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BLOOD PRODUCT TRANSFUSION PRACTICES IN A TERTIARY CARE NEONATAL INTENSIVE CARE UNIT

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ABSTRACT Neonates receiving intensive care often receive transfusion of blood products. Preterm neonates comprise the most heavily transfused group of patients, and about 85% of extremely low birth weight newborns receive a transfusion by the end of their hospital stay.[1,2]

Blood components used in modern day practice include blood components such as red blood cell components, platelet concentrates, and plasma rather than whole blood. Transfusion of blood products in the vulnerable neonates need to be strictly regulated to avoid the inherent risks of transfusion such as transmission of infections.[3]

The aim of the present study was to obtain information regarding the relationship of blood product transfusion in neonates admitted to Neonatal Intensive Care Unit with clinical outcomes and to evaluate transfusion practices in neonatal centre of a tertiary care centre. The most common indication for red cell transfusion was low haemoglobin.

Transfusion of red cells has significant effect on laboratory parameters as compared to clinical parameters such as weight gain, episodes of apnoea and respiratory support.

KEYWORDS : Blood Component Therapy, Neonatal Intensive Care Unit, Clinical Outcome

INTRODUCTION:

Transfusion practice in neonates differs from that in adults. During the transition from a foetus to a neonate, several physiologic changes occur, involving blood volume, haematologic parameters and other organ systems in the neonate. In preterm neonates, there is lack of development and adaptation to extra-uterine life that leads to diminished capacity of neonate to produce red cells, platelets and neutrophils, especially during periods of stress. The blood volume in a full term new born is approximately 85 ml/kg, while that in a preterm new born is about 100 ml/kg and that in an adult is about 70 ml/kg [4,5]. The small blood volume and immature organ systems in the neonate necessitate special approaches in neonatal transfusion practice.

Physiological causes for the anaemia of prematurity include

(1) Diminished erythropoietin secretion
(2) Decrease in survival of foetal red cells
(3) Increasing blood volume due to rapid growth.

This is usually self-limited and well tolerated; however in certain situations like blood loss due to repeated phlebotomy, sepsis and severe anaemia, intervention may be required in the form of transfusion of blood and blood components .[4]

The most commonly used blood components in neonates are red blood cells. Red cell transfusion could be exchange transfusion for hyperbilirubinemia, or top-up transfusion for correction of anaemia. Red cell transfusions are given to maintain the haematocrit (Hct) at a level judged best for the clinical condition of the infant [6]. Several guidelines have been published over the last two decades for red blood cell transfusion in neonates [7, 8, 9]. Most of the recommendations are based on clinical experience rather than on evidence. Although clinical trials have been conducted in the past, they are not mutually supportive and questions still remain. An unresolved controversy is the use of restrictive guidelines (low pretransfusion Hct) versus liberal guidelines (high pre-transfusion Hct) for red cell transfusions [7,8].

In a study on blood component therapy by Avneet et al in 2015; sepsis was the most common reason for blood product transfusions. Various blood components include packed red blood cells (PRBC), fresh frozen plasma (FFP), and platelet concentrate (PC). The common reasons in the neonatal intensive care unit for which various blood components are transfused include thrombocytopenia, anemia, bleeding, various surgical conditions, exchange transfusion for hyperbilirubinemia, etc.

A recent international survey of transfusion practices for extremely premature infants showed that factors considered “very important” regarding the need to administer blood transfusions included degree of oxygen requirement (44.7%of respondents) and need for respiratory support (44.1%of respondents).[11]

MATERIALS AND METHODS:

This retrospective study was conducted by Department of Pediatrics in a tertiary care Neonatal Intensive Care Unit over a period of 8 months from January 2021 to August 2021. Data was collected from Medical Record section and details of blood component transfusion were obtained from neonatal case sheets of neonates admitted in Neonatal Intensive Care Unit over an 8 months duration. The data was segregated using SPSS software and monthly analysis and classification according to blood component used in neonates done.

INCLUSION CRITERIA

Gestation at birth > 26 completed weeks.
Birth weight > 700 g.
Duration of stay in NICU > 6 h
Exclusion Criteria:
Major Congenital malformation

Clinical Parameters:

All neonates receiving red cell transfusions were assessed for general clinical parameters i.e. gestational age (GA) at birth and birth weight. In addition, Apgar score at 1 and 5 min; and growth status whether appropriate for gestational age, low for gestational age or large for gestational age were assessed.

Neonates in need of red cell transfusion were also assessed for indication for admission whether prematurity, respiratory distress, jaundice or suspected sepsis. Morbidities like respiratory distress syndrome, intraventricular haemorrhage, bronchopulmonary dysplasia and retinopathy of prematurity were also noted.

