



MOTHER'S ABO BLOOD GROUP WISE CHANGES IN HEMATOLOGICAL AND BIOCHEMICAL PARAMETERS BEFORE, AND AFTER EXCHANGE TRANSFUSION IN NEONATAL HYPERBILIRUBINEMIA

Immunohematology

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ABSTRACT

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

Aim & Objective: To determine the mother's ABO blood group wise changes in hematological and biochemical parameters before and after exchange transfusion in neonates.

Materials & Methods: The study center 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: The distribution of blood groups among 40 neonates revealed B Rh +ve in 19 (47.5 %) neonates, B Rh- ve in 02(5%), neonates, O Rh+ ve in 6 (15%) neonates, O Rh- ve in 01(2.5%) neonates, A Rh+ ve in 10(25%) neonates, A Rh- ve in 0 (0%) neonates, AB Rh+ ve in 02 (5%) neonates and AB Rh- ve in 0 (0%) neonates and The distribution of blood groups among the 40 Mother's was B Rh + ve in 06 (15%), B Rh -ve in 06 (15%), O Rh + ve in 16 (40%), O Rh -ve in 04 (10%), A Rh + ve in 0 (%), A Rh -ve in 06 (15%), AB Rh + ve in 0 (%) and AB Rh - ve in 02 (5%) mother's respectively.

KEYWORDS

exchange, transfusion, hyperbilirubinemia, Hemoglobin, Hematocrit, Total, Direct and indirect bilirubin.

INTRODUCTION

An exchange transfusion involves removing small aliquots of neonate's 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 hemolytic disease and improvements in the management of neonatal hyperbilirubinaemia¹. Severe hyperbilirubinemia in relatively healthy neonates carries the potential for complications from acute bilirubin encephalopathy and chronic sequelae. Neonatal hyperbilirubinemia 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 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 (20 mg/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 (20 mg/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. The Research in the 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 age 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 the Department of Immunohematology & 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 a 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 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.³ (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. Selection of study population was done as per inclusion, and exclusion criteria. The detailed personal and medical history of the neonates and mother's of neonates were recorded as per proposed Performa. The 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 the increase is >0.5 mg/dL/hour.
- Severe anemia: hemoglobin 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 hemoglobin <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

Blood group distribution among their Mother's:- The distribution of blood groups among the 40 Mother's was B in 12 (30%), O in 20 (50%), A in 06 (15%), AB in 02 (5%) mother's respectively. **Mother's ABO blood group wise changes in Hematological and biochemical parameters before, and after exchange transfusion:-** When mother's blood groups were A, then the Hb (g/dl) mean values before, and after

exchange transfusion were 12.64±0.87 and 13.81±0.98 respectively. The P-value of the mean difference was 0.203. When mother's blood group was B, then the Hb (g/dl) mean values before, and after exchange transfusion was 13.41±0.89 and 13.90±0.90 respectively. The P-value of the mean difference was 0.582. When the mother's blood group was AB, then the Hb (g/dl) mean values before, and after exchange transfusion were 8.70±0.60 and 13.07±0.46 respectively. The P-value of the mean difference was 0.005. When the mother's blood group was O, the Hb (g/dl) mean values before, and after the exchange, transfusion was 13.11±0.79 and 13.56±0.59 respectively. The mean difference was P-value 0.528. When mother's blood groups were A, then the Hematocrit (%) mean values before, and after exchange transfusion was 38.63±1.97 and 41.71±2.84 respectively. The P-value of the mean difference was 0.278. When the mother's blood group was B, then the Hematocrit (%) mean values before and after were 38.84±2.61 and 40.99±2.65 respectively. The P-value of the mean difference was 0.430. When the mother's blood group was AB, then the Hematocrit (%) mean values before, and after exchange transfusion was 23.82±1.34 and 36.40±0.47 respectively. The P-value of the mean difference was 0.005. When mother's blood group was O, the Hematocrit (%) mean values before, and after exchange transfusion were 35.74±2.30 and 39.42±1.71 respectively. The non-significant P-value was 0.122. When mother's blood groups were A, then the Total bilirubin (mg/dl) mean values before and after were 24.83±4.58 and 13.18±1.84 respectively. The P-value of the mean difference was 0.026. When mother's blood group was B then the Total bilirubin (mg/dl) mean values before, and after exchange transfusion was 20.50±2.18 and 9.30±1.36 respectively. The P-value of the mean difference was 0.001. When the mother's blood group was AB, then the Total bilirubin (mg/dl) mean values before, and after exchange transfusion were 13.34±5.62 and 8.22±1.40 respectively. The P-value of the mean difference was 0.541. When mother's blood group was O, then the Total bilirubin (mg/dl) mean values before, and after exchange transfusion was 21.86±1.66 and 12.04±1.04 respectively. The mean difference was P-value was of 0.001. When the mother's blood group was A, then the Direct bilirubin (mg/dl) mean values before and after were 6.08±4.46 and 1.38±0.39 respectively. The P-value of the mean difference was 0.345. When mother's blood group was B, then the Direct bilirubin (mg/dl) mean values before, and after exchange transfusion were 2.95±1.70 and 0.62±0.12 respectively. The P-value of the mean difference was 0.195. When the mother's blood group was AB, then the Direct bilirubin (mg/dl) mean values before and after were 6.70±6.01 and 0.94±0.47 respectively. The P-value of the mean difference was 0.407. When mother's blood group was O, then the Direct bilirubin (mg/dl) mean values before, and after exchange transfusion was 3.18±1.44 and 1.15±0.19 respectively. The mean difference P-value was 0.134. When the mother's blood group was A, then the Indirect bilirubin (mg/dl) mean values before and after were 23.26±3.78 and 11.92±1.79 respectively. The P-value of the mean difference was 0.013. When the mother's blood group was B, then the Indirect bilirubin (mg/dl) values before, and after exchange transfusion were 20.23±1.48 and 8.68±1.35 respectively The P-value of mean difference was <0.001. When the mother's blood group was AB, then the Indirect bilirubin (mg/dl) mean values before and after the exchange transfusion was 14.71±3.96 and 7.29±1.05 respectively. The P-value of mean difference was 0.277 which was non-significant. When the mother's blood group was O, then the Indirect bilirubin (mg/dl) mean values before and after exchange transfusion was as 22.20±0.95 and 10.89±1.01 respectively. The P-value of mean difference was <0.

