



## A COHORT STUDY OF DISTRIBUTION AND UTILIZATION OF BLOOD AND ITS COMPONENTS IN A TERTIARY CARE HOSPITAL

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### ABSTRACT

**Introduction:** Blood and its components play an important role in different treatment practices. It is important to maintain a balance between the ongoing demand and supply. Periodic review of blood component usage is very important to assess the blood utilization patterns in any hospital. It acts as a management tool for the appraisal and justification of appropriateness and efficacy of transfusion therapy [14].

**Aim:** A retrospective cohort study of distribution and utilization of blood and its components in a tertiary care hospital Akola, Maharashtra.

**Materials and methods:** This is a retrospective cohort study carried out in blood bank of tertiary care centre, Akola, Maharashtra. The data was collected from issue and cross matching register of last 1 yr dating from 1st August 2016 to 31st June 2017. The period of study was 1 year. A month with number of units utilization nearest to the average of units utilized in the last year (1136) is selected as representative month for detailed analysis. October month with 1151 no. of units utilization was considered and analyzed.

**Results:** Out of 605 recipients, 393 were female patients and 212 were male patients. Total no. blood units utilized in last 1 yr was 13638. About 1.86 units were transfused averagely per patient. In representative month (in this case month of October) whole blood (55%) was most commonly used blood product. PRBC (25%) was most utilized product among blood components. Most common indication was anemia and female patients received more blood products than male. Pre transfusion Hb also categorized according to blood products recipients. Age - sex relationships shows maximum recipients with age between 21-30 yrs in which 144 recipients were female and 44 were male recipients.

**Conclusion:** Trend of utilization of blood and its components is found which helps to reduce inappropriate use of it, avoids unwanted blood transfusion reaction and avails the deprived patients.

**KEYWORDS :** Blood transfusion, requisitions, FFP, PRBC, platelets, whole blood, utilization.

### INTRODUCTION-

Blood transfusion constitutes an important part of various treatment protocols. The purpose of a blood transfusion is to replace lost blood, to increase the flow rate of cardiac, to increase blood elements, to replace the missing clotting factors and immune system elements. Indications for blood usage have been defined over the years. Blood transfusion was first performed successfully by James Blundell in 1818[1]. Today, many modern surgical procedures could not be carried out without the use of blood. There is no substitute for human blood. It has been estimated that one-third of all patients admitted to intensive care units in the developed world receive a blood transfusion [2]. The blood components implies separation of whole blood into various components like packed red cells (PRBC), platelets rich plasma, fresh frozen plasma (FFP), cryoprecipitate and leucocytes. In many hospitals, it is now a standard practice of blood bank to manufacture different blood components from donated whole blood units and supply only components thereafter to patients [3-7]. Component therapy was introduced between 1950 and 1960s to maximize benefits of all components present in whole blood [8].

The demand of blood far exceeds the supply, especially in the densely populated third world countries where ignorance and superstition mitigate against voluntary blood donation. So each unit of blood is precious and utilized judiciously with minimal wasting. Every blood bank should formulate its own guidelines in relationship to local requisitions from various healthcare providers so that there is no delay in supply of the required product and also there is no undue wastage [9]. Blood transfusion is indicated in the treatment of various conditions including bleeding disorders, trauma and blood loss due to varying causes. Blood components such as red blood cells, platelets and FFP are important in prophylaxis as well as treatment. Data on usage of blood products is limited; studies have revealed high proportion of inappropriate use of blood transfusion often in both developed and developing countries [8, 12]. An estimated 33-62% of all transfusions given

post-trauma have been found to be inappropriate [13]. Periodic review of blood component usage is very important to assess the blood utilization patterns in any hospital. It acts as a management tool for the appraisal and justification of appropriateness and efficacy of transfusion therapy [14].

Thus the present study was carried out at the blood bank of a tertiary care hospital, Akola, Maharashtra aiming to analyze the pattern of requisitions it receives from various departments of the hospital and assess the utilization of various blood components manufactured in blood bank, where records from 'ISSUE AND CROSS MATCHING REGISTER' are used of 1 year dating from 1st August 2016 to 31st July 2017

### AIMS AND OBJECTIVE -

**Aim:** A retrospective cohort study of distribution and utilization of blood and its components in a tertiary care hospital, Akola, Maharashtra.

