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MATURITY WISE (TERM/PRETERM WISE) CHANGES IN HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS BEFORE AND AFTER EXCHANGE TRANSFUSION

Immunohaematology

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ABSTRACT

Background: Exchange transfusion (ET) is required in hyperbilirubinemic hospitalized neonates.
Aims & Objectives: 1) To determine term and preterm wise changes in haematological and biochemical parameters before and after exchange transfusion. 2) To study the effect of whole blood exchange transfusion to decrease serum bilirubin and raise haemoglobin in neonatal hyperbilirubinemia.3) To find out the underlying disease pattern of haemolytic jaundice among the study population.
Materials & Methods: The study centre at SMS and associated hospitals. Blood bank is licensed and fully equipped. Fall in serum bilirubin minimum 40 cases were required as sample size of present study.
Results: - In term Neonates mean Hb (g/dl) and Haematocrit values before and after exchange transfusion were highly significant whereas in Preterm it was non-significant. In term and Preterm Neonates mean Total bilirubin (mg/dl) direct bilirubin (mg/dl) values and indirect bilirubin values before and after exchange transfusion were significant.

KEYWORDS

exchange transfusion, hyperbilirubinemia, Haemoglobin, Haematocrit, Total, Direct and indirect bilirubin.

INTRODUCTION

An exchange transfusion involves removing small aliquots of patient blood and replacing it with small aliquots of donor blood in order to remove abnormal blood components and circulating toxins whilst maintaining adequate circulating blood volume. It is primarily performed to remove antibodies and excess bilirubin in isoimmune disease, the incidence of exchange transfusion is decreasing secondary to the prevention and improved prenatal management of alloimmune haemolytic disease and improvements in the management of neonatal hyperbilirubinaemia1. Severe neonatal hyperbilirubinemia in relatively healthy term or late preterm (greater than 35 weeks' gestation) had continued to carry the risks for chronic sequelae and acute bilirubin encephalopathy. Neonatal hyperbilirubinemia with mild to moderate elevation of serum bilirubin levels were generally considered to be an innocuous state. However, if serum bilirubin levels exceed a dangerous limit, which varies with birth weight, gestational age, chronological age and internal milieu of the body, bilirubin may cross the blood-brain barrier and bilirubin encephalopathy results. Severe hyperbilirubinemia occurs when the total serum bilirubin (TSB) concentration is >340 µmol/L (20mg/dl) at any time during the first 28 days of life and critical hyperbilirubinemia occurs when the TSB concentration is >425 µmol/L (25 mg/dl) during the first 28 days of life. It is estimated that 60% of the term newborns develop jaundice and 2% reach a TSB concentration >340 µmol/L (20mg/dl).2

These changes in global and national contexts have prompted this work. Therefore, there was a need for Clarification of probably related factor(s) like age and these objectives were arranged to some fulfilled the scanty information.

Research in the basic emergency clinical subjects like Transfusion Medicine forms the foundation stone for a further work in other disciplines. The present investigation has been planned to elucidate the effect of maturity on various blood parameter before and after blood transfusion in neonatal hyperbilirubinemia

The results of this study will be useful to clinician's pediatricians and para-clinicians for diagnosis and treatment of various ailments of neonatal hyperbilirubinemia and will also help the scientists involved in research on neonatal hyperbilirubinemia

MATERIALS AND METHODS

Study Type: Interventional study without control.
Study Design: Longitudinal study.
Study Area: The study was undertaken at SMS hospital, JK Lon Hospital and Mahila Chikitsalya, Jaipur. The tests were performed in Department of Immunohaematology & Transfusion Medicine and laboratories of SMS hospital, JK LON Hospital and Mahila Chikitsalya, Jaipur.

Sample size: Sample size was calculated at 95% confidence level assuming standard deviation of 9.7% in fall of serum bilirubin as preference study, at the precision of 3% fall in serum bilirubin minimum 40 cases were required as sample size of present study.

