TRANSFUSION REQUIREMENT AND COMPLICATION IN CHILDREN ADMITTED IN A TERTIARY HOSPITAL

V. Booma[1], K. Palaniappan[2]

[1]Associate Professor, Department of Paediatrics, Coimbatore Medical College and Hospital, Coimbatore.
[2]Assistant Professor, Department of Paediatrics, Coimbatore Medical College and Hospital, Coimbatore.

ABSTRACT

BACKGROUND

Indications for transfusion include symptomatic anaemia, haemolytic anaemia, haematological malignancy, acute sickle cell crisis, and acute blood loss of more than 30 percent of blood volume, sepsis, etc. Fresh frozen plasma infusion can be used for reversal of anticoagulant effects. Platelet transfusion is indicated to prevent haemorrhage in patients with thrombocytopenia or platelet function defects. Cryoprecipitate is used in cases of hyperfibrinogenaemia, which most often occurs in the setting of massive haemorrhage or consumptive coagulopathy, factor VIII deficiency and Von Willebrand disease as an alternate to specific component therapy. Transfusion-related infections are less common than non-infectious complications. All non-infectious complications of transfusion are classified as non-infectious serious hazards of transfusion. Acute complications occur within minutes to 24 hours of the transfusion, whereas delayed complications may develop days, months or even years later. Blood transfusion can be a lifesaving procedure, but it has risks, including infectious and non-infectious complications. There is debate in the medical literature concerning the appropriate use of blood and blood products. Clinical trials investigating their use suggest that waiting to transfuse at lower haemoglobin levels is beneficial. This study will consider the indications for transfusion of blood and blood products, and will discuss common non-infectious complications associated with transfusion. Requirement of blood and blood component transfusions in children admitted in a tertiary care hospital and its related complications.

OBJECTIVE

To evaluate the pattern of transfusion requirement in children admitted in a tertiary care hospital and the frequency of transfusion related complications.

METHODS

Children of various age groups presenting with clinical profile like symptomatic anaemia, haemolytic anaemia, haematological malignancy, acute sickle cell crisis and acute blood loss of more than 30 percent of blood volume, patients with thrombocytopenia or platelet function defects, consumptive coagulopathy, factor VIII deficiency and Von Willebrand disease were taken. All patients who had transfusion related complications like non-infectious serious hazards, infectious complications of blood transfusions, acute transfusion reactions, allergic reactions, transfusion related lung injury, febrile non-haemolytic transfusion reactions, transfusion associated circulatory overload, delayed transfusion reactions will be assessed.

KEYWORDS

Blood Products, Transfusion Reactions.

HOW TO CITE THIS ARTICLE: Booma V, Palaniappan K. Transfusion requirement and complication in children admitted in a tertiary hospital. J. Evolution Med. Dent. Sci. 2016;5(36):2099-2105, DOI: 10.14260/jemds/2016/493

INTRODUCTION

Indications for transfusion include symptomatic anaemia, haemolytic anaemia, haematological malignancy, acute sickle cell crisis and acute blood loss of more than 30 percent of blood volume, sepsis, etc. Fresh frozen plasma infusion can be used for reversal of anticoagulant effects. Platelet transfusion is indicated to prevent haemorrhage in patients with thrombocytopenia or platelet function defects. Cryoprecipitate is used in cases of hypofibrinogenaemia, which most often occurs in the setting of massive haemorrhage or consumptive coagulopathy, factor VIII deficiency and Von Willebrand disease as an alternate to specific component therapy.

Financial or Other, Competing Interest: None.
Submission 18-03-2016, Peer Review 14-04-2016,
Acceptance 20-04-2016, Published 04-05-2016.
Corresponding Author:
Dr. V. Booma,
#46, 50 Feet, Road,
Krishnaswamy Nagar,
Ramanathapuram,
Coimbatore-641045.
E-mail: boomavmohan@yahoo.co.in
DOI: 10.14260/jemds/2016/493

Transfusion-related infections are less common than non-infectious complications. All non-infectious complications of transfusion are classified as non-infectious serious hazards of transfusion. Acute complications occur within minutes to 24 hours of the transfusion, whereas delayed complications may develop days, months or even years later.