### Objectives:

1. To demonstrate the usage and trend of utilization of blood and blood components in a tertiary care hospital.
2. To rank the blood and its products according to its utilization.
3. To find out which ward is getting highest supply of blood.
4. To evaluate the most common indication and diagnosis for whole blood and components transfusion.
5. To find out the sex and age relationship with blood transfusion

### MATERIAL AND METHODS -

This study was conducted at the blood bank of Government Medical College And Hospital Akola, Maharashtra. It was a type of retrospective cohort study done from 1st August 2016 to 31st July 2017 i.e. within 1 year. The number of recipients (of all age group) recorded as per 'Issue & Cross Matching Register' of blood bank in last 1 year dating from 1st August 2016 to 31st July 2017. Ethical clearance was obtained from institutional ethical committee.

Procedure– The number of all whole blood units and blood components supplied to various wards in 1 year was recorded and their average was calculated. This average is compared with number of units transfused to the recipients in each month. The month showing transfusion number closest to average is considered as representative month; let say number of units transfused in that month as 'n'. Information of recipients in representative month is collected as;

Name/ Inpatient registration number, Age, Sex, Consultant in-charge, Admission Ward, Clinical indication for which the product was required. Applying this information following tables in the result was made. All the data was entered using MS-Access 2010 database and charts were drawn using Microsoft excel 2010. Graph Pad prism version 5.0 was used to analyze the data, using  $P \leq 0.05$  as level of significance.

**OBSERVATION AND RESULTS –**

Total no. of blood units collected in last one year dating from 1st August 2016 to 31st July 2017 were 8171 units from both voluntary and replacement donors. Whereas total no. of whole blood and its components recipients from our blood bank were 13638 units with a monthly average of 1136 units.

TABLE 1: No. of transfusions per month for 1 year showing (October) representative month PRBC= Packed red blood cell, FFP= Fresh frozen plasma, n=no. of units transfusion in Representative month =1151

Sr.No.	Month	Whole blood	PRBC	FFP	Platelets	Total no. of transfusions
1.	August '016	1118	274	386	24	1802
2.	September '016	848	254	160	33	1295
3.	October '016	630	289	214	18	1151(n)
4.	November '016	527	206	142	18	893
5.	December '016	743	304	212	16	1275
6.	January '017	628	215	191	11	1045
7.	February '017	540	305	204	15	1064
8.	March '017	463	371	247	10	1091
9.	April '017	398	480	231	10	1119
10.	May '017	455	309	226	4	994
11.	June '017	313	310	246	2	871
12.	July '017	688	122	220	8	1038
	TOTAL	7351	3439	2679	169	13638
	AVERAGE	613	287	223	14	1136

A month (whose no. of transfusions were closest to average transfusion of whole year) of October was considered as 'representative month' and chosen for detailed study [Table 1]. Monthly transfusion data indicated that, August month was with highest no. of transfusions (1802) whereas June with the lowest no. of transfusions (871). In October (representative month) 'n= 1151' no. of units transfused. The no. of requests for these 'n' units transfusion was from 605 patients, with many of these requests for more than one unit. 152 requests were for two units and 115 requests for more than two units [Figure 1]. With average of 1.90 units transfused per patient.

- Comparative usage of different products of blood in representative month–

In October month, whole blood was found to be the most common product ordered from various departments of the hospital accounting for 630 (55%) no. of units; followed by PRBC with 289 (25%) no. of units, FFP with 214 (19%) no. of units and Platelets with 18 (1%) no. of units [Figure 2]. Mostly whole blood units were requested as single unit requisitions but; few requests were for multiple units too. Whereas FFP was the blood product ordered maximally in multiple unit requests mainly by obstetrics wards for hereditary coagulopathy patients.