The other observations noted were requirement of Continuous positive airway pressure (CPAP) and/or Ventilation and number of exchange transfusions. Adverse reactions to the transfusion, whether febrile, allergic, circulatory overload or other types of reaction were also noted. General parameters of neonates were assessed for outcome of admission whether discharged, referred to other hospital or died.

RESULTS:

During the study period 1363 neonates were admitted in NICU. 32 neonates were excluded as they were congenitally malformed. Out of.1363 admitted neonates 723 neonates (53 %) received blood and blood component transfusions. Only 92 (6.7 %) neonates received PRBC transfusions.

The Apgar score for neonates ranged from 2–9 at 1 min and 5–9 at 5 min. The neonates, who were transfused, belonged to age group ranged

from 27 to 41 weeks of GA. The mean age was 32.4 ± 3.4 weeks of GA. Neonates with GA less than 37 weeks were 955 who received total 755 transfusions and those with GA more than 37 weeks was 408, who received 205 transfusions.

The birth weight of neonates who received PRBC transfusion ranged from 750 g to 2300 g with mean birth weight was 1374 ± 390.9 g. Neonates with birth weight less than 1500 g were 15, who received total 19 transfusions while those with birth weight more than 1500 g were 5, who received total 6 transfusions. Neonates who were premature and weight less than 1500 g required more number of transfusions (p\0.05).

Table 1: Indications for PRBC Transfusion:

1. Anemia
2. Sepsis with DIC
3. Neonatal Shock
4. Neonatal Hyperbilirubinemia

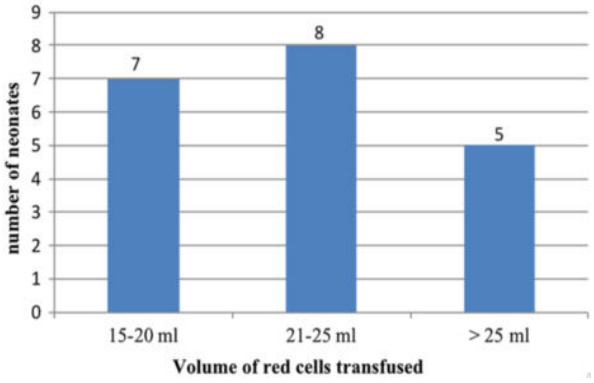

Figure 1. Distribution of Volume of Red Cell Transfusion

Table 2: Month-wise distribution of Blood Component Therapy in NICU

MONTH	FFP	RDP	PCV	WHOLE BLOOD	TOTAL
JANUARY	7	17	6	8	38
FEBRUARY	36	45	20	20	121
MARCH	22	17	7	33	79
APRIL	9	12	9	27	57
MAY	13	29	7	26	75
JUNE	15	24	20	33	92
JULY	18	33	16	36	103
AUGUST	35	69	7	47	158
TOTAL	155	246	92	230	723

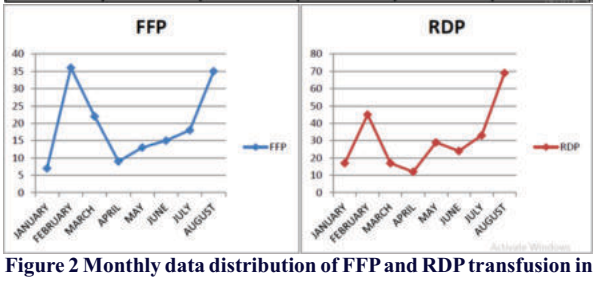

Figure 2 Monthly data distribution of FFP and RDP transfusion in NICU

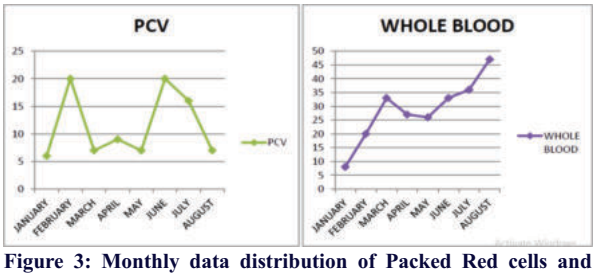

Figure 3: Monthly data distribution of Packed Red cells and Whole Blood Transfusions.

