Pattern of Blood Component Utilization in Tertiary Care Hospital of Central Nepal

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ABSTRACT

Background

Blood component are essential part of patient and hospital for the safety and improvement of health care of patient. Proper transfusion is must to avoid the misuse, overuse and transfusion reaction.

Objective

The main objective of this study was to provide information regarding current utility of blood component in tertiary care hospital of central Nepal.

Method

In this descriptive study, details of blood components transfused were recorded that was correlated with patient age, sex, different hospital wards, clinical diagnosis and pretransfusion hemoglobin for the duration of 6 month

Result

Total blood component utilize were 1,267 for 539 patients. Whole blood was most utilized blood component that is followed by packed red blood cells. Demand of Blood product was highest in patient admitted to Intensive Care Unit (ICU). Bleeding patients due to obstetric and gastrointestinal complication got maximum transfusion of blood component. Majorly transfusion of Whole Blood and Packed red cell was done for pre transfusion hemoglobin level that falls in 7 to 10 gm/dl.

Conclusion

Analysis of blood component usage in any hospital with blood bank setup is very important to improve the blood utilization pattern for transfusion and maintaining blood stock to meet the future demand of blood component.

KEY WORDS

Blood bank, Blood component, Transfusion

INTRODUCTION

Blood and its component are the essential part of hospital for the healthcare of patient, majorly use in accident, emergency, surgeries, obstetric service and life threatening anemia. Transfusion of blood can save life and improve the quality of health. But sometime it may be potentially harmful and clinically risk for patient which may cause acute and delayed complication through transfusion reaction. Hence supply of safe blood and its component is must for patient care. However in developing countries, like Nepal utility of blood component in appropriate clinical indication is still lacking behind that is directly relating to blood transfusion complication.

Blood transfusion service is one of the priority programs of government of Nepal and supply of safe and adequate blood component is main goals of National blood program.[1] Currently, there are 86 blood transfusion service centers in 62 of the 75 districts in Nepal to fulfill the requirement of blood component.[2]

The current study assessed the utilization pattern of blood and blood components in Dhulikhel hospital, anindependent, not for profit, non-government tertiary care center with a small blood bank located at Kavre District of Nepal.

METHODS

This was a descriptive study conducted at the Blood Bank, Department of Pathology of Dhulikhel Hospital, Kathmandu University Hospital. Transfusion data was prospectively collected for a 6-month period, from August 2017 to January 2018.

Inclusion Criteria

All transfusion request, made by clinicians from different wards of Dhulikhel hospital were included irrespective of age and sex.

Exclusion Criteria

Proforma with incomplete and improperly filled details on blood transfusion were excluded.

Recorded data included details of patient age, gender, ward/unit where admitted, Components transfused [Whole blood (WB), Packed red blood cell (PRBC), Fresh frozen plasma (FFP), platelet rich plasma (PRP], pre-transfusion hemoglobin and diagnosis for transfusion. Data collected were recorded in Microsoft spreadsheet and later statistical analysis was carried out using SPSS version 16.0. This research protocol was approved by Institutional Review Committee of Kathmandu University School of Medical Sciences.

RESULTS

During the 6-months period, 707 transfusion requests for 1,267 blood products for 539 patients (113 patients had multiple requests/transfusion for different blood products) were reviewed. Multiple transfusion requests means blood transfusion a day or few days after his/her last transfusion episode (Once post transfusion hemoglobin level is checked). Out of total transfused blood component, 56.2% was whole blood (WB), of which 22.6% as fresh whole blood (FWB) and 26.8% was packed red blood cells (PRBC). Platelet rich plasma (PRP) and fresh frozen plasma (FFP) represented 7.5% and 9.5% of all transfused blood product respectively. (Table 1)

Table 1. Utilization of whole blood and blood components during a 6-months period in Dhulikhel Hospital.

Blood Component	Transfusion Request	Total Units (%)
Whole Blood	425	712 (56.2)
Fresh Whole Blood	98[1]	161 (22.6[1])
Packed Red Blood Cell	192	340(26.8)
Fresh Frozen Plasma	57	120 (9.5)
Platelet Rich Plasma	33	95 (7.5)
Total	707	1267

[1]percentage of whole blood; Total number of transfused patients was 539, and of these 116 patients had multiple requests/ transfusion for different blood products. Multiple Request/ transfusion refers to transfusion of blood products a day after or few days after his/her last transfusion episode.

