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Original Research Article

Study of Indications of Blood and Blood Components in Neonatal Intensive Care Unit and Pediatric Intensive Care Unit.

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Abstract:

Background: Transfusion of blood & its components is very important and often required in management of patients admitted in NICU (first 28 days of birth) and PICU(29 days to 12 years of age).Common indications of blood and blood components transfusion in paediatric age group patients are Anemia, Preterm, Low birth weight, shock, etc.

Aims and Objective: (1) To study the indications of blood & its components in NICU and PICU unit. (2) To investigate current transfusion practices in critically ill children. (3) Analysis of the relevance of various components which should be used in NICU & PICU cases for proper utilization of blood & its components. (4) To identify most commonly used blood component.

Method and Material: This is a retrospective study conducted by Department of Pathology over a period of 6 months from September 2021 to February 2022.Data of blood & its components supplied for NICU & PICU patients were collected from records of Blood Bank of Tertiary Care Center and studied.

Result: (1) Total 335 cases of blood transfusion and its components were supplied to critically ill patients admitted in NICU and PICU units, out of which 189 Packed Red Cells, 97 Fresh Frozen Plasma, 46 Platelet Concentrates and 03whole blood were supplied. (2) Number of transfusions used for pathological conditions were as following 83were used in Anemia,64 in shock,30 in preterm babies and 37 in low birth weight babies besides others. **(**3) Most common indication for blood transfusion was Anemia. **(**4) Most commonly used component was Packed Red Cells.

Conclusion: Anemia was the most common indication of blood transfusion. Whole blood transfusion is still used which should be minimized. Blood wastage can be reduced with evidence based blood utilization strategies. Use of appropriate blood components should be encouraged.

Keywords: Packed red cell, ffp, pc, anemia, nicu, picu, lbw, shock.

Introduction

Transfusion of blood & blood components is very important and often required in management of patients admitted in Neonatal intensive care unit (NICU) (first 28 days of birth) and Pediatric Intensive care unit (PICU) (29 days to 12 years of age). Neonate admitted in a tertiary NICU require multiple blood transfusions as a consequence of extended NICU stay and repeated sampling. Neonate refers to an infant in the first 28 days after birth. A neonate's blood volume is tiny compared to the large transfusion bags they frequently receive [1]. For a 2.5 kg neonate, the total blood volume is approx 210ml [2]. Multiple physiological changes occure when a fetous becomes a neonate. These changes refer to an alteration in their blood volume, hematological parameters, and other body systems. Stress to adapt in an extrauterine environment leads to a blunted capacity of premie to produce erythrocytes, thrombocytes and immune cells, i.e. Neutrophils. The blood volume in a full-term newborn is approximately 85 ml/kg while that in a preterm newborn is about 100 ml/kg and that in an adult is about 70 ml/kg. The miniature blood volume and rookie organ systems in the neonate call for novel proposals in neonatal blood transfusion practice [3]

Neonates are often transfused based on expert clinical opinion rather than specific documented guidelines [4]. Lack of statistically valid clinical trials put neonatal transfusion practice in controversy [5]

Blood component therapy is a life-saving treatment to provide hemodynamic stability in critically ill

children in intensive care settings. About half of Pediatric intensive care unit [PICU] admissions are transfused with blood. [7]

Many studies have shown inappropriate utilisation of blood components. [8-11]

- Common indications of blood and blood components transfusion in neonatal and paediatric age group patients are Anemia, Preterm, Low birth weight, shock, Respiratory diseases, Coagulopathies, Congenital heart diseases, Severe Acute Malnutrition, Sepsi,etc.
- The majority required transfusion due to neonatal sepsis, disseminated intravascular coagulopathy, low birth weight, respiratory distress syndrome, and unconjugated hyperbilirubinemia. No transfusion-related complications were observed in our study [2].
- For surgical patients especially, blood transfusion plays a major role for resuscitation and management. There is over ordering of blood for elective and emergency surgical procedures and it is usually a common practice [20].
- This study aims to delineate the neonatal blood transfusion indications and the most commonly used component. Sharing of component usage data with the blood bank will prepare them to store components according to demand, thus limiting the wastage of components as well as make banks ready to face a shortage in case of ramped up requirements.