Blood transfusion can be a lifesaving procedure, but it has risks including infectious and non-infectious complications. There is debate in the medical literature concerning the appropriate use of blood and blood products. Clinical trials investigating their use suggest that waiting to transfuse at lower haemoglobin levels is beneficial.[1,2] The study will consider the indications for transfusion of blood and blood products and will discuss common non-infectious complications associated with transfusion.

AIMS AND OBJECTIVES

Primary Objective: To evaluate the pattern of transfusion requirement in children admitted in a tertiary care hospital.

Secondary Objective: To find out the frequency of transfusion related complications.

METHODOLOGY

Study Design: Descriptive study.

Study Place: Department of Paediatrics, Coimbatore Medical College and Hospital (CMCH).

Study Period: June 2014 – May 2015.

Study Population: Includes children admitted in PICU, Department of Paediatrics, and Coimbatore Medical College Hospital, who satisfy the inclusion criteria.

Inclusion Criteria: Children requiring transfusion of blood and blood component.

Exclusion Criteria: Children who died before transfusion.

Sample Size: 1219 Children who required transfusion therapy among the 2837 total admissions in PICU.

Sampling Technique: All children fulfilling inclusion criteria were included.

DEFINITIONS

PRBC

Packed Red Blood Cells (RBCs) are prepared from whole blood by removing approximately 250 mL of plasma. One unit of packed RBCs should increase levels of haemoglobin by 1 g per dL (10 g per L) and haematocrit by 3 percent.[3]

FFP

FFP is prepared by separating plasma from whole blood and freezed in–22 degrees and stored for max of one year. Thawed plasma that may be stored at 33.8 to 42.8°F (1 to 6°C) for up to five days. Plasma contains all of the coagulation factors. Fresh frozen plasma infusion can be used for reversal of anticoagulant effects. Thawed plasma has lower levels of factors V and VIII and is not indicated in patients with consumption coagulopathy (Diffuse intravascular coagulation).[3]

Platelets

One unit of apheresis platelets should increase the platelet count in adults by 30 to 60×10^3 per µL (30 to 60×10^4 per L).[3] One apheresis platelet collection is equivalent to six pooled random donor platelet concentrates.[5] Here we use random donor platelets concentrate, so it roughly increases platelet concentration by 10,000/cml of blood in 50 kg adult.

Cryoprecipitate

Cryoprecipitate is prepared by thawing fresh frozen plasma and collecting the precipitate. Cryoprecipitate contains high concentrations of factor VIII and fibrinogen. Cryoprecipitate is used in cases of hypofibrinogenaemia, which most often occurs in the setting of massive hemorrhage or consumptive coagulopathy. Indications for cryoprecipitate transfusion are, hypofibrinogenaemia, haemophilia A, VWF, burns, sepsis, etc. Each unit will raise the fibrinogen level by 5 to 10 mg per dL (0.15 to 0.29 µmol per L), with the goal of maintaining a fibrinogen level of at least 100 mg per dL (2.94 µmol per L).[6,7] The usual dose in adults is 10 units of pooled cryoprecipitate.

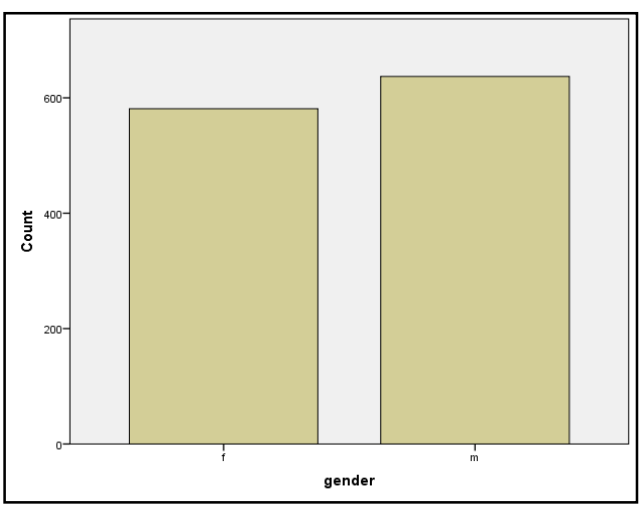
Manoeuvre

Children of various age groups presenting with clinical profile like symptomatic anaemia, haemolytic anaemia, haematological malignancy, acute sickle cell crisis and acute blood loss of more than 30 percent of blood volume, patients with thrombocytopenia or platelet function defects, consumptive coagulopathy, factor VIII deficiency and Von Willebrand disease were taken from the total admission to PICU during the study period.