Inclusion Criteria:
(a). All neonates with Neonatal Hyperbilirubinemia requiring exchange transfusion and/or if requiring multiple exchange transfusions.[2]
(b). Those giving consent for participation in this study.

Exclusion Criteria:
(a). Patients who may get benefit by phototherapy and blood transfusion and don't fall in range of exchange transfusion criteria.
(b). Major congenital malformations.
(c). Those refusing consent for participating in this study.

This study was initiated after the approval of research review board and fulfilled all requisite formalities. Selection of study population was done as per inclusion and exclusion criteria. The detailed personal and medical history of the donor was recorded as per proposed Performa.

Information recorded were age, weight and sex of the newborn baby and Volume of blood Transfusion. Investigations conducted in all neonates requiring exchange were total serum bilirubin (TSB), conjugated and unconjugated fractions of TSB, ABO and Rhesus blood group; direct coombs test (DCT), reticulocyte count and peripheral blood smear examination. Glucose-6-phosphate dehydrogenase (G6PD) levels, thyroid profile and sepsis screen were done wherever indicated.

Traditional guidelines suggest exchange transfusion in the following circumstances:

Within 12 hours of birth if
- Cord blood bilirubin concentration exceeds 3 to 5 mg/dL for preterm infants, 5 to 7 mg/dL for term infants, or the rate of increase is >0.5 mg/dL/hour.
- Severe anemia: haemoglobin 10 g/dl combined with hyperbilirubinemia.

After 24 hours of birth if
Total bilirubin concentration >20 mg/dL or a bilirubin increase of >0.5 mg/dL/hour or haemoglobin 10 g/dL combined with hyperbilirubinemia.

The study centre at SMS / JKLon hospital / Mahila Chikitsalya blood

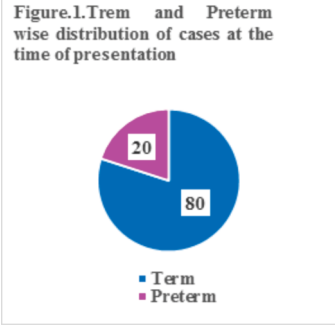
bank is licensed and fully equipped for component preparation with the facility of deep fridge centrifuge, laminar flow, plasma extractor, dielectric tube sealer, deep fridge of -40°C and -70°C, sterilized connecting device, cryo water bath etc. Whole Blood was supplied to neonatal hyperbilirubinemia cases requiring exchange transfusion, hospitalized in Newborn Care Unit attached with the present institute. All the cases of HDN were diagnosed by testing cord blood/neonate blood for ABO grouping and Rh typing (Tube technique), Direct Coomb's test (DCT) by Polyspecific AHG Column technique, total, direct and indirect serum bilirubin (Autoanalyser method) along with mother's sample for ABO grouping, RhD typing (Tube technique).

RESULT

Neonatal Hyperbilirubinemia ratio of Term and Preterm born Neonates: -

In the present study 80% (32) were term neonates whereas 20% (8) were having Preterm delivery. (Table.1 and Figure.1):-

Table-1:-Numbers and Percentage of Term and Preterm Neonates



Term and Preterm wise changes in haematological and biochemical parameters before and after exchange transfusion (Table.2 and Figure. 2):-

In term Neonates mean Hb (g/dl) values before and after exchange transfusion were 12.71±0.57 and 13.86±0.48, respectively. The mean difference P-value was 0.027 which was significant whereas in Preterm Neonates it was 13.28±1.04 and 12.88±0.67, respectively. The mean difference P-value was 0.717 which was non-significant.

In term Neonatesmean Haematocrit values before and after exchange transfusion were 35.65±1.64% and 40.84±1.38% before and after exchange transfusion, respectively. The mean difference P-value was 0.001 which was highly significant whereas in Pre-term it was 39.19±3.05% and 36.89±2.16%, respectively. The mean difference P-value was 0.517 which was non-significant.