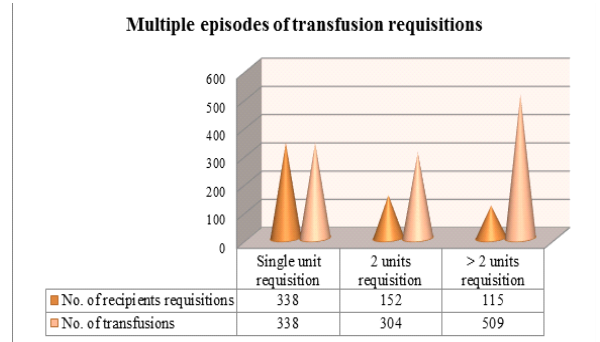


FIGURE 1: Multiple episodes of transfusion requisitions

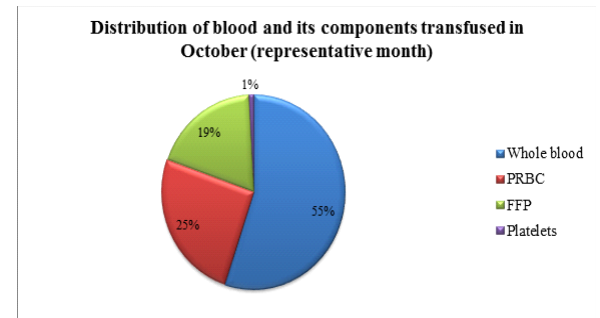


FIGURE 2: Distribution of blood and its components transfused in October month (representative month)

- Sex and age relationship with transfusion in representative month–

Out of total 605 recipients, 393 requests were by female patients and 212 by male patients. Female is to male (F: M) ratio was found to be '1.8: 1'. Females received more blood in child bearing age due to pregnancy related transfusion purposes. In our study, it is also found that except 0-1 yr. age group all other age groups recipients were with female predominance [Figure 3].

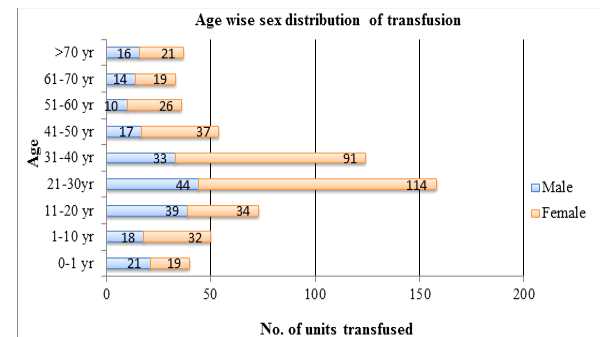


FIGURE 3: Age wise sex distribution of transfusion

- Distribution of utilization of blood products in clinical specialties –

In our study, it is found that, medicine and Intensive care unit (ICU) was the department which utilized maximum (31%) no. whole

blood units; followed by Obstetrics &Gynaecology departments with (28%). General surgery department was the third highest (22%) department in whole blood utilization. Blood components also shows similar distribution trend. Others category contains units given to private hospitals (if emergency is mentioned) and other specialties [Table 2].

Department	No. of Whole Blood units utilization	No. of Blood Components units utilization
Medicine/ICU	198	174
General Surgery	143	71
Obstetrics &Gynaecology	176	159
Orthopedics	35	15
Pediatrics	24	86
TB & Chest	8	6
ENT	13	0
Casualty	11	13
Others	35	3
Skin	0	4
TOTAL	630	521

**TABLE 2:** Distribution of blood and its components according to departments

- Clinical Indications for usage of blood products-

The most common indication for whole blood was Anemia associated with blood loss i.e. hypovolemia with maximum 33% of total utilization followed by malignancies (23.5%) like carcinoma of stomach, testicular carcinoma, breast lump, etc. Thalassemia major (26%) patients received maximum number of PRBC units .Coagulation disorders e.g. hemophilia (31%) and Acute Disseminated Intravascular Coagulation (DIC) (33%) was found to be most common indications for FFP requisitions. Thrombocytopenia (50%) was most common indication for platelets utilization followed by use in prophylaxis for surgery (22) and other causes (28%) [Table 3].

