiating blood transfusion.

In order to avoid unnecessary crossmatch of blood products, MSBOS came into practice in developed countries who have already implemented voluntary non remunerated blood donation. MSBOS is abbreviated as Maximum surgical blood ordering schedule. It comprises of list of elective surgeries performed commonly and the number of units of blood required during the surgery. By following MSBOS, we shall avoid unnecessary crossmatching of blood units which in turn reduces the workload for the blood centre personnels and improve the efficiency of blood transfusion services [4]. MSBOS improves blood-ordering practices and helps in reducing wastage in developing countries.

In the present study, we have received 3279 PRBC reservation request over the period of 2 years. Out of which 2167 units of blood products were issued with a monthly average of 90 Units. In the current study, utilization of blood components was packed red blood cells 1485(69%), Fresh frozen plasma 145 units (7%) and Platelet concentrates/ random Donor Platelets 54 units (2%). Kalpesh V. Vaghela [6] found that based on monthly utilisation, FFP and Platelet concentrates are most commonly used throughout the months of August



through November. During this period, due to dengue fever, platelet concentrates were rampantly used throughout the district. Most common indication for Blood transfusion in this study was anemia which is similar to Dushyant Singh Gaur [7]. Awareness about autologous blood donation should be created among the clinicians as autologous blood transfusion is considered immunologically safe. Rubiya Ryhan [8] discussed about inappropriate usage of blood components. overall, 35.6 % of blood components were inappropriately utilised. In the current study, Whole blood 483 units (22%) were transfused which is comparatively lesser than Dr. Sampat Kumar and Giriyan SS i.e., 40.8% and 51.2% [9,10]. Whole blood is the source of other blood products. Whole blood which is collected from voluntary non remunerated donors is separated into various blood components based on specific gravity of red cells, Platelets, etc. On separation of whole blood into components, components can be utilized for multiple patients. In present study, most of the blood products were utilised by Obstetrics and Gynaecology patients (1267 units) which is similar to Dr. Sampat Kumar and Giriyan SS [9,10]. The most common blood group (Figure-1) for which blood products were issued was O Positive (48.5 %) followed by B Positive (28.62%). Like Dr. Sampat Kumar [9], Priyanka N Bansod showed majority of blood products used belonged to B positive blood group [11]. Deepak Muraleedharan found the seasonal variation in the demand of blood products. There is a rise in demand during the period of post-monsoon and monsoon season and decreased demand during the premonsoon season in terms of blood requirement [12]. Fresh Whole Blood can be utilised to resuscitate severe traumatic haemorrhage when platelets are not available in a military setting [13]. Least number of units were utilised in Paediatric department (2 units) which is contradictory to Biman Mondal [14]. In this study, utilization of Whole blood noted as Whole blood 483 units (22%) which is found to be higher when compared with Reena Sharma, Biman Mondal utilisation of whole blood 7.45 %, 7.5 % respectively [13,14]. In this study, overall CT ratio is found to be 1.5:1. Least was found in pediatrics but only 2 units were crossmatched and transfused. CT ratio was 1 in pediatrics. Next least was in medicine department. Transfusion index indicates the appropriateness of number of blood units transfused with number of patients crossmatched. Overall Transfusion Index was 1.6 in the study. Overall better utilisation of blood components was noted. Majority of crossmatched units were transfused.

In surgical departments CT ratio is comparatively higher considering the risk of bleeding and anticipated blood loss more units were reserved. Biman Mondal [14] CT ratio and Transfusion index is found to be 1.27 and 0.92 respectively which is similar to our study. Decision of red blood cells transfusion in critically ill patients should be made based on the comprehensive hemodynamic status of the patient rather than an arbitrary lab value. [15] In the current study, most of the blood transfusion is observed in the age group of 20-40 years of age i.e., 971 units which accounts to 44.89% which is similar to Kaushik Ishore [16]. Ghartimagar D [17] mentioned that rationale use of blood products means right blood utilised for right patient. Appropriate pre transfusion testing is mandatory before initiating blood transfusion. Shuvra Podder [18] found that majority of blood products were utilised for patients of age group greater than 50 years (28%). In India, complete ban on professional blood donation was made in year 1998 making a huge shift in the blood donation practices. This was strengthened by national blood policy (2002) to further enhance the safe blood transfusion practices in India [19,20]. The reservation policy followed in our institute is that the reservation for Packed red blood cells is valid till 2nd day till Midnight considering receiving day for the requisition form and sample as Day 0. This is done in order to avoid wastage of blood products.

Limitation(s):

1. The patient load in each clinical disciplines also had an impact on utilisation of blood components. Based on which orthopaedics and Paediatrics department had a lesser utilisation of blood components when compared with rest of the departments.
2. Wastage rate of blood and blood components were not taken into consideration.
3. Feedback on utilisation of blood components were not taken into consideration i.e., once issued from the blood centre, whether the blood components transfused or not were not tracked.

Conclusion:

In the current study, insights about the pattern of utilisation of blood and blood components in the hospital was provided. Periodic assessment of pattern of utilisation has to be done to maintain the quality of the blood centre. Packed red blood cells was the maximum utilized product followed by Whole blood, Fresh Frozen Plasma and then platelet concentrates. Utilisation of blood and blood products was found to be highest in the



Obstetrics and Gynaecology department. Majority of blood components was utilised for patients between the age group of 20-40 years of age. Most common indication for transfusion of blood products was anaemia (53%). Blood transfusion quality indicators such as CT ratio, Transfusion Index was assessed. It showed effective blood utilisation. In this study, whole blood usage is found to be high. Developing the appropriate blood transfusion policy in each hospital after discussing with the clinicians helps in strengthening the appropriateness of use of blood components. This also act as check point for internal quality control aiding in better functioning of blood centre. This also enables internal quality control for better functioning of blood bank. Educational and training sessions should be conducted to the clinicians regarding the medicolegal aspects; patient blood management will further strengthen the blood transfusion practices. Periodic Training programs for staff nurse regarding the safe bedside blood transfusion practices is inevitable.

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