



NEONATAL ABO BLOOD GROUP 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 hospitalized hyperbilirubinemic neonates.

Aims & Objectives: 1) To determine Baby's ABO blood group wise changes in haematological and biochemical parameters before, and after exchange transfusion. 2) To study the effect of the 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 is licensed and fully equipped. Fall in serum bilirubin minimum 40 cases was required as the sample size of the present study.

Results: The distribution of blood groups B, O, A, and AB among the Neonates numbers was 21, 07, 10, and 2 respectively. When Neonate's blood group were A, B, AB and O then the Hb (g/dl), Haematocrit (%) and Direct bilirubin (mg/dl) mean values before, and after exchange transfusion was non-significant. When Neonate's blood group was B, AB and O then the Total bilirubin (mg/dl) and indirect bilirubin (mg/dl) mean values before, and after exchange transfusion was 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 donor blood to purge and obviate most of the abnormal blood components and circulating toxins whilst maintaining an adequate circulating blood volume. It's primarily performed to purge the excess bilirubin and antibodies in iso-immune disease, the incidence of exchange transfusions are decreasing secondary to the prevention, and improved prenatal management of alloimmune haemolytic diseases and enhancements within the management of neonatal hyperbilirubinaemia. Severe hyperbilirubinemia in relatively healthy term or late preterm babies continues to bear the potential for complications from acute bilirubin encephalopathy and chronic sequelae. hyperbilirubinemia of the newborn with mild to moderate elevation of serum bilirubin levels was generally considered as an innocuous state. However, if serum bilirubin levels exceed a dangerous limit which varies with the 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 $>340 \mu\text{mol/L}$ ($>20 \text{ mg/dl}$) at any time during the first 28 days of life, and critical hyperbilirubinemia occurs when the TSB concentration is $>425 \mu\text{mol/L}$ ($>25 \text{ mg/dl}$) during the first 28 days of life. It's estimated that 60% of the term newborn develop jaundice and reach a TSB concentration $>340 \mu\text{mol/L}$ ($>20 \text{ mg/dl}$). These changes in global and national contexts have prompted this work. Therefore, there was a necessity for Clarification of probably related factor(s) like age, and these objectives were arranged to some fulfilled the scanty information. These Researches in an exceedingly basic emergency clinical subject like Transfusion Medicine forms the foundation stone for further work in other disciplines. The present investigation has been planned to elucidate the effect of the neonate's ABO blood group on various blood parameters before, and after Exchange Transfusion, in hyperbilirubinemia of the Newborn. The results of this study are going to be useful to clinician's paediatricians and para-clinicians for diagnosis and treatment of varied ailments of hyperbilirubinemia of the Newborn and can also help the scientists involved in research on hyperbilirubinemia of the Newborn.

MATERIALS AND METHODS

Study Type: Interventional study without control. **Study Design:** Longitudinal study. **Study Area:** The study was undertaken at the SMS hospital, JK 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 3% fall in serum bilirubin minimum 40 cases were required as the sample size of the 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 from phototherapy and blood transfusion, and not fall in the 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 the research review board and fulfilled all requisite formalities. The selection of the study population was done as per inclusion, and exclusion criteria. The detailed personal and medical history of the donor was recorded as per the proposed Performa. The information recorded was age, weight, and sex of the Newborn baby and Volume of Blood Transfusion. Investigations conducted in all neonates requiring exchange was 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 $>0.5 \text{ mg/dL/hour}$. Severe anemia: haemoglobin $< 10 \text{ g/dl}$ combined with hyperbilirubinemia. After 24 hours of birth if Total bilirubin concentration $> 20 \text{ mg/dL}$ or a bilirubin increase of $> 0.5 \text{ mg/dL/hour}$ or haemoglobin $< 10 \text{ g/dL}$ combined with hyperbilirubinemia. The study center at SMS / JK Lon 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