Clinical Indication	No. of FFP units utilization(Total 214)	Percentage(100%)
Acute DIC	71	33
Coagulation disorders e.g. hemophilia	67	31
Excessive hemorrhage	27	13
Volume depletion	30	14
Other causes	19	9
No. of PRBC units utilization (Total 289)		
Anemia (in Anti Natal Care)	68	23
Thalassemia major	77	26.5
CKD (Chronic kidney disease)	25	9
Sickle cell disease	29	10
RVD (Retro viral diseases)	22	8
Fracture	13	4
Prophylactic supplement during surgery	36	12.5
Other causes	19	7
No of whole blood units utilization (Total630)		
Anemia with acute hypovolemia	208	33
Fracture	113	18

Carcinoma	147	23.5
CKD (Chronic kidney disease)	60	9.5
Exchange transfusion	57	9
Other causes	45	7
No. of platelets units utilization (Total18)		
Thrombocytopenia	9	50
Prophylaxis of surgery	4	22
Other causes	5	28

**TABLE 3:** Indications of recipients of whole blood/ PRBC/ FFP/ Platelets

**DISCUSSION –**

In our study, the total no. of blood units utilized over last 1 yr was found to be 13638. Whole blood utilization (55%) was found to be more than its components utilized confirming studies of Joshi et al. and other earlier studies [11]. Among blood components highest utilized product was PRBC constituting 25% of total utilization in representative month similar result was obtained in the study by Kaur et al [15]. The next commonly ordered component was FFP (19%). The findings of the present study also correlated with the findings of a similar study by Singhal et al and Chalapathy et al [16, 17]. Female patients used more blood products than male patients, similar to the results published by many workers [22]. Averagely 1.9 units are transfused per recipient. Most no. of recipients were between age group of 21-30 yrs. Comparable results were obtained in many previous studies [18]. This may be due to the transfusion related to pregnancy in this age group being the maximum with 114 female recipients. Medicine and intensive care unit department utilized maximum whole blood (31%) and its components (33%), confirming studies like that of Alcantara et al [12] and Wallis et al [19] which reported more blood supply 66% to medicine wards compared to surgery wards utilizing 33%; followed by Obstetrics & Gynaecology department with 28% whole blood and 30% blood components utilization. In contrary, Venkatachalapathy and Subhashish et al [16] noted highest utilization of blood units by Obstetrics & Gynaecology department. Surgery was the third most blood products utilizing department. There is no uniformity in the distribution of blood and its components according to clinical specialties.

In the present, acute anemia with hypovolemia (33%) was the most common indication for transfusion of whole blood, confirming the results of earlier research [10]. Females with anemia in ANC found to be the most common PRBC recipients. Educating females for healthy diet habits to overcome anemia can help to decrease the demand of transfusion to some extent. Thalassemia major was most common indication for PRBC requisition. Similar to Charan Paul et al [20] Disseminated intravascular coagulation (DIC) was most common indication for FFP utilization and thrombocytopenia for Platelets utilization. With limited resources of blood, its inappropriate use leads to considerable impact on the health care cost, wastage of resources, depriving more needy patients and transfusion of infection with unnecessary allergic reactions leading to high mortality and morbidity rate in patients [10]. Hence in our study we tried to look into the transfusion practices in a tertiary care hospital, Akola.

Denial to issue blood and its components may lead to problems between clinicians and laboratory staff. Also medicolegal problems in patients care may arise. In various studies, [10] it is revealed that for sustained improvement in practice and prospective monitoring must be continued indefinitely.

**CONCLUSION –**

The study helped in assessment of the transfusion practices at our tertiary care center which is found to be encouraging. It helped to provide information about whole blood and blood component usage in a tertiary care hospital in one year. Current pattern of blood

distribution among different wards with different indications is ruled out.

This study also concludes that there is need to increase awareness and knowledge about blood donation in voluntary blood donors to increase blood resource. It is necessary to correct the balance for efficient succession. It also concludes the desire to increase in supply and decrease in demand which will make efficient transfusion services. Formulation of strict guidelines for the transfusion practices will improve the appropriate use of this limited resource.

This information is relevant for quality management of transfusion practice, cost analysis and for planning local and regional blood donation programs.

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