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Effect of Blood Transfusion on Levels of Haemoglobin Variants in Neonates in First Six Months of Age

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Abstract

Context: To see effect of transfusion on variants of haemoglobin in neonates. Results: There was significant difference in mean value of serum haemoglobin variants (Hb F, Hb A & Hb A2) at age of one month but no significant difference in mean value of serum haemoglobin variants at three months & six months in cases and control.

Aims: To compare if there is any difference in variants of haemoglobin in transfused and non-transfused neonates at various ages.

Settings and Design: Tertiary care hospital in north India. Prospective cohort study

Methods and Material: All neonates who underwent double volume exchange transfusion with whole blood in neonatal period were followed up at ages one month, three months and six months for their haemoglobin electrophoresis and compared with similar parameters in age and sex matched controls.

Statistical analysis used: Average and standard deviation of various variants of haemoglobin in both the groups was calculated and p value between the values of both the group was derived.

Results: p value of HbF, HbA and HbA2 between cases and controls was not significant (p=0.27, p=0.21 and p=0.39 respectively) at six months of age.

Conclusions: Major haemoglobin variants in transfused and non-transfused neonates equalizes by three months of age.

Keywords: Blood Transfusion; Levels of Haemoglobin; Neonates in First Six Months.

Key Messages: Haemoglobin variants; In transfused and non-transfused; Neonates equalizes by three months of age.

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Introduction

Neonates comprise the most heavily transfused group of patients. About 85% of extremely low birth weight newborns receive some form of transfusion by end of their hospital stay.[1] Whole blood transfusion has no indication in present day context except for exchange transfusion.[2,3] We studied the effect of exchange transfusion on HbF and HbA levels in neonates in first six months of

life by comparing it with age matched controls who did not undergo any transfusion in their neonatal period.

Subjects and Methods

This prospective cohort study was conducted in SNCU of a tertiary hospital in North India over 12 months. Study protocol was approved by the Institutional Ethics Committee. All consecutive neonates admitted in the SNCU who received whole blood transfusion, for double volume exchange transfusion (DVET) were included in the study. Controls taken from Sick Newborn Care Unit (SNCU) or general ward were healthy and matched in sex and gestational age. One control was taken for each case enrolled. Procedure of study was explained to parents in their own language. A written informed consent was obtained from mother/father of neonate before enrolling in study. All sick newborns on life support were excluded. Neonates underwent DVET as per standard guidelines.[4,5] All study subjects and controls were put on nutritional supplements as per Facility Based Newborn Care (FBNC) protocols. These neonates were followed up in neonatal clinic at one month, three month and six months of age. Three ml of blood was collected from the peripheral vein by milking method and put to High Performance Liquid Chromatography by same machine. At each follow up electrophoresis was done to estimate HbF/HbA/HbA_2 in all subjects & their controls and their values compared in both the groups. To eliminate any bias the pathologist who analysed the sample and the person who analysed the results were blinded.

Data collected was statistically analysed by Epi Info 7 software. Average and standard deviation of various variants of haemoglobin in both the groups was calculated and p value between the values of both the group was derived. A p value of < 0.05 was considered to indicate statistical significance.

Results

In our study 45 participants were enrolled of which 23 were cases. Out of these four newborns did not complete their follow-up & three expired during study period. Thus, 16 subjects underwent final analysis. There were 22 babies in control-group, out of which six did not complete their follow-up. The baseline characters of subjects and controls are mentioned in Table 1. Among subjects, all 23 cases received whole blood for DVET. In our study, NNJ was only indication of exchange transfusion (100%) and all neonates received whole blood for DVET. Two subjects had repeat exchange transfusion. Prematurity was the most common co morbidity in the cases (47%). Other co morbid conditions encountered in cases were early onset sepsis (33%), hypoxic ischemic encephalopathy (25%), late onset

Table 1: Baseline Charcters.

	Cases	Cases Dropouts	Controls	Control Dropouts
Sex				
Male	8(35%)	6(26%)	4(18%)	4(18%)
Female	8(35%)	1(4%)	12(55%)	2(9%)
Gestation				
<34weeks	1(4%)	2(9%)	0(0%)	0(0%)
34-37weeks	2(9%)	2(9%)	0(0%)	0(0%)
>37weeks	13(56%)	3(13%)	16(73%)	6(27%)
Birth weight				
<1000g	0(0%)	0(0%)	0(0%)	0(0%)
1000-1499g	1(4.5%)	1(4.5%)	0(0%)	0(0%)
1500-2499g	5(22%)	3(13%)	1(4.5%)	1(4.5%)
>2500	10(43%)	3(13%)	15(68%)	5(23%)
Age of DVET				
≤5th day	11(48%)	4(17%)	-	-
>5th day	5(22%)	3(13%)	-	-

Table 2: Comparision of Case and Cotrol According Hb Variants.

	1 month		3 months		6 months	
	Case	Control	Case	Control	Case	Control
Hb F	16.09±7.68	45.65±25.38	12.37±4.20	14.58±8.00	3.18±0.73	3.56±1.24
HbA	74.99±6.98	50.33±20.48	76.93±7.03	78.33±3.72	84.36±3.79	85.78±2.28
Hb A_2	2.38±0.36	1.73±1.01	2.21±0.37	2.93±0.60	2.26±0.54	2.80±0.75

sepsis (11%) and septic meningitis (6%). Majority (89%) were discharged after seven days of hospital stay and rest were discharged within a week of admission. A fall in mean haemoglobin level was observed at four weeks of postnatal life followed by recovery and stabilization at 24 weeks of postnatal life in cases. Haemoglobin means and standard deviations in g/dL were 10.6(±2.3), 9.4 (±2.2), and 10.5(±1.3) at the 4, 12and 24 weeks respectively.

P value of HbF and HbA between subjects and controls was significant (p=0.000095 and p=0.00008 respectively) but p value of HbA2 between subjects and controls was not significant (p=0.022) at 1 month of age. p value of HbF and HbA between subjects and controls was not significant (p=0.34 and p=0.49 respectively) but p value of HbA2 between subjects and controls was significant (p=0.000312) at 3 months of age. p value of HbF, HbA and HbA2 between subjects and controls was not significant (p=0.27, p=0.21 and p=0.39 respectively) at 6 months of age.

Discussion

Statistically significant changes are observed in haemoglobin variants at the age of one month after DVET. At the age of three month & six months, the statistical observation shows no significant changes in haemoglobin variants.

Exclusion of very sick neonates undergoing ET or PRBC transfusion may give us an incomplete picture of potential of newborns of attain Hb values corresponding to healthy neonates who have not gone any transfusion.[6,7]

Brian M. Barkemeyer MD studied neonate to determine effect of transfusion on haemoglobin variants in 25-very low birth weight infants.[8] Mean initial Hb F level before transfusion was 87.165.1%, and a single 15 ml/kg packed red blood cell transfusion decreased the mean Hb F level to 54.06%. They found, there was progressive decline in Hb F content after frequent transfusions in the first month of life, 15% of the total Hb after five transfusions. They concluded that multiple transfusion in very low birth weight infants results in rapid transition from Hb F to Hb A predominance. In our study, we also found significant decrease in Hb F level and significant increase in Hb A level after DVET at 1-month of age.

Considering the statistically significant difference in different types of haemoglobin in blood of transfused and non-transfused patients' history of ET/PRBC transfusion needs to be elicited before making a careful interpretation of results of haematological investigations in transfused patients.

However, for better significance of result, we need studies on larger sample size and observation on other variables which are affected by blood transfusion in neonates.

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