Aims and Objective

- To study the indications of blood & its components in NICU and PICU unit.
- To investigate current transfusion practices in critically ill children.
- Analysis of the relevance of various components used in NICU & PICU cases for proper utilization of blood & its components.
- To identify most commonly used blood component.

Method and Material

- This is a retrospective study conducted by Department of Pathology over a period of 6 months from September 2021 to February 2022. Any preterm and term neonates admitted to the NICU and PICU at Gandhi Medical College and Hamidia Hospital, who received any transfusion, i.e., fresh frozen plasma (FFP), red cell concentrate (RCC), platelet concentrate (PC), and exchange transfusion, is included in our study.
- Data of blood and blood components supplied for NICU & PICU patients were collected from records of Blood Bank of Tertiary Care Center, studied and analysed. Patients were categorized according to the classification of neonatal conditions by the International Classification of Diseases 11th Revision (ICD-11) [6].

Percentage distribution of different components supplied in nicu and picu units

Sr. No	Types of Blood Component	Number of Components	Frequency of used components
1	Packed red cells	190	56.72%
2	Fresh frozen plasma	97	28.95%
3	Platelet concentrates	45	13.43%
4	Whole blood	03	0.9%

- This observation showed Packed red cells as the most common transfused followed by fresh frozen plasma (4,5,6,7).
- Whole blood was the least common component supplied and only indication was severe neonatal hyperbilirubinemia.
- Severe hyperbilirubinemia can be corrected rapidly with the use of whole blood exchange transfusion (WBET).
- WBET has the advantage of removing partially hemolyzed RBCs, antibody-coated BCs, and circulating immunoglobulin. (8)

Comparison tables

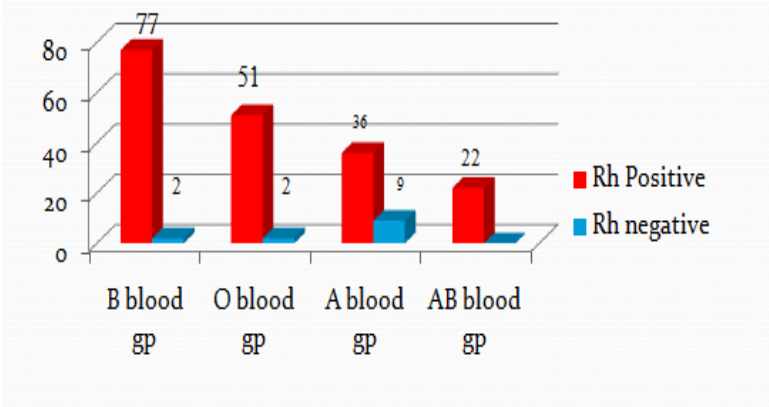
Sr.No	Total transfusions (335)	NICU(136)	PICU(199)
1	Male	83(61%)	118(59.3%)
2	female	53(31%)	81(40.7%)

This observation shows that male babies required more transfusion in comparison to female babies.

Sr.No	Age groups in NICU cases	Total transfusions	PRC	FFP	PC	Whole blood
1	Preterm (<37weeks)	24	10	09	05	00
2	Full term (>37weeks)	12	07	04	00	01

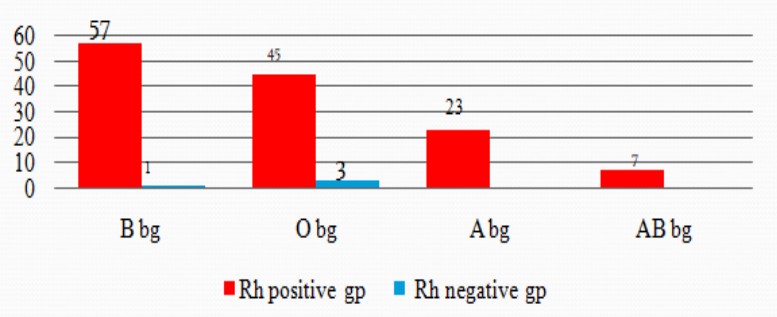
Gestational age is inversely proportional to the number of PRC, frequency of components transfused in NICU cases.(9)