The distribution of blood groups B, O, A, and AB among the Neonates numbers was 21, 07, 10, and 2 respectively. Neonate's ABO blood group wise changes in haematological and biochemical parameters before, and after exchange transfusion:- When Neonate's blood group was A, then the Hb (g/dl) mean values before and after the exchange transfusion was 14.25 ± 0.83 and 14.48 ± 0.79 respectively. The mean

difference of the P-value was 0.730. When Neonate's blood group was B, then the Hb (g/dl) mean values before, and after exchange transfusion was 12.83 ± 0.64 and 14.04 ± 0.56 . The mean difference of the P-value was 0.065. When Neonate's blood group was AB, then the Hb (g/dl) mean values before and after the exchange transfusion was 12.57 ± 1.52 and 12.07 ± 2.12 respectively. The P-value of the mean difference was 0.872. When Neonate's blood group was O, then the Hb (g/dl) mean values before and after the exchange transfusion was 10.26 ± 1.60 and 11.63 ± 0.57 respectively. The P-value of the mean difference was 0.431. When Neonate's blood group was A, then the Haematocrit (%) mean values before and after the exchange transfusion was 38.40 ± 2.38 and 43.02 ± 2.19 respectively. The mean difference of the P-value was 0.073. When Neonate's blood group was B, then the Haematocrit (%) mean values before, and after exchange transfusion were 37.24 ± 2.02 and 40.80 ± 1.74 respectively. The mean difference of the P-value was 0.079. When Neonate's blood group was AB, then the Haematocrit (%) mean values before, and after exchange transfusion were 36.27 ± 4.17 and 34.47 ± 5.80 respectively. The mean difference of the P-value was 0.832. When Neonate's blood group was O, then the Haematocrit (%) mean values before and after the exchange transfusion were 29.58 ± 4.64 and 34.59 ± 1.39 respectively and P-value was 0.336. When Neonate's blood group was A, then the Total bilirubin (mg/dl) mean values before, and after exchange transfusion was 19.89 ± 3.64 and 12.93 ± 1.38 respectively. The mean difference of the P-value was 0.082 which was non-significant. When Neonate's blood group was B, then the Total bilirubin (mg/dl) mean values before and after exchange transfusion was 22.43 ± 1.34 and 10.28 ± 1.06 respectively. The mean difference of the P-value was <0.001 . When Neonate's blood group was AB, then the Total bilirubin (mg/dl) mean values before and after exchange transfusion were 22.10 ± 4.70 and 8.18 ± 1.67 respectively. The mean difference of the P-value was 0.044 which was significant. When Neonate's blood group was O, then the Total bilirubin (mg/dl) mean values before and after exchange transfusion was 20.77 ± 3.51 and 12.39 ± 1.79 respectively. When Neonate's blood group was A, then the Direct bilirubin (mg/dl) mean values before and after exchange transfusion were 7.71 ± 3.39 and 1.44 ± 0.33 respectively. The P-value of the mean difference was 0.086. When Neonate's blood group was B, then the Direct bilirubin (mg/dl) mean values before and after exchange transfusion were 1.84 ± 0.77 and 0.87 ± 0.13 respectively. The mean difference of the P-value was 0.195. When Neonate's blood group was AB, and then the Direct bilirubin (mg/dl) mean values before and after exchange transfusion were 1.54 ± 0.73 and 0.44 ± 0.13 respectively. The mean difference of the P-value was 0.329. When Neonate's blood group was O, then the Direct bilirubin (mg/dl) mean values before and after exchange transfusion were 4.26 ± 3.17 and 1.00 ± 0.25 having P-value 0.351.

When Neonate's blood group was A, then the Indirect bilirubin (mg/dl) mean values before and after the exchange transfusion was 20.88 ± 2.43 and 11.56 ± 1.29 respectively. The mean difference between the P-value was 0.001. When Neonate's blood group was B, then the Indirect bilirubin (mg/dl) mean values before and after the exchange transfusion was 21.64 ± 1.16 and 9.41 ± 1.06 respectively. The mean difference of the P-value was <0.001 . When Neonate's blood group was AB, and then the Indirect bilirubin (mg/dl) mean values before and after exchange transfusion was 20.56 ± 4.14 and 7.74 ± 1.76 respectively. The mean difference P-value was 0.035. When Neonate's blood group was O, then the Indirect bilirubin (mg/dl) mean values before and after the exchange transfusion was 21.54 ± 1.84 and 11.39 ± 1.63 respectively. The mean difference of the P-value was 0.002.