Blood product usage was highest in the intensive care unit (17.4%), which was followed by obstetrics/gynecology ward (15.1%) and medicine ward (14%) while pediatric, hemodialysis, and ear, nose and throat (ENT) wards used less than 10% of all blood products. Besides different needs for platelet rich plasma and fresh frozen plasma, large differences existed between wards regarding the use of other products; except for the hemodialysis ward all other wards used whole blood as well as packed red cells, the highest use of whole blood was in the obstetrics/ gynecology, and in the NICU ward mostof whole blood transfusions were fresh whole blood. (Table 2)

The most frequent clinical indications for transfusion were bleeding 27.4% (predominantly upper gastrointestinal), trauma (15.6%) and anemia (13.8%). (Table 3) The majority of transfused patients were in the 21 to 40 years age group and females' predominance was seen in < 20 years and 21 to 40 years age group. (fig. 1)

Total numbers of transfused patient were 539 but, 41 out of 539 patients were transfused with blood component without red blood cell (PRP /FFP). Hence, 497 patients were transfused with blood component with red blood cells (WB / FWB / PRBC) with the aim to increase recipient hemoglobin level, where pre transfusion hemoglobin is indicated before transfusion. Among 497 patients, 107 patients got multiple

Table 2. Utilization of blood components in different wards during a 6-months period in Dhulikhel Hospital.

S.N	Department	Patient (%[1])	Whole Blood (%[1])	Fresh Whole Blood (%[2])	Packed Red Blood Cell (%[1])	Platelet Rich Plasma (%[1])	Fresh Frozen Plasma (%[1])	Total (%)
1	ICU	70 (13)	108 (15.2)	34 (31.5)	55 (16.2)	24 (25.3)	33 (27.5)	220 (17.4)
2	Obstetrics/ Gynecology	105 (19.5)	153 (21.5)	16 (10.4)	36 (10.6)	0 (0)	3 (2.5)	192 (15.1)
3	Medicine	68 (12.6)	60 (8.4)	6 (10)	60 (17.6)	25 (26.3)	32 (26.7)	177 (14)
4	Surgery	60 (11.1)	82 (11.5)	25 (30.0)	40 (11.8)	13 (13.7)	12 (10)	147 (11.6)
5	Orthopedic	63 (11.7)	93 (13.1)	5(5.4)	38 (11.2)	0 (0)	1 (0.8)	132 (10.4)
6	Emergency	50 (9.3)	81(11.4)	4 (4.9)	18 (5.3)	0 (0)	1 (0.8)	100 (7.9)
7	HDU	29 (5.4)	40(5.6)	4 (10)	35 (10.3)	4 (4.2)	16 (13.3)	95 (7.5)
8	NICU	43 (8)	53(7.4)	48 (90.5)	1 (0.3)	17 (17.9)	13 (10.9)	84 (6.6)
9	Pediatric	37 (6.8)	37(5.2)	19 (51.3)	10 (2.9)	12 (12.6)	9 (7.5)	68 (5.4)
10	Hemodialysis	9 (1.7)	0 (0)	0 (0)	45 (13.2)	0 (0)	0 (0)	45 (3.5)
11	ENT	5 (0.9)	5(0.7)	0 (0)	2 (0.6)	0 (0)	0 (0)	7 (0.6)

Data depicted as numbers (%); ICU, intensive care unit; NICU, neonatal ICU;ENT, Ear, nose and throat ; HDU, High dependency unit; [1]percentage of total products of column; [2]percentages of total whole blood

Table 3. Diagnosis and blood usage of the 267 transfused patient during a 6-months period in Dhulikhel Hospital.