DISCUSSION

Blood group distribution among their Mother's:- The distribution of blood groups among the 40 Mother's was B in 12 (30%), O in 20 (50%), A in 06 (15%), AB in 02 (5%) mother's respectively whereas in Singla, et al³, 2017 in 49 mothers of neonates blood groups were B, O, A and AB among the Neonates were 20(41%), 17 (35%), 08 (16%) and 4 (8%) respectively. Mother's ABO blood group wise changes in Hematological and biochemical parameters before and after exchange transfusion:-

When mother's blood groups were A, B and O then the Hb (g/dl) mean values before and after exchange transfusion were non-significant. When the mother's blood group was AB, then the Hb (g/dl) mean values before and after exchange transfusion were highly significant. When mother's blood groups were A, B and O then the Hematocrit (%) mean values before and after exchange transfusion were non-significant. When the mother's blood group was AB, then the

Hematocrit (%) mean values before and after the exchange transfusion was highly significant. When mother's blood groups were A, B and O then the Total bilirubin (mg/dl) mean values before and after were significant. When the mother's blood group was AB, then the Total bilirubin (mg/dl) mean values before and after exchange transfusion was non-significant. When the mother's blood group was A, B, AB and O then the Direct bilirubin (mg/dl) mean values before and after were non-significant. When the mother's blood group was A, B and O then the Indirect bilirubin (mg/dl) mean values before and after were significant. When the mother's blood group was AB, then the Indirect bilirubin (mg/dl) mean values before and after the exchange transfusion was non-significant.

Conclusion- When mother's blood groups were A, B and O then the Hb (g/dl), Hematocrit (%) and Direct bilirubin (mg/dl) mean values before and after exchange transfusion were non-significant. When mother's blood group was AB, then the Hb (g/dl) and Hematocrit (%) mean values before and after exchange transfusion were highly significant but in case of Direct bilirubin (mg/dl) it was non-significant.

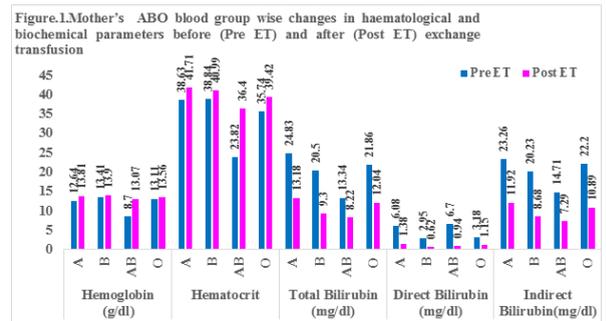


Table-1:-Mother's ABO blood group wise changes in hematological and biochemical parameters before and after exchange transfusion:-

Variable	Mother's blood group	Before transfusion	After transfusion	P-value
Hb (g/dl)	A	12.64±0.87	13.81±0.98	0.203
	B	13.41±0.89	13.90±0.90	0.582
	AB	8.70±0.60	13.07±0.46*	0.005
	O	13.11±0.79	13.56±0.59	0.528
Hematocrit (%)	A	38.63±1.97	41.71±2.84	0.278
	B	38.84±2.61	40.99±2.65	0.430
	AB	23.82±1.34	36.40±0.47*	0.005
	O	35.74±2.30	39.42±1.71	0.122
Total bilirubin (mg/dl)	A	24.83±4.58	13.18±1.84*	0.026
	B	20.50±2.18	9.30±1.36*	<0.001
	AB	13.34±5.62	8.22±1.40	0.541
	O	21.86±1.66	12.04±1.04*	<0.001
Direct bilirubin (mg/dl)	A	6.08±4.46	1.38±0.39	0.345
	B	2.95±1.70	0.62±0.12	0.195
	AB	6.70±6.01	0.94±0.47	0.407
	O	3.18±1.44	1.15±0.19	0.134
Indirect bilirubin (mg/dl)	A	23.26±3.78	11.92±1.79*	0.013
	B	20.23±1.48	8.68±1.35*	<0.001
	AB	14.71±3.96	7.29±1.05	0.277
	O	22.20±0.95	10.89±1.01*	<0.001

*-Denotes significance difference in the Table

REFERENCES

- Carl P. The Exchange Transfusion Newer Concepts and Advances in Technic, Clinical Clinical pediatrics. 1968:7(7)383-388.cpj.sagepub.com.
- Stevenson DK, Fanaroff AA, Maisels MJ, MJ, Young BW, Wong RJ. Prediction of Hyperbilirubinemia in Near Term and Term Infants. Pediatrics.; 2001:108(1):31-9.
- Singla, Deeksha A, Seema S, Milap S, Sanjeev C. Evaluation of Risk Factors for Exchange Range Hyperbilirubinemia and Neurotoxicity in Neonates from Hilly Terrain of India. International Journal of Applied and Basic Medical; 2017: Research | Vol.7(4). [http://www.ijabmr.org on Friday, July 27, 2018, IP: 103.210.93.16]