The clinical status, HB level, blood grouping were assessed after obtaining informed consent from the parents. All the cases who required transfusion therapy were given one or more components accordingly. The acute transfusion reactions, like non-infectious serious hazards, infectious complications of blood transfusions, acute transfusion reactions, allergic reactions, transfusion related lung injury, febrile non haemolytic transfusion reactions, transfusion associated circulatory overload.[8,9] delayed transfusion reactions were noted and managed appropriately. They were followed up for 6 months for delayed transfusion reactions like iron overload and infections.

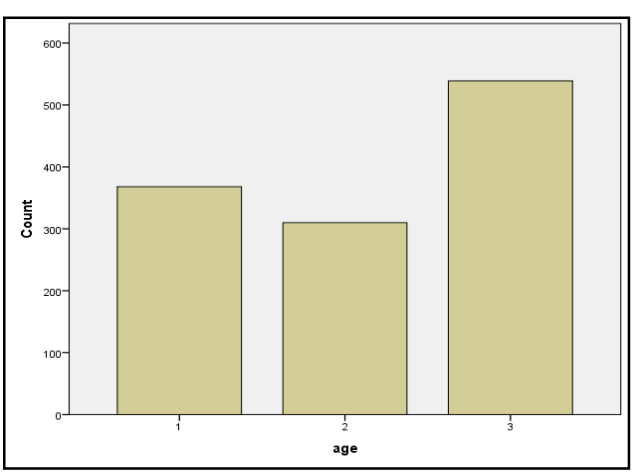
RESULTS

Male and Female Ratio



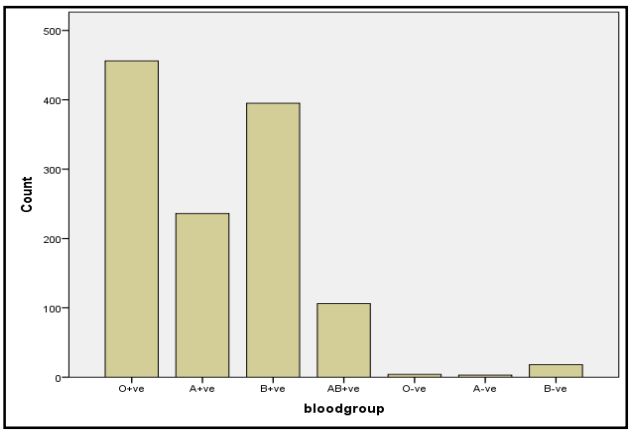
f-female: 582(48%), m-male: 637(52%)

The gender distribution showed a little higher incidence in male (52.22%) than females (47.78%) probably due to haemophilia requiring transfusion therapy is common among males.



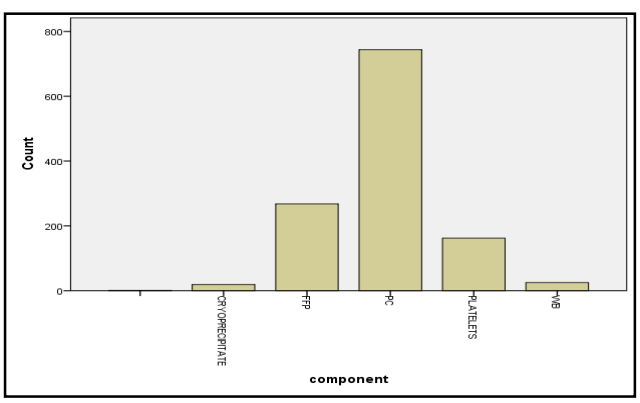
1-Below one year: 368 (31%), 2-1 to 5 year: 310 (25%), 3-Above 5 year: 541 (44%)

Children less than 1 yr. crossed neonatal period was 368. The rest 851 subjects were above 1 year of age probably Thalassaemia was the major group requiring transfusion.