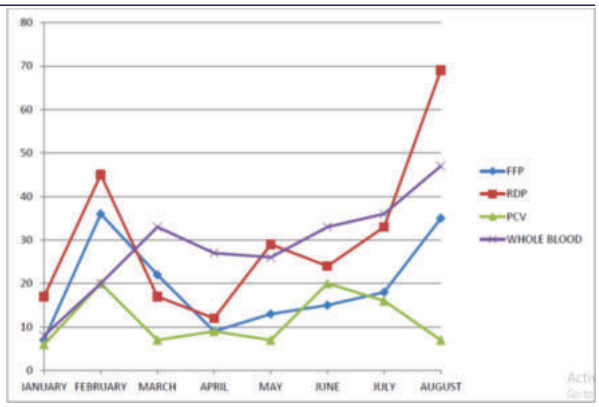

Figure 4: Comparative Distribution of Blood Component Therapy

Table 2: Transfusion of PRBC based upon various Blood Groups

BLOOD GROUP	O			A			B			AB			TOTAL
MONTH	TOTAL	POS	NEG	TOTAL	POS	NEG	TOTAL	POS	NEG	TOTAL	POS	NEG	
JANUARY	8	7	1	5	5		25	25		0			38
FEBRUARY	42	39	3	29	29		30	30		20	19	1	121
MARCH	36	36		22	22		15	15		6	6		79
APRIL	18	16	2	10	10		27	27		2	2		57
MAY	28	22	6	15	15		28	28		4	4		75
JUNE	43	42	1	11	11		24	24		14	14		92
JULY	26	26		20	20		30	28	2	27	27		103
AUGUST	52	51	1	30	27	3	42	41	1	34	33	1	158
TOTAL	253			142			221			107			723

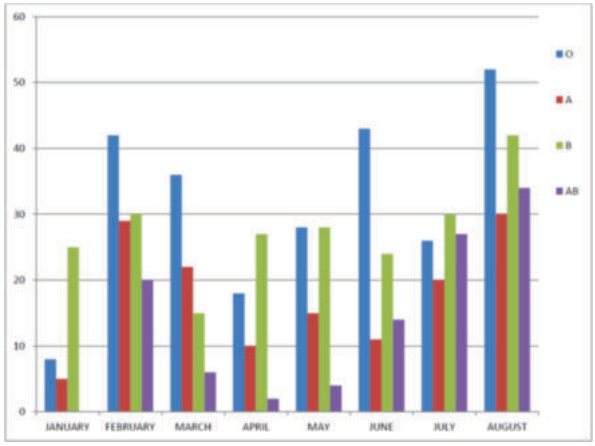

Figure 5: Month-wise distribution of Different Blood Group Products used in our Study

DISCUSSION:

During initial weeks of infancy, red cell transfusions are frequently indicated to correct anaemia which thereby improves oxygen support and cardio-respiratory status. In our study, 21.7% (61/289) of patients received transfusion of either single component or more than one component. A total of 32.7% (20/61) neonates received PRBC transfusions and 75% received 15 ml to 25 ml of PRBC. The incidence of transfusions as reported by Portugal et al. [12] was 20.9%. The incidence of transfusions found in our study was very low as compared to 55.9% in Santos et al.; 85% and 90% in studies by Fabres et al. and Valieva et al., respectively [13,14,15]. The difference could be explained by the fact that their study included only very low birth weight infants.

When we examined the relationship between transfusions and weight gain, the average weight gain per week was not significant between pre- and post-transfusion period. There was also no difference in the mean weight gain per day between the transfused and non-transfused groups. Stockmann et al. [9]reported improvement in weight gain after transfusion and were greatest when the pre transfusion Hb was less than 7.5 g/dl. Improvements in weight gain were associated with a decrease in metabolic rates as determined by declines in oxygen consumption while Valieva et al. [15] did not report average weight gain per week being significant after transfusion.

FiO2 significantly changed after transfusion in our study (p\0.05). No

significant change in FiO2 was reported in both liberal (32%) and restrictive (31%) group after transfusion by Fredrickson et al. [16]

The transfusions were administered to neonates with no reported occurrences of adverse reactions This may be attributed to chance only and may also be due to the small study population.

The present study has its own limitations. The study had a very small sample size and various confounding factors. In our NICU, restrictive policy was used for red cell transfusion in most of neonates, so we could not compare the mean number of transfusions per infant with liberal group. The study design didn't have any neonatal follow up protocol as a result of which we failed to obtain the long-term adverse effects of neonatal RBC transfusions.

Thus, the results from this study give additional insight on transfusion practices of neonates admitted in
NICU. However, still further studies are required to have better insight of the long term effects of PRBC transfusions on neonates.

Conflict of Interest: The authors declare that there is no conflict of interest.

Ethical Approval Institutional. All data collection and analysis were in accordance with ethical standards of the institution committee and comparable ethical standards.

Informed Consent was obtained from all participants' parents before blood component transfusion.

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