



MOTHER'S RH FACTOR WISE CHANGES IN HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF NEONATES BEFORE AND AFTER EXCHANGE TRANSFUSION

Immunohaematology

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ABSTRACT

Background: Exchange transfusion (ET) is required in hyperbilirubinemia hospitalized neonates.

Aims & Objectives: 1) To determine Mother's Rh factor 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. The blood bank was licensed and fully equipped. Fall in serum bilirubin minimum 40 cases was required as the sample size of the present study.

Results: Mother's Rh factor wise grouped was Rh+ve =22 (55%) and Rh-ve =18 (45%). When the mother's blood group was Rh+ve, the Hb (g/dl) and Haematocrit mean difference before and after exchange transfusion was non-significant. Whereas the mother's blood group was Rh-ve, then the Hb (g/dl) and Haematocrit before and after exchange transfusion the mean difference was highly significant. When the mother's blood group was Rh+ve, then the Total bilirubin (mg/dl) and Indirect bilirubin (mg/dl) the mean difference before and after the exchange transfusion was highly significant. When the mother's blood group was Rh+ve and Rh-ve, both then the Direct bilirubin (mg/dl) the mean difference before and after exchange transfusion was non-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 donor blood to remove abnormal blood components and circulating toxins whilst maintaining adequate circulating blood volume. It was primarily performed to remove excess bilirubin and antibodies in iso-immune diseases like neonatal hyperbilirubinemia. 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 hyperbilirubinemia¹.

Severe neonatal hyperbilirubinemia in relatively healthy late preterm (greater than 35 weeks) or term babies had continued to carry the potential for complications of chronic sequelae like 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 basic emergency clinical subjects like Transfusion Medicine forms the foundation stone for further work in other disciplines. The present investigation has been planned to elucidate the effect of age on various blood parameter before and after blood transfusion in neonatal hyperbilirubinemia. The results of this study will be useful to clinician's, paediatricians 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, J K Lon Hospital, and Mahila Chikitsalya, Jaipur. The tests were performed in the Department of Immunohaematology & Transfusion Medicine and

laboratories of SMS hospital, JK Lon Hospital, and Mahila Chikitsalya, Jaipur.

SAMPLE SIZE:

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

INCLUSION CRITERIA:

- All neonates with Neonatal Hyperbilirubinemia requiring exchange transfusion and/or if requiring multiple exchange transfusions.²
- Those giving consent for participation in this study.

EXCLUSION CRITERIA:

- Patients who may get benefit from phototherapy and blood transfusion and don't fall in the range of exchange transfusion criteria.
- Major congenital malformations.
- Those refusing consent for participating in this study.

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

Information recorded were age, weight, and sex of the Neonate 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 anaemia: 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 center 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 the Newborn Care Unit attached to 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

Mother's Rh factor wise grouped was Rh+ve = 22 (55%) and Rh-ve = 18 (45%).

Mother's Rh factor wise changes in haematological and biochemical parameters before and after exchange transfusion:-

When the mother's blood group was Rh+ve, then the Hb (g/dl) mean before exchange transfusion was 13.94 ± 0.57 and after exchange transfusion was 14.25 ± 0.61 . Whereas when the mother's blood group was Rh-ve, then the Hb (g/dl) mean value before exchange transfusion was 11.46 ± 0.77 and after exchange transfusion was 13.21 ± 0.50 . The mother's blood group was Rh+ve, then the Haematocrit mean value before exchange transfusion was $39.17 \pm 1.71\%$, and after exchange transfusion was $41.08 \pm 1.82\%$. Whereas when the mother's blood group was Rh-ve, then the Haematocrit mean value before exchange transfusion was $32.79 \pm 2.26\%$, and after exchange transfusion was $39.44 \pm 1.49\%$.

When the mother's blood group was Rh+ve, then the Total bilirubin (mg/dl) mean value before exchange transfusion was 21.23 ± 1.56 and after exchange transfusion was 11.22 ± 1.08 . Whereas when the mother's blood group was Rh-ve, then the Total bilirubin (mg/dl) mean value before exchange transfusion was 21.37 ± 2.33 and after exchange transfusion was 11.00 ± 1.03 . When the mother's blood group was Rh+ve, then the Direct bilirubin (mg/dl) mean value before exchange transfusion was 2.92 ± 1.27 and after exchange transfusion was 0.91 ± 0.16 . Whereas when the mother's blood group was Rh-ve, then the Direct bilirubin (mg/dl) mean value before exchange transfusion was 4.95 ± 2.08 and after exchange transfusion was 1.16 ± 0.20 .