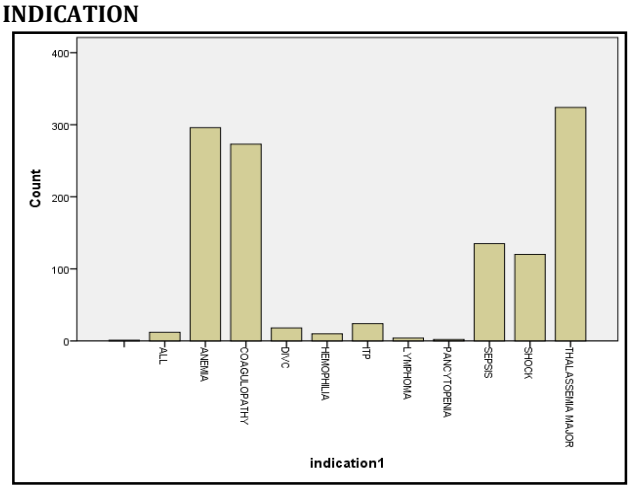
O+ve: 456 (37%), A+ve : 236 (19%), B+ve :394 (32%), AB+ve :106 (9%), O-ve :4 (0.58%), A-ve :3 (0.42%), B-ve :20 (2%)

The most common blood go %) up required in our study was O+(37.3%) followed by B+(32.5%), A+(19.3%), AB+(8.6%). Among the negative blood groups B-ve was 1.6%. Bombay group was not used for transfusion in our study group.



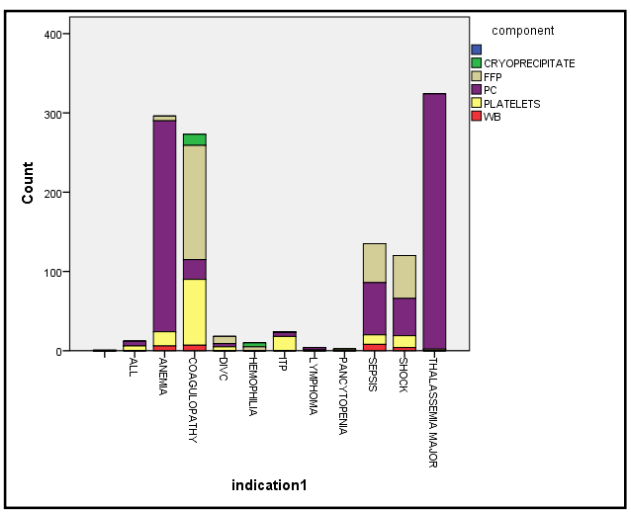
CRYOPRECIPITATE: 20 (2%), FFP: 268 (22%), PC: 743 (61%) PLATELETS: 162 (13%), WB: 26 (2%)

INDICATION



ALL: 1%
ANAEMIA: 24.3%
COAGULOPATHY: 22.4%
DIVC: 1.5%
HEMOPHILA: 0.8%
ITP: 2%
LYMPHOMA: 0.3%
ANCYTOPENIA: 0.2%
SEPSIS: 11.1%
SHOCK: 9.8%
THALASSEMIA MAJOR: 26.6%

Thalassaemia is a major haematological problem requiring packed cell transfusion followed by shock and anaemia of various aetiologies. Coagulopathies, shock required FFP transfusion, platelet transfusion was indicated in platelet disorders, haemorrhagic fevers and cryoprecipitate was used in the management of haemophilia. Whole blood was again used in shock.



We use PRBC for indications like anaemia, includes nutritional, thalassemia, other haemolytic anaemias, blood loss in haemophilia, ITP, IC bleed, sepsis, DIVC, shock, bone marrow aplasia/suppression in pancytopenias, ALL and lymphomas. Whole blood is rarely used only in shock for volume replacement, florid sepsis. Platelet transfusion here we use single platelets unit from multiple donors. We did not use aparetic units. Common indications are dengue, shock, sepsis, DIVC, large volume PRBC transfusions, ITP, ALL, certain coagulopathies.