DISCUSSION

The distribution of blood groups B, O, A and AB among the Neonates numbers were 21 (52.5%), 07 (17.5%), 10 (25%) and 2 (05%) respectively whereas Singla, et al, 2017 in 49 neonates mentioned that B, O, A and AB among the Neonates were 22 (44.9%), 08 (16.3%), 16 (32.5%) and 3 (6.1%) respectively. When Neonate's blood group were A, B, AB and O then the Hb (g/dl) mean values before and after exchange transfusion were non-significant. When Neonate's blood group were A, B, AB, and O then the Haematocrit (%) mean values before and after exchange transfusion were non-significant. When Neonate's blood group was A, then the Total bilirubin (mg/dl) mean values before and after exchange transfusion were non-significant. When Neonate's blood group were B, AB, and O then the Total bilirubin (mg/dl) mean values before and after exchange transfusion were significant. When Neonate's blood groups were A, B, AB, and O, then the Direct bilirubin (mg/dl) mean values before and after

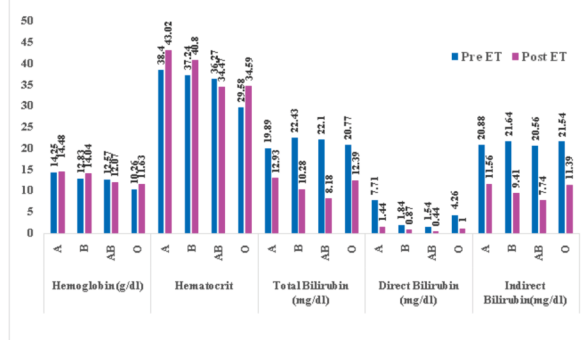
exchange transfusion were non-significant. When Neonate's blood group were A, B, AB, and O, then the Indirect bilirubin (mg/dl) mean values before and after exchange transfusion were significant. Conclusion: - The distribution of blood groups B, O, A, and AB among the Neonates numbers was 21, 07, 10, and 2 respectively. When Neonate's blood group were A, B, AB and O then the Hb (g/dl), Haematocrit (%) and Direct bilirubin (mg/dl) mean values before and after exchange transfusion were non-significant. When Neonate's blood group were B, AB and O then the Total bilirubin (mg/dl) and Indirect bilirubin (mg/dl) mean values before and after exchange transfusion were significant.

Table-1:-Neonate's ABO blood group wise changes in haematological and biochemical parameters before and after exchange transfusion

Variable	Neonate's blood group	Before transfusion	After transfusion	P-value
Hb (g/dl)	A	14.25 ± 0.83	14.48 ± 0.79	0.730
	B	12.83 ± 0.64	14.04 ± 0.56	0.065
	AB	12.57 ± 1.52	12.07 ± 2.12	0.872
	O	10.26 ± 1.60	11.63 ± 0.57	0.431
Haematocrit (%)	A	38.40 ± 2.38	43.02 ± 2.19	0.073
	B	37.24 ± 2.02	40.80 ± 1.74	0.079
	AB	36.27 ± 4.17	34.47 ± 5.80	0.832
	O	29.58 ± 4.64	34.59 ± 1.39	0.336
Total bilirubin (mg/dl)	A	19.89 ± 3.64	12.93 ± 1.38	0.082
	B	22.43 ± 1.34	10.28 ± 1.06	<0.001
	AB	22.10 ± 4.70	8.18 ± 1.67	0.044
	O	20.77 ± 3.51	12.39 ± 1.79	0.041
Direct bilirubin (mg/dl)	A	7.71 ± 3.39	1.44 ± 0.33	0.086
	B	1.84 ± 0.77	0.87 ± 0.13	0.195
	AB	1.54 ± 0.73	0.44 ± 0.13	0.329
	O	4.26 ± 3.17	1.00 ± 0.25	0.351
Indirect bilirubin (mg/dl)	A	20.88 ± 2.43	11.56 ± 1.29	<0.001
	B	21.64 ± 1.16	9.41 ± 1.06	<0.001
	AB	20.56 ± 4.14	7.74 ± 1.76	0.035
	O	21.54 ± 1.84	11.39 ± 1.63	0.002

*--Denotes significance difference in the Table

Figure-1: Baby's ABO blood group wise changes in haematological and biochemical parameters before (Pre ET) and after (Post ET) exchange transfusion



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