Original Research Article

Comparative study of hemoglobin and packed volume levels in term and preterm babies delivered in RMMCH

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Abstract

Background: Most existing accounts of hemoglobin values in healthy premature infants covering the early weeks of life were written before many of the errors of such determinations were recognized. Because of these limitations, it was decided to review the normal values for the first three months of life. The results were compared with a small series of readings made on a group of healthy, full-term infants.

Aim: To compare hemoglobin and packed volume levels in term and preterm babies.

Materials and methods: Sixty pregnant women who came from in and around Chidambaram who fulfilled the inclusion criteria during the period from July 2001 to March 2002 were included in this study. Among them, 50 delivered at term (37 to 42 weeks) and the rest delivered prematurely (< 37 weeks). Hemoglobin and packed cell volume as measured by standardized technique. The results were analyzed accordingly.

Results: The estimated mean hemoglobin concentration of the term babies was 10.88 gm% with the standard deviation of 1.5 gm%. For preterm babies, the mean hemoglobin concentration was 10.33 gm% with the standard deviation of 2 gm%. The mean calculated packed cell volume (PCV) of the term babies was 34.03% and the standard deviation was found to be 5%. The mean packed cell

volume of the premature babies in the present study was found to be 32.75% with the standard deviation of 6.5%.

Conclusion: Anemia of prematurity is a multifactorial anemia characterized by low levels of erythropoietin (EPO), iatrogenic blood loss, low circulating blood volume and lack of erythropoiesis. It is a problem due to the high incidence, associated symptoms and increased transfusion requirements. It is a normochromic normocytic anemia hypo-regenerative that occurs between the 2nd and 6th weeks of age in premature infants with gestational age (GA) up to 35 weeks.

Key words

Anemia, Term babies, Preterm babies, Packed cell volume.

Introduction

The lower limit of hemoglobin (Hb) of a premature baby is lower than a term new born and up to 6.5g/dl, clinically associated with decreased activity, growth failure, tachycardia, and tachypnea or sometimes without clinical expression [1]. Erythropoietin glycoprotein that stimulates division and maturation of erythroid cell lines is produced from the fetal life and it can be from a 19-years week in the umbilical cord [2]. Epo is synthesized in the kidney and in particular stimulated by the decrease of oxygen in the renal flow [3]. During fetal life EPO is produced in the liver reaching birth to occur mainly in the kidney. During fetal development, circulating EPO concentrations increase from 4 mU/ml at 16 weeks to 40 mU/ml at term [4]. After birth, EPO levels of new born babies at term decrease between 15-40 mU/mL immediately after birth to rise to reach the nadir between 4 and 6 weeks of life [5]. Between 10 and 12 weeks old, adult concentration is reached (about15 mU/ml) Hepatocytes that synthesize EPO have low sensitivity to hypoxia such as premature baby is dependent on inefficient EPO production corresponding to a degree of anemia [6]. It has long been considered that deficits of vitamin E, iron, folic acid, and protein were most responsible for the early development of anemia [7]. Preterm birth deprives the fetus of a significant accumulation of iron in storage that occurs beyond 32nd week, total body iron deposits in tissues, Hb and serum ferritin are low in premature babies [8].

Materials and methods

Sixty pregnant women who came from in and around Chidambaram who fulfilled the inclusion criteria during the period from July 2001 to March 2002 were included in this study. Among them, 50 delivered at term (37 to 42 weeks) and the 10 delivered prematurely (< 37 weeks). Blood samples were collected from the babies at the onset of labour. 6 ml of venous blood was collected, and 1 ml of it was transferred to an EDTA tube for the estimation of hemoglobin (Hb) and packed cell volume (PCV). The rest of the blood was transferred to a conical centrifuge tube, allowed to clot, centrifuged at 2000 RPM and serum was removed and preserved at -20°C before the analysis of iron and zinc was made. Hemoglobin and packed cell volume were estimated with the aid of Svsmexx autoanalyzer.

Results

The estimated mean hemoglobin concentration of the term babies was 10.88 gm% with the standard deviation of 1.5 gm%. For preterm babies, the mean hemoglobin concentration was 10.33 gm% with the standard deviation of 2 gm% (**Table – 1**).

The mean calculated packed cell volume (PCV) of the term babies was 34.03 % and the standard deviation was found to be 5%. The mean packed cell volume of the premature babies in the present study was found to be 32.75% with the standard deviation of 6.5% (**Table – 2**).

Discussion

There were a total of 60 subjects in the present study. They were divided into two groups. The

first group comprised of mothers who delivered at term (n - 50) (83%) and the second group comprised of mothers who had preterm deliveries (n - 10) (17%) [9]. The various parameters estimated for the mothers and the newborns were hemoglobin (Hb), packed cell volume (PCV), serum iron and zinc. The results obtained were compared and statistical significance was noted. Pearson correlation coefficient statistics was done to find out any significant relationship between the mother and baby separately for the term and preterm pregnancy [10]. We have shown that a lower Hb level at birth was significantly associated with the primary outcome of death before discharge in preterm infants born at ≤32 weeks of gestation independent of GA and BWt [11]. This result is consistent with that observed by Hosono, et al. who demonstrated a reduced risk of mortality in infants with Hb level at birth ≥15 g/dL compared to <15 g/dL in a smaller cohort of 54 infants. However, during the development and validation of Clinical Risk Index for Babies score (n = 812 infants born at 23 to 31 weeks of gestation), anaemia in the first 12 hours of life was not found to be significantly associated with mortality in a univariate analysis, and hence was excluded from the final regression analysis Hct and haemoglobin (Hb) level could be improved by delaying clamping and/or by milking of the umbilical cord in term and preterm infants [12]. In a randomised controlled trial of 46 preterm infants born between 24 and 32 weeks gestation, measured circulating blood volume was higher in infants delivered by delayed cord clamping (≥30 seconds) compared to early cord clamping; the benefit was seen in both vaginal and caesarean section deliveries Though the increased blood volume is noted soon after delivery, the raised Hb and Hct become apparent after several minutes to hours following birth. Providing additional placental blood to the preterm infant by delaying cord clamping for 30 to 120 seconds appears to be associated with better circulatory stability, less respiratory distress syndrome, less need for blood transfusion, and a lower risk of intraventricular haemorrhage (IVH) and necrotising enterocolitis (NEC) currently, there is a paucity of evidence regarding the relationship between Hb level at birth and morbidity and mortality of preterm infants irrespective of the mode of delivery and time of umbilical cord clamping [13]. The objectives of our study were to evaluate the relationship between Hb level at birth and primary outcomes of IVH, NEC, bronchopulmonary dysplasia (BPD), retinopathy of prematurity (ROP), and death before discharge as well as secondary outcomes of receiving red blood cell transfusions, length of intensive care stay, and total neonatal unit days in preterm infants born at ≤32 weeks gestation [14].

Table - 1: The descriptive statistics of hemoglobin for term and preterm babies.

Pregnancy Status	Mean	S.D.	Mini.	Max.	S.E.	t-test values	Significance value
Term Babies	10.88	1.52	7.80	14.70	0.2152	0.99	NS
Pre Term Babies	10.33	1.98	7.80	13.90	0.6281		

Table – 2: The descriptive statistics of packed cell volume for term and preterm babies.

Pregnancy Status	Mean	S.D.	Mini.	Max.	S.E.	t-test values	Significance value
Term Babies	34.02	5.02	23.80	47.20	0.71	0.694	NS
Pre Term Babies	32.75	6.49	25.20	47.80	2.05		

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