In term Neonates mean Total bilirubin (mg/dl) values before and after exchange transfusion were 22.15±1.61 and 12.09±0.79 before and after exchange transfusion, respectively. The mean difference P-value was <0.001 which was highly significant whereas in Preterm it was 18.51±1.28 and 7.62±1.39, respectively. The mean difference P-value was <0.001 which was highly significant.

In term Neonates mean Direct bilirubin (mg/dl) values before and after exchange were 4.58±1.43 and 1.12±0.15 before and after exchange transfusion, respectively. The mean difference P-value was 0.018 which was significant whereas in Preterm it was 0.83±0.06 and 0.62±0.07, respectively. The mean difference P-value was 0.032 which was significant.

In term Neonates mean indirect bilirubin (mg/dl) values before and after exchange were 22.23±1.09 and 10.99±0.76 before and after exchange transfusion, respectively. The mean difference P-value was <0.001 which was highly significant

	Numbers of Neonates	Per cent
Term	32	80.0
Preterm	8	20.0

whereas in Preterm it was 17.67±1.29 and 7.00±1.45, respectively. The mean difference P-value was <0.001 which was highly significant.

DISCUSSION: -

In term Neonates mean Hb (g/dl) and Haematocrit values before and after exchange transfusion were was highly significant whereas in Preterm it was non-significant.

In term and Preterm Neonates mean Total bilirubin (mg/dl) values before and after exchange transfusion were highly significant which was similar to Singh *et al* (2015)[3] where the infants were divided into two groups, Group A containing Full term infants and Group B containing Preterm infants. Blood samples were obtained and the following tests were performed i.e. serum bilirubin and a significant decrease in serum bilirubin values was observed in both the groups after exchange transfusion. Our study also demonstrates a preponderance of small for date neonates to develop severe hyperbilirubinemia requiring exchange transfusion with statistically significant results. In Term and Preterm Neonates mean direct bilirubin (mg/dl) values and indirect bilirubin (mg/dl) values before and after exchange were significant.

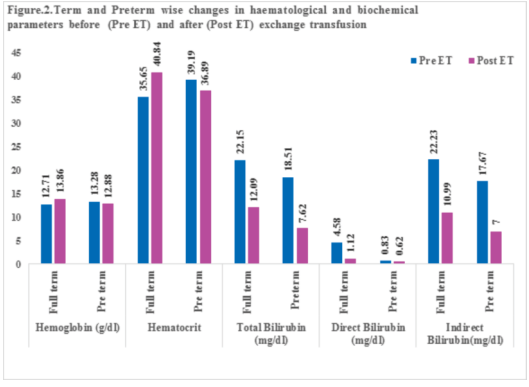
CONCIUSION

In term Neonates mean Hb (g/dl) and Haematocrit values before and after exchange transfusion were highly significant whereas in Preterm it was non-significant. In term and Preterm Neonates mean Total bilirubin (mg/dl) direct bilirubin (mg/dl) values and indirect bilirubin values before and after exchange transfusion were significant.

Table-2:-Maturity wise changes in Haematological and biochemical parameters before and after exchange transfusion:-

Variable	Term / Preterm	Before transfusion	After transfusion	P-value
Hb (g/dl)	Full term	12.71±0.57	13.86±0.48*	0.027
	Preterm	13.28±1.04	12.88±0.67	0.717
Haematocrit (%)	Full term	35.65±1.64	40.84±1.38*	0.001
	Preterm	39.19±3.05	36.89±2.16	0.517
Total bilirubin (mg/dl)	Full term	22.15±1.61	12.09±0.79*	<0.001
	Preterm	18.51±1.28	7.62±1.39*	<0.001
Direct bilirubin (mg/dl)	Full term	4.58±1.43	1.12±0.15*	0.018
	Preterm	0.83±0.06	0.62±0.07*	0.032
Indirectbilirubin(mg /dl)	Full term	22.23±1.09	10.99±0.76*	<0.001
	Preterm	17.67±1.29	7.00±1.45*	<0.001

*–Denotes significance difference in the Table



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