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Cord Blood Leukocyte Counts in Term and Preterm Babies in Northern Kerala - A Comparative Study

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Abstract
Background: *Leukocyte counts are frequently done investigation in new born babies especially when neonatal sepsis is suspected. About one third of newborn babies were born as preterm in India and neonatal sepsis is a important cause of mortality and morbidity in neonatal period.*
Objective: *This study was undertaken to establish the reference values for various leukocyte counts among term and preterm babies and to compare the values each other to find out any significant difference.*
Materials and Methods: *Umbilical cord blood samples were taken from 140 babies, 70 of them belongs to each group. Leukocyte counts were detected. The data obtained was analyzed with SPSS version 16.*
Results and Conclusion: *Present study revealed a statically significant decrease in TLC as gestational age increases. ANC had a direct relationship with gestational age, as gestational age increases ANC increases. ALC had an inverse relationship with gestational age, which decreases as gestational age advances. The normal range for TC and ANC were significantly different in both groups. The reference value obtained can be used as background data for early identification and management of neonatal sepsis.*
Keywords: *total leukocyte count, differential count, absolute neutrophil count. term, preterm.*

Introduction

From very beginning, the unique, blood picture of newborn received special attention. In one of the oldest hematological texts "Du Sang et de ses alterations anatomiques" published in Paris in 1889, Hayem discussed the blood at birth in great detail. Hematology of neonate remains a cardinal concern of investigators for many decades. Progress was slow, perhaps in part because of variable obstetric and pediatric practices and difference in timing of observations. Accordingly different hematological values, by different observers had led difficulties to draw a line between normal and abnormal values. Even though last fifty years witnessed tremendous advancement in the field of hematology, routine blood examination Hb, TLC (total leukocyte count), and DC (differential count) are still the

first investigation ordered by a physician. Keeping in pace with global development, laboratory medicine also witnessed tremendous development in techniques and equipments. This facilitated easy and accurate estimation of various tests. Instead of older hemoglobinometer, and Neubauer's counting chambers ,fully automated hematology analyzers were available which requires less amount of blood and gives results at a faster rate, as a print out.

A baby delivered after 37 completed weeks of gestation is called term baby and before 37 completed weeks is called preterm baby and a baby weighing less than2500 gm at birth is called low birth weight baby (LBW)[1] (.LBW can be caused by preterm birth or intrauterine growth retardation[1]. The latter group also referred as small for gestational age (SGA) babies[1],[2]. Both groups are associated with increased mortality and morbidity[1]. About 10 -12 % of babies delivered in India are preterm[3]. According to UNICEF, preterm related complications are, the main causes of neonatal death, globally which accounts for 35% of neonatal deaths[4],[5]. Sepsis is an important preventable cause of mortality in preterm, which contributes to 20 % of neonatal mortality in India[6]. TLC and ANC are important investigation in sepsis screening. Marked improvement in the neonatal care during the past decades resulted survival of large number of preterm babies. Hematological parameters changes as the child grow older and older. The normal values occurring in a in an infant may not be applicable to a newborn and values normal for term baby may not be normal for a preterm baby. Although profiles of various hematological parameters are available in the published literature as established norms, there is no evidence that any studies were done to asses these norms across the population. Hence studies are relevant and needed to establish the normal values for TLC, DC, and ANC in northern Kerala population. The present study is an attempt to compare above parameters in term and preterm babies in north Kerala.

Material and Methods
This study was done to find out normal WBC parameters in term and preterm babies in northern Kerala. It was a cross-sectional study lasted for 1 year. The parameter studied are total leukocyte count (TLC), differential count (DC), absolute neutrophil count (ANC) and absolute lymphocyte count (ALC).

Inclusion criteria: New born babies delivered in Institute of maternal and child health, Government medical college, Kozhikode was included in the study.

Exclusion criteria: Babies born to mothers with documented sepsis, mothers with positive coombs test, mothers or relatives with hereditary spherocytosis were excluded from the study. SGA Babies, babies with birth asphyxia, hydropsfoetalis, and with hepatosplenomegaly were also excluded.

The study was done after obtaining approval from institutional ethics committee. The study group included 70 each of term and preterm babies. 2ml of blood was collected from the placental end of the umbilical cord in to a bottle containing EDTA. Samples were analyzed in fully automated triparthematology analyzer within 30 minutes. Print out of the reports was collected and various data such as TLC, DC.ANC and ALC were obtained. Results were tabulated and analyzed. Statistical evaluation done with, SPSS version 16 to find out, any significant difference between the, two study groups.