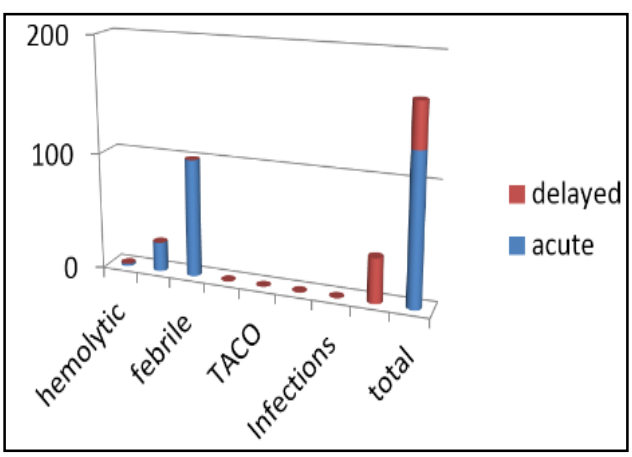
FFP used in children for correction of coagulation abnormalities in coagulopathies like haemophilia, VWD, shock, DIVC, sepsis. Very rarely used for volume replacement as we use synthetic colloids for volume replacement. Cryoprecipitate specifically used for haemophilia when factor VIII was not available and in VWD.

INDICATION 2					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	.1	.1	.1
	Anaemia	1	.1	.1	.2
	Acute CNS infection	4	.3	.3	.5
	Acute encephalopathy	4	.3	.3	.8
	Acute leukaemia	4	.3	.3	1.1
	Acute liver failure	13	1.1	1.1	2.2
	ADD with compensated shock	1	.1	.1	2.3
	ADD with dehydration	8	.7	.7	3.0
	ADD with failure to thrive	2	.2	.2	3.1
	ADD with sepsis	1	.1	.1	3.2
	ADD with shock	1	.1	.1	3.3
	ADD with some dehydration	1	.1	.1	3.4
	ADEM	5	.4	.4	3.8
	AGN	1	.1	.1	3.9
	ALL	18	1.5	1.5	5.3
	Anaemia	24	2.0	2.0	7.3
	Anaemia	1	.1	.1	7.4
	Anaemia for evaluation	9	.7	.7	8.1
	Anaemia with failure	4	.3	.3	8.4
	Anaemia with hepatosplenomegaly	2	.2	.2	8.6
	Anaemia with septicaemia	2	.2	.2	8.8
	Anaemia with shock	1	.1	.1	8.9
	Anaemia with splenomegaly	5	.4	.4	9.3
	Anaemia with thrombocytopenia	6	.5	.5	9.8
	Aplastic Anaemia	8	.7	.7	10.4
	ARDS	4	.3	.3	10.7
	ARF	6	.5	.5	11.2
	ARF on PD	2	.2	.2	11.4
	ARF with anaemia	2	.2	.2	11.6
	ARF with DIC	8	.7	.7	12.2
	Aspiration sepsis	1	.1	.1	12.3
	Autoimmune haemolytic anaemia	2	.2	.2	12.5
	Bronchiolitis	3	.2	.2	12.7
	Bronchopneumonia	26	2.1	2.1	14.8
	CCF with anaemia	2	.2	.2	15.0
	CCH with cardiogenic shock	2	.2	.2	15.2
	CHD	1	.1	.1	15.3
	CHD with CCF with LRI	2	.2	.2	15.4
	Cholestasis syndrome	1	.1	.1	15.5
	Cognitive disorder with seizure	2	.2	.2	15.7
	Compensated shock	2	.2	.2	15.8
	Congenital heart disease	1	.1	.1	15.9
	Congenital lobar emphysema	4	.3	.3	16.2
	congenital neonatal hepatitis	2	.2	.2	16.4
	CRF	1	.1	.1	16.5
	Dengue	7	.6	.6	17.1
	Dengue fever	8	.7	.7	17.7
	Dengue haemorrhagic fever	2	.2	.2	17.9
	Dengue shock syndrome	3	.2	.2	18.1
	Dengue with compensated shock	6	.5	.5	18.6
	DIC	2	.2	.2	18.8
	DIVC	4	.3	.3	19.1
	DKA	2	.2	.2	19.3
	DKA with shock	14	1.1	1.1	20.4
	EHPO	4	.3	.3	20.8
	Encephalopathy	4	.3	.3	21.1
	Failure to thrive	8	.7	.7	21.7
	Febrile seizures	2	.2	.2	21.9
	Fever for evaluation	2	.2	.2	22.1
	Fever with sepsis	2	.2	.2	22.2
	Fever with thrombocytopenia	6	.5	.5	22.7
	GBS	1	.1	.1	22.8