Prevalence of blood groups in total 199 components supplied to picu cases



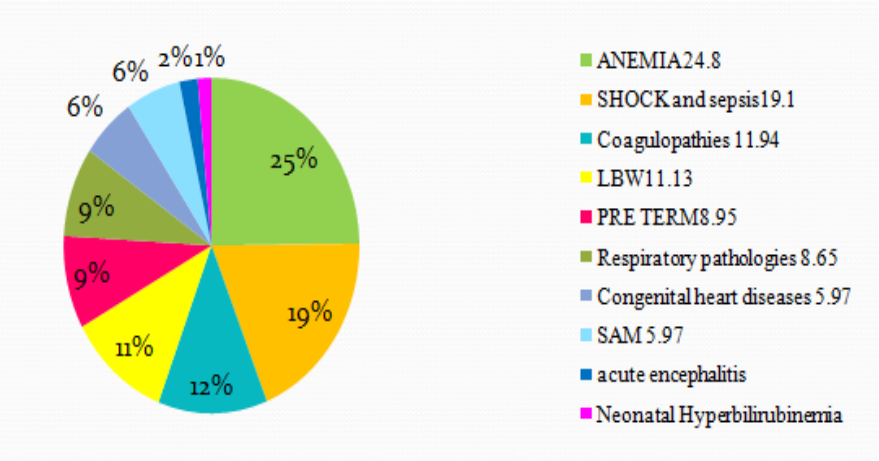
- This showed that blood group B positive is the most common and AB negative is the least prevalent component supplied to PICU cases.

Prevalence of blood groups in total 136 components supplied to nicu cases



This showed that blood group B positive is the most common and AB negative is the least prevalent component supplied to NICU cases.

Percentage of various conditions /diseases in nicu and picu in which blood components were supplied



- Anemia poses a major health threat for extremely low birth weight babies.
- Low birth weight and prematurity are the two risk factors identified that leads to multiple blood transfusion(3)

Results

- Total 335 cases of blood transfusion and its components were supplied to critically ill patients admitted in NICU and PICU units, out of which 189 were Packed Red Cells, 97 were

Fresh Frozen Plasma, 46 were Platelet Concentrates and 03 were Whole blood were supplied.

- Number of transfusion used for pathological conditions were as follows 83 were used in Anemia, 64 in shock and sepsis, and 37in low birth weight babies, 30 in preterm babies, 29 in Respiratory Pathologies, 40 in coagulopathies, 20 in congenital heart diseases, 20 in Severe Acute Malnutrition, 7 acute encephalitis, 5 in neonatal hyperbilirubinemia.
- Most common indication for blood transfusion is Anemia and most common blood group B positive.
- Most commonly used component is Packed Red Cells.
- Whole blood used in 03 cases of Neonatal hyperbilirubinemia.

Discussion

- Blood and its components play a major role in patient care. The supply of this human product is limited with considerable risks of infections and reactions.
- Bahadur et al found 59.65 % of appropriate usage of blood components.(13) Thus the inappropriate transfusions still continue. There by necessity to improve transfusion practices by standardising the indications of blood transfusion with more appropriate randomised clinical trials in critically ill children
- We found in our study that red cell transfusions were most frequently transfused followed by platelets and fresh frozen plasma. This is similar to findings in studies by Slonim et al, Bahadur et al and by other studies.(12-15)
- Pattern of utilisation of blood and its components and status of transfusion practice in different centres in different countries, vary accordingly. In studies conducted by Joshi AR et al., Gaur D et al., and Giriyan SS et al., showed that the majority of the blood transfused was WB which was contrary to the present study [16,17,18].
- In the present study, it was found that the majority of the blood component transfused was PRBC (56.72%) followed by FFP (28.95%). The least number of transfused blood components was platelets and WB [19].

Conclusion

- Anemia is the most common indication of blood transfusion.
- Most common blood group in our study found to be B positive and the least common blood group found to be AB negative in both NICU and PICU cases.
- We found in our study that packed red cells were most frequently transfused followed by fresh frozen plasma.
- Whole blood transfusion is still used which needs to be minimized.
- Higher blood wastage can be reduced with evidence based blood utilization strategies.
- Use of appropriate blood components should be encouraged.

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