Observations and Results
Cord blood was collected from one hundred and forty newborn babies. Seventy each belongs to term and preterm group. The total leukocyte count was estimated and compared (table-1). Results showed that total leukocyte count was higher in preterm babies. The difference seen in the total leukocyte count between term and preterm was highly statistically significant with a p value <0.001. When DC was considered, neutrophils were the predominant cells in term babies but lymphocyte were the predominant cells in preterm

babies. Statistical evaluation showed the differences in differential count between term and preterm was highly significant (Table-2). Mean value for ANC and ALC were $9.81\pm3.88mm^3$ and $5.09\pm1.96mm^3$ in Term and $4.86\pm4.86mm^3$ and $7.12\pm5.18mm^3$ in preterm (table 3). The difference in ANC and ALC between two study groups was statistically significant.

Table -1 Mean total leukocyte count (TLC) in Term and preterm babies

	Term	Preterm
Mean ($\times1000/mm^3$)	13.92	15.89
Standard deviation	4.8	7.62
P value		<0.001

Table -2 Mean differential count (DC) in Term and preterm babies

	Term		Preterm	
	Polymorphs	Lymphocytes	Polymorphs	Lymphocytes
Mean (%)	54.33	38.58	42.54	49.75
Standard deviation	14.1	12.94	14.09	15.11
P value			<0.001	<0.001

Table -3 Mean absolute neutrophil count (ANC) and absolute lymphocyte count (ALC)

	Term		Preterm	
	ANC	ALC	ANC	ALC
Mean ($\times1000/mm^3$)	9.81	5.09	7.12	7.99
Standard deviation	3.88	1.96	4.86	5.18
P value			<0.001	<0.001

Discussion

Neonatal sepsis is one of the most common causes of the neonatal mortality and morbidity in India [6]. Estimation of total WBC count and absolute neutrophil counts are the preliminary investigations in neonatal sepsis. Preterm babies are at a higher risk for neonatal infection when compared to term babies. Neonatologists and pediatricians working at grass root level are constantly facing the question that what values constitute normal range for total WBC count and absolute neutrophil count for a new born baby and is there any difference between term and preterm. The questions are particularly relevant in India where one third of babies are delivered as preterm and facilities for tertiary level neonatal care are beyond the scope of most of the rural population. The present study revealed TL C was more in preterm babies when compared to term babies and the difference was statistically significant. The normal range for preterm and term were 15.89 $\pm$ 7.62/mm^3 and 13.92$\pm$4.8/mm^3 respectively, which clearly shows total WBC count decreases as gestational age increases. Several researchers like Forestier et al and Millar et al had similar observations[7],[8],[9]. In contrast our finding Murkowski J et al reported that there is no correlation between total WBC count and gestational age[10]. Marwah N et al observed wide variation in total WBC count limiting its utility in newborn period[11]. Sepsis in the mother may affect the total count in baby as reported by Stallmach et al[12]. In the present study babies born to mothers with sepsis were excluded, hence the normal range of values revealed in the present study can be used as reference range in clinical practice.

Regarding differential count, proportion of neutrophil, increases as gestational age increases, and proportion of lymphocyte, decreases as gestational age increases. In true reflection to differential count, ANC had a direct relation and ALC had an inverse relation with the gestational maturity. Miller DS et al and Forestier F et al had similar observation[7],[8],[9]. Present study revealed mean values for ANC was 9.81$\pm$3.88/mm^3 for term and only 7.12 $\pm$ 4.86/mm^3 for preterm. Any values above the above range constitute

neutrophilia and below the above range constitute neutropenia.

Conclusion

Prematurity is an important cause for increased mortality and morbidity in newborn period. Preterm babies are at a higher risk of several neonatal conditions including sepsis. Total WBC count and ANC are the basic investigations used for screening for sepsis in newborn. Present study revealed a statically significant decrease in TLC as gestational age increases. ANC had a direct relationship with gestational age as gestational age increases ANC increases. ALC had an inverse relationship with gestational age, which decreases as gestational age advances. The mean value for TC and ANC were significantly different in both groups. The reference value obtained can be used as background data for early identification and management of neonatal sepsis.

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