	GBS with shock	2	.2	.2	23.0
	HDN	6	.5	.5	23.5
	Haematological malignancy	2	.2	.2	23.6
	Haematemesis	18	1.5	1.5	25.1
	Haemolytic anaemia	11	.9	.9	26.0
	Haemolytic anaemia with failure	2	.2	.2	26.2
	Haemolytic anaemia	2	.2	.2	26.3
	Haemolytic uremic syndrome	50	4.1	4.1	30.4
	Haemophilia A	25	2.1	2.1	32.5
	Hepatic encephalopathy	6	.5	.5	33.0
	Hodgkin's lymphoma	2	.2	.2	33.1
	Hydrocephalus	6	.5	.5	33.6
	Hypertensive encephalopathy	1	.1	.1	33.7
	IBD	1	.1	.1	33.8
	ICH	30	2.5	2.5	36.3
	Inborn error of metabolism	1	.1	.1	36.3
	Infective endocarditis	6	.5	.5	36.8
	Ipp	1	.1	.1	36.9
	Iron deficiency anaemia	1	.1	.1	37.0
	ITP	18	1.5	1.5	38.5
	Langerhans cell histiocytosis	6	.5	.5	39.0
	Late HDN	3	.2	.2	39.2
	Late HDN/ ICH	16	1.3	1.3	40.5
	Late onset sepsis	8	.7	.7	41.2
	Leukaemia	9	.7	.7	41.9
	LHDN	12	1.0	1.0	42.9
	Lymphoma	4	.3	.3	43.2
	Lymphoma with LRI	2	.2	.2	43.4
	Lymphoproliferative malignancy	1	.1	.1	43.5
	Malaria	2	.2	.2	43.6
	Massive pleural effusion	2	.2	.2	43.8
	Meningitis	1	.1	.1	43.9
	Meningitis	1	.1	.1	44.0
	Myocarditis with shock	4	.3	.3	44.3
	Near fatal asthma	5	.4	.4	44.7
	Neonatal cholestasis syndrome	14	1.1	1.1	45.9
	Neurocutaneous syndrome	1	.1	.1	45.9
	Neurocutaneous syndrome c sepsis	1	.1	.1	46.0
	Neurogenic shock	6	.5	.5	46.5
	Obstructive hydrocephalus	6	.5	.5	47.0
	Pancytopenia	8	.7	.7	47.7
	Paraquat poisoning	3	.2	.2	47.9
	PEM with anaemia	1	.1	.1	48.0
	PEM with bronchiopneumonia	2	.2	.2	48.2
	PLHA with severe anaemia	2	.2	.2	48.3
	Pneumonia	1	.1	.1	48.4
	Pneumonia with sepsis	6	.5	.5	48.9
	Pulmonary Koch disease with anaemia	2	.2	.2	49.1
	Renal failure	1	.1	.1	49.1
	Respiratory distress	1	.1	.1	49.2
	Rta	2	.2	.2	49.4
	Seizure disorder	11	.9	.9	50.3
	Sepsis	23	1.9	1.9	52.2
	Septic shock	21	1.7	1.7	53.9
	Septicaemia	28	2.3	2.3	56.2
	Severe acute malnutrition	2	.2	.2	56.4
	Severe anaemia	10	.8	.8	57.2
	Severe anaemia	2	.2	.2	57.3
	Severe anaemia for evaluation	2	.2	.2	57.5
	Severe anaemia with failure	2	.2	.2	57.7
	Severe malnutrition	6	.5	.5	58.2
	Shock	6	.5	.5	58.7
	Sickle cell anaemia	17	1.4	1.4	60.0
	SLE	2	.2	.2	60.2

	Snake bite	28	2.3	2.3	62.5
	Spastic cerebral palsy	1	.1	.1	62.6
	Spastic cerebral palsy C Pneumonia	1	.1	.1	62.7
	Status epilepticus with shock	13	1.1	1.1	63.7
	TB meningitis	8	.7	.7	64.4
	Thalassemia major	322	26.4	26.4	90.8
	Thalassemia with shock	2	.2	.2	91.0
	Thrombocytopenia	10	.8	.8	91.8
	Vhf	61	5.0	5.0	96.8
	VHF in shock	1	.1	.1	96.9
	VHF with compensated shock	1	.1	.1	97.0
	Viral encephalitis	6	.5	.5	97.5
	Viral encephalitis with shock	14	1.1	1.1	98.6
	Viral exanthematous fever	2	.2	.2	98.8
	Viral haemorrhagic fever	2	.2	.2	98.9
	Von-Willebrand's disease	1	.1	.1	99.0
	Von-Willebrand's disease	4	.3	.3	99.3
	VSD	1	.1	.1	99.4
	VSD with failure	5	.4	.4	99.8
	Wilson's disease	1	.1	.1	99.9
	With sepsis	1	.1	.1	100.0
	Total	**1219**	**100.0**	**100.0**	