When the mother's blood group was Rh+ve, then the Indirect bilirubin (mg/dl) mean value before exchange transfusion was 21.40 ± 1.02 and after exchange transfusion was 10.32 ± 1.03 . Whereas when the mother's blood group was Rh-ve, then the indirect bilirubin (mg/dl) mean value before exchange transfusion was 20.95 ± 1.76 and after exchange transfusion was 9.89 ± 1.01 .

DISCUSSION

Mother's Rh factor wise grouped was Rh+ve = 22 (55%) and Rh-ve = 18 (45%). But according to Singla, et al, 20173 Rh factor wise grouped was Rh+ve = 34 (70%) and Rh-ve = 15 (30%).

Mother's Rh factor wise changes in haematological and biochemical parameters before and after exchange transfusion:-

When the mother's blood group was Rh+ve, the Hb (g/dl) mean difference before and after exchange transfusion was non-significant ($P < 0.001$). Whereas when the mother's blood group was Rh-ve, then the Hb (g/dl) the mean difference before and after exchange transfusion was highly significant.

Mother's the blood group was Rh+ve, then the Haematocrit the mean difference before and after exchange transfusion was non-significant ($P = 0.368$). Whereas the mother's blood group was Rh-ve, then the Haematocrit the mean difference before and after exchange transfusion was highly significant. When the mother's blood group was Rh+ve, then the Total bilirubin (mg/dl) the mean difference before and after exchange transfusion was highly significant ($P < 0.001$). Whereas when the mother's blood group was Rh-ve, then the Total bilirubin (mg/dl) the mean difference before and after exchange transfusion was highly significant.

When the mother's blood group was Rh+ve, then the Direct bilirubin

(mg/dl) the mean difference before and after exchange transfusion was non-significant (P -value = 0.089). Whereas when the mother's blood group was Rh-ve, then the Direct bilirubin (mg/dl) the mean difference before and after exchange transfusion was non-significant. When the mother's blood group was Rh+ve, then the Indirect bilirubin (mg/dl) the mean difference before and after exchange transfusion was highly significant ($P = 0.001$). Whereas when the mother's blood group was Rh-ve, then the Indirect bilirubin (mg/dl) the mean difference before and after exchange transfusion was highly significant. When the mother's blood group was Rh+ve, the Hb (g/dl) and Haematocrit mean difference before and after exchange transfusion was non-significant. Whereas the mother's blood group was Rh-ve, then the mean difference of the Hb (g/dl) and Haematocrit before and after exchange transfusion was highly significant.

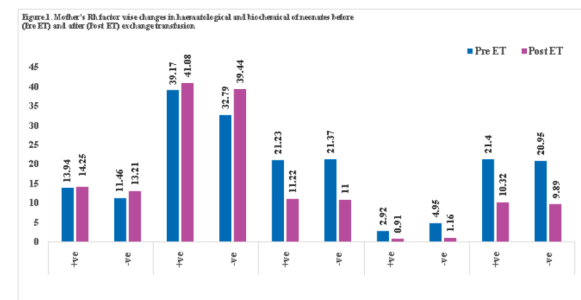
CONCLUSION

Mother's Rh factor wise grouped was Rh+ve = 22 (55%) and Rh-ve = 18 (45%). When the mother's blood group was Rh+ve, then the Total bilirubin (mg/dl) and Indirect bilirubin (mg/dl) the mean difference before and after the exchange transfusion was highly significant. When the mother's blood group was Rh+ve and Rh-ve, both then the Direct bilirubin (mg/dl) the mean difference before and after exchange transfusion was non-significant.

Table-1:-Mother's Rh factor wise changes in haematological and biochemical parameters of neonate before and after exchange transfusion

Variable	Mother's Rh factor	Before transfusion	After transfusion	P-value
Hb (g/dl)	+ve	13.94 ± 0.57	14.25 ± 0.61	0.643
	-ve	11.46 ± 0.77	$13.21 \pm 0.50^*$	0.008
Haematocrit	+ve	39.17 ± 1.71	41.08 ± 1.82	0.368
	-ve	32.79 ± 2.26	$39.44 \pm 1.49^*$	< 0.001
Total bilirubin (mg/dl)	+ve	21.23 ± 1.56	$11.22 \pm 1.08^*$	< 0.001
	-ve	21.37 ± 2.33	$11.00 \pm 1.03^*$	< 0.001
Direct bilirubin (mg/dl)	+ve	2.92 ± 1.27	0.91 ± 0.16	0.089
	-ve	4.95 ± 2.08	1.16 ± 0.20	0.088
Indirect bilirubin (mg/dl)	+ve	21.40 ± 1.02	$10.32 \pm 1.03^*$	< 0.001
	-ve	20.95 ± 1.76	$9.89 \pm 1.01^*$	< 0.001

*-Denotes significance difference in the Table



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