S.N	Diagnosis	Number of Patient (%)	Male: Female	Whole Blood (%)	Fresh Whole Blood (%[2])	Packed Red Blood Cell (%)	Platelet Rich Plasma (%)	Fresh Frozen Plasma (%)	Total (%)
1	Bleeding	127 (23.6)	68:59	189 (26.5)	32 (16.9)	81 (23.8)	28(29.4)	49 (40.8)	347(27.4)
	- UGI	72 (56.7[1])	60:12	111 (58.7[1])	15(13.5[1])	61(75.3[1])	26(92.8[1])	22(44.9[1])	220(63.4[1])
	- Obstetric	35 (27.6[1])	0:35	63 (33.3[1])	10(15.9[1])	15(18.5[1])	0(0.0[1])	4(8.2[1])	82(23.6[1])
	- Coagulopathy	20 (15.7[1])	8:12	15 (7.9[1])	7(46.7[1])	5(6.2[1])	2(7.2[1])	23(46.9[1])	45 (13.0[1])
2	Trauma	84 (15.6)	53:31	133(18.7)	20(15.0)	62(18.2)	0(0.0)	3 (2.5)	198 (15.6)
3	Anemia	86 (15.9)	41:45	110 (15.5)	46(41.8)	57 (16.8)	2 (2.1)	6 (5.0)	175 (13.8)
4	Elective surgery	72 (13.4)	35:37	99 (13.9)	23(23.2)	41 (12.0)	4 (4.2)	21 (17.5)	165 (13)
5	Gynecological	79 (14.7)	0:79	113 (15.9)	10(8.8)	19 (5.6)	11(11.6)	3 (2.5)	146 (11.5)
6	Hepatic Disorder	24 (4.4)	20:4	19 (2.7)	2(10.5)	20 (5.9)	9 (9.5)	33 (27.5)	81 (6.4)
7	Renal Disorder	18 (3.3)	10:8	7 (1)	3(42.8)	54 (15.9)	0 (0.0)	1 (0.8)	62 (4.9)
8	Infection	20 (3.7)	11:9	24 (3.3)	20(83.3)	1 (0.3)	7 (7.4)	4 (3.4)	36 (2.8)
9	Thrombocytopenia	16 (3)	10:6	0 (0.0)	0(0)	0 (0.0)	31 (32.6)	0 (0.0)	31(2.5)
10	Malignancy	13 (2.4)	6:7	18 (2.5)	5(27.8)	5 (1.5)	3 (3.2)	0 (0.0)	26 (2.1)

[1]Percentage of bleeding; [2]Percentage of total whole Blood; UGI, Upper gastrointestinal intestinal;

Table 4. Pre-transfusion hemoglobin level in different transfusion episode

Hemoglobin (g/dl)	N=666 (%)
<7	256 (38.4)
7-10	269 (40.4)
>10	138 (20.7)
Unknown	3 (0.5)

Figure 1. Age groups of the 539 transfused patients during a 6-months period in Dhulikhel Hospital

transfusion requests for WB/ FWB /PRBC. Hence, total number of cases requiring pre-transfusion hemoglobin is 666. According to pre-transfusion hemoglobin (Hb) levels, 61.1% (N=666) of transfusions were not fully justified (Hb>10g/dL) or at least debatable (Hb 7 to 10 g/dL), while in 0.45% (N=666), pre-transfusion Hb value was unknown. (Table 4)
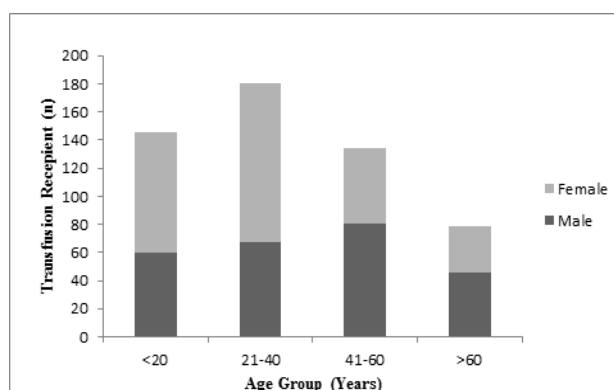
DISCUSSION

This study provides detailed information on the utilization of whole blood and blood components for patients in a tertiary care hospital of Nepal. Whole blood was the most frequently used and in the majority of patients the actual need for transfusion was debatable.

Transfusions should provide a therapeutic benefit while its inappropriate uses may cause adverse reactions in patients. It is the clinician's responsibility to properly indicate blood components while the blood bank is responsible for its safe supply. Good transfusion practice should regularly evaluate these components of the transfusion chain. As in other low-income countries, the use of blood components, instead of whole blood, in Nepal is lacking behind compared to high-income countries, mainly due to a lack of proper clinical utilities to prepare blood components and due to proper infrastructure to prepare blood component.

Fresh whole blood (FWB) transfusion provides RBC, Plasma and Platelet in 1:1:1 ratio. FWB is more concentrated and does not contain 3X volume of anticoagulant and additives. As it is not stored it does not have any storage artifacts. Hence, Fresh blood is used in patient with acute blood loss for replenishment of volume loss or trauma patient requiring massive transfusion and clinically significant coagulopathy. But it is not recommended by FDA (Food and Drug Administration) as there is more chance of clerical error in FWB requisition.[3] Hence Utility of FWB decision should be made with appropriate medical authority. FWB is recommended only when other blood products are unable to deliver at an acceptable rate or when specific component are unavailable. FWB stored more than 24 hours destroy all blood component and there is more chance of bacterial contamination. So blood store for more than 24 hour at Room temperature is not considered as FWB. Fresh whole blood is only indicated if all blood component have to transfuse to replenish volume with beneficial of introducing foreign antigen from only one donors that expose patient with lower immunological risk. Hence if the risk: benefit ratio is considered then FWB may be advantageous even though component therapy is available.[4,5]