Adverse Reactions



	Acute	Delayed
Haemolytic	2	0
Allergic	25	0
Febrile	100	0
TRALI	0	0
TACO	0	0
Ta – GVHD	0	0
Infections	0	0
Iron overload	0	38
Total	**127**	**38**

Out of 1219 cases, acute adverse reactions seen in 127 cases and delayed reactions seen in 38 cases. Acute adverse reactions noted in our study are non-allergic febrile reaction (100), allergic (25), haemolytic reaction due to minor incompatibility (2). Iron over load as a delayed and expected complication was seen in 38 transfused thalassemic children. TACO, TRALI, TA- GVHD and infections were not noted in any of the transfused subjects.

DISCUSSION

The gender distribution did not show any statistically significant difference. Most of the transfusions are in infants - below one year: 368 (31%) mainly attributed to the indications like sepsis, shock, DIVC, etc. Transfusions after infancy is usually for haematological conditions like thalassemias and haemophilias.

Pattern of blood group reflects the distribution of blood group in this part of our country, that if O positive, B positive, A positive and AB positive then negative groups in that order. Majority of the component used is PRBC 743 (61%) as expected. Mostly the collected blood is processed and separated using component separating machines into FFP, platelets, suspended RBCs before storage. We do not generally keep whole blood at all. We use whole blood for selective indications like exchange transfusion, intraoperative loss, cardio thoracic surgeries, florid sepsis, haemorrhagic shock. This comes only 2% (26) of the total transfusions. We do get adverse reactions. But life-threatening reactions are rare.

Only 2 cases had haemolytic transfusion reactions and death reported after transfusions is none. Infections also not noted in our study because of very good screening tests protocol and quality control policy. Non allergic febrile and allergic reactions were transient needed supportive therapy and observation only. We did not encounter TRALI, TACO, TA-GVHD in our study. Thalassemia is the single most common indication for transfusion therapy. In our study it is 26.6% and this is due to the high prevalence of thalassemia in our region. All are planned transfusions with fewer reactions. We encounter problem of iron over load and all receive iron chelation as per the recommendation.

CONCLUSION

- Mostly, we use components than whole blood (98%, 2%).
- Commonest component is PRBC.
- Single most common indication is Thalassemia.
- Serious adverse reactions are rare.
- Iron over load is common delayed complication in thalassemic recipients.

REFERENCES

1. Hébert PC, Wells G, BLAJCHMAN MA, et al. A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care. Transfusion requirements in critical care investigators, canadian critical care trials group. N Engl J Med 1999;340(6):409–17.
2. Lacroix J, Hébert PC, Hutchison JS, et al. Transfusion strategies for patients in paediatric intensive care units. N Engl J Med 2007;356(16):1609–19.
3. King KE, Bandarenko N. Blood transfusion therapy: a physician's handbook. Bethesda, Md: American Association of Blood Banks 2008;9th edn:236.
4. Lichtiger B, Perry-Thornton E. Hemolytic transfusion reactions in oncology patients: experience in a large cancer center. J Clin Oncol 1984;2(5):438-42.
5. Slichter SJ. Platelet transfusion therapy. Haematol Oncol Clin North Am 2007;21(4):697–729.
6. Poterjoy BS, Josephson CD. Platelets, frozen plasma, and cryoprecipitate: what is the clinical evidence for their use in the neonatal intensive care unit? Semin Perinatol 2009;33(1):66-74.
7. Callum JL, Karkouti K, Lin Y. Cryoprecipitate: the current state of knowledge. Transfus Med Rev 2009;23(3):177-88.
8. Hendrickson JE, Hillyer CD. Noninfectious serious hazards of transfusion. Anesth Analg 2009;108(3):759-69.
9. Vamvakas EC, Blajchman MA. Transfusion-related mortality: the ongoing risks of allogeneic blood transfusion and the available strategies for their prevention. Blood 2009;113(15):3406–17.