Whole Blood is majorly indicated for blood loss during elective surgery, bleeding or gynecological cases. Anemia, Chronic anemia and decreased oxygen carrying capacity secondary to bleeding are major indication for transfusion of PRBC. Red cell transfusion is indicated to increase oxygen carrying capacity of blood by raising hemoglobin concentration of patient with acute of chronic anemia.[4,6] Similarly severe thrombocytopenia and a major surgery are indication of transfusing platelet while FFP is majorly transfused for patient with coagulopathy, hypovolemic and exchange transfusion.[4,7,8] In our study whole blood utilization is increased in number (56.2%) in compare to other blood component. Similar study done by Giriyan et al. showed 50.4% utilization of whole blood in total component utilized for transfusion.[9]

Upper gastrointestinal (UGI) bleeding and Obstetric hemorrhage are leading cause of morbidity and mortality. Obstetric hemorrhage still remains a major issue for safe motherhood in developing countries that account for 25-30% of maternal death while 8-14% of mortality is due to UGI bleeding.[10-11] In our study the first most common diagnosis for ordering blood component was bleeding disorder (27.4%, N=1, 267) that accounts UGI bleeding 63.4%, (N=347) Obstetric hemorrhage 23.6% (N=347) and coagulopathy bleeding 13.0% (N=347). Hence, blood transfusion is one of the major treatment modalities for replenishment of loss blood volume. One study showed that in 65.6% and 42.1% of sample who had vaginal and abdominal delivery, respectively, had postpartum hemorrhage (PPH) and thus received blood transfusion as a life saving measure.[12] The maternal mortality rate (MMR) of Nepal is 281 per 100,000 live births and 25% of which is contributed by PPH.[13] It was therefore not surprising that in our study, gynecological (11.5%) cases and obstetric complication (6.47%) were also significant indicator for blood transfusion. The second most common cause for transfusion is trauma cases (15.6%) for the replenishment of actual blood loss and such patient are majorly admitted to orthopedics ward while demand for malignancy (2.1%) is least in our institute. Study done by Gaur et al. found trauma (20.6%) being the most common cause of requiring blood transfusion that is followed by malignancy (17.3%).[14]

Patient with renal disorder are mainly from hemodialysis unit receiving blood transfusion (4.9%). In chronic kidney disease (CKD), red cell production decrease due to inadequate renal erythropoietin production that contributes for anemia. So transfusion is required to meet target Hemoglobin (Hb) level in dialysis patient.[15]

In our study, ICU department utilize maximum number of blood component (17.4%), that is followed by obstetrics and gynecology department (15.1%). Study done by Goncalez et al. also observed maximum utilization of blood component in ICU department (44%).[16] In this study 33.4% of transfused patient were in age group 21 to 40 years and 14.7% of transfused patient were > 60 years while 27% were below 20 years. Similar Observation were made by Brazilian study.[16] Female (52.9%) were transfused more in compare to male (47.1%) in our institute. In similar study done by Giriyan et al. also found majority of transfusion recipient were female (61.8%), followed by male (38.2%).[9]

Our data demonstrate a wide range of pre transfusion hemoglobin level within patient undergoing red blood cells transfusion. Pre transfusion Hemoglobin level in patient receiving red blood cells (WB, FWB or PRBC) falls in 7 to 10 g/dl (40.4%, N=666) that is followed by <7 g/dl (38.4%, N=666). This data suggest that clinician transfuse blood component whenever hemoglobin fall near moderate to severe anemia. Red cell transfusion indicated whenever hemoglobin falls < 7 g/dl in hospitalized hemodynamically stable adult patients and < 8 g/dl in patient undergoing

orthopedic surgery, cardiovascular surgery or with preexisting cardiovascular disease.[17] There is 20.7% (N=666) of transfusion done in patient with hemoglobin concentration > 10 g/dl in our institute which is not indicated in relation of hemoglobin concentration only and majorly such patients were form trauma or active bleeding cases.

Study cover data from only one small blood bank set up of tertiary care center and include data only for short duration of time.

CONCLUSION

The main purpose of this study was to provide information regarding current utility of blood component in tertiary care hospital of central Nepal. It demonstrates blood requisition practice that need to be improved for quality management of blood transfusion service and proper planning of future blood supply.

Periodic assessment of blood component utilization followed by educational session for clinician is recommended that will help in proper utilization of blood component. Every institute should develop blood transfusion guideline for effective utilization of blood component.

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