ABSTRACT: Congenital hypothyroidism is a more common pediatric endocrine disorder and also most common preventable cause of mental retardation. Early diagnosis by measuring Thyroid hormones thyroxine (T4), Thyroid Stimulating Hormone (TSH) levels and prompt treatment is crucial in improving intellectual outcome and for growth of the baby. There are several perinatal factors which influence cord blood TSH, T4 values which has to be considered while interpreting the results. Umbilical cord blood samples were collected for assessment of TSH and T4 in 100 newborns. The influence of birth weight and gestational age on T4 & TSH levels was assessed. On comparing mean TSH and T4 levels among preterm and term infants, it was found that there was statistically significant difference in the mean TSH levels between term and preterm infants. Difference in mean T4 levels among low birth weight and normal birth weight infants was statistically significant. To conclude Birth weight & gestational age have influence on Cord blood TSH and T4 levels and a caution in their interpretation should be considered.

KEYWORDS: Thyroid Stimulating Hormone (TSH); Thyroxine (T4); Perinatal factors; Cord blood.

INTRODUCTION: Congenital hypothyroidism is a more common pediatric endocrine disorder and also most common preventable cause of mental retardation. It has an incidence of 1 in 2,400 to 2,800 births according to various neonatal screening programs. Postnatal thyroid hormone levels in preterm infants will differ from term infants. There will be decreased TSH surge with low T4 level in preterm infants. Thyroid hormones appear to have their most profound effects on the terminal stages of brain differentiation, including synaptogenesis, growth of dendrites and axons, myelination and neuronal migration. Early diagnosis by measuring Thyroid hormone (T4, TSH) levels and prompt treatment is crucial in improving intellectual outcome and for growth of the baby. Hence screening of newborns for congenital hypothyroidism is important. Many western countries have their own screening programs by performing filter spot test for TSH and T4 on 4th and 5th day of newborn. In our country, no such program exists at the national level. As hospital stay is only for short period after delivery it leads to difficulties in follow up of newborn once they are discharged. So in these circumstances cord blood is preferred for its ease and is more practical.

Fuse et al have shown that, cord blood is a good sample for screening of congenital hypothyroidism. Indian Academy of Pediatrics (IAP) has recommended the use of cord blood for screening congenital hypothyroidism.

Some perinatal factors like birth weight and gestational age are known to influence the TSH & T4 levels in cord blood, but are not well studied. The main factors that influence thyroid function...
in preterm infants are immaturity of the hypothalamic-pituitary-thyroid axis, immature thyroid hormone synthesis, immature thyroid hormone metabolism, and systemic diseases.\(^7\) Hence the present study was done to observe the influence of perinatal factors like gestational age, birth weight on TSH, T4 values in cord blood.

**OBJECTIVES:**

1. To study the cord blood T4 & TSH levels.
2. To compare the T4 & TSH values between term and preterm infants.
3. To compare the T4 & TSH values between normal birth weight and low birth weight infants.

**MATERIALS AND METHODS:** It is an observational study conducted at Department of Biochemistry in collaboration with Department of Obstetrics and Gynecology at K R Hospital, a part of MMC & RI Mysore, over a period of one year. Study was approved by institutional ethical committee. Consent was obtained from mothers of newborn. Sample size was calculated with 5% alpha error and 20% beta error based on previous studies. Total numbers of 100 patients were included under study, which includes 50 preterm infants & 50 term infants. Preterm is defined as babies born alive before completion of 37 weeks of pregnancy.\(^8\) Low birth weight (LBW) is defined as a birth weight of a live born infant of less than 2,500 g (5 pounds 8 ounces) regardless of gestational age.\(^9\) Detailed antenatal history of mother including gestational age was taken. Baby was examined thoroughly. Birth weight of newborn & APGAR score was noted down. Newborn born to mothers who are on anti-thyroid drugs or newborn with congenital anomalies, syndromic features or malformations were excluded from the study. 5 ml of umbilical cord blood was collected after ligation of maternal side of cord in a sterilized plain vacutainer and sent to the lab immediately. Serum was separated after centrifuging cord blood. TSH, T4 was measured by CLIA (Chemiilluminesence assay) using immulyte 1000 analyser.

All values were entered in MS excel. Statistical analysis was done using SPSS 16.5 version software. Mean T4 & TSH values were obtained. Statistical difference between the mean values of T4 & TSH between preterm & term babies and also between Normal birth weight and low birth weight babies were calculated using student “t” test. P value <0.05 was considered as statistically significant.

**RESULTS:** A total of 100 newborns were included in study. Out of which 50 were term babies, another 50 were preterm babies. Among 50 term babies 20 were low birth weight babies & 30 were normal birth weight babies.
Table 1 shows mean values of birth weight, maternal age & gestational age of preterm and term infants.

|                | Term Mean±SD | Preterm Mean±SD | P value |
|----------------|--------------|-----------------|---------|
| TSH (µIU/ml)   | 8.52±4.68    | 7.40±6.17       | 0.0352* |
| T4 (µg/dl)     | 8.90±2.25    | 8.64±1.63       | 0.5977  |

Table 2: Comparison of TSH & T4 values, between term & preterm infants

On comparing mean TSH and T4 levels among preterm and term infants, it was found that there was statistically significant difference in the mean TSH levels between term and preterm infants, whereas T4 levels were not significant (table2).

|                | Normal birth weight (NBW) infants Mean±SD | Low birth weight (LBW) infants Mean±SD | P value |
|----------------|-------------------------------------------|----------------------------------------|---------|
| TSH (µIU/ml)   | 8.81±6.03                                 | 8.31±1.36                              | 0.722   |
| T4 (µg/dl)     | 9.18±2.20                                 | 7.70±1.37                              | 0.0334* |

Table 3: Comparison of TSH & T4, between normal birth weight & low birth weight infants

Difference in mean T4 levels among low birth weight and normal birth weight infants was statistically significant (table3).

DISCUSSION: Screening for congenital hypothyroidism is very important to reduce mental retardation. Cord blood collection of sample is preferred for its ease of collection of sample, lower rates of follow up losses, more practical for mothers with short hospital stay following delivery and its utility as an indicator of the prevalence of iodine deficiency disorders. But there are several perinatal factors like birth weight, gestational age, mode of delivery, birth asphyxia, maternal diseases which have effect on cord blood TSH & T4 values. Fuse, et al. also suggested that TSH values in cord blood could be less influenced by perinatal factors than T4 values. There are several studies on influence of perinatal factors on cord blood thyroid profile, but each study shows different results. The present study shows a significant increase in TSH values among term infants compared to preterm infants which is similar to the study conducted by Gurudatt Joshi. But the study done by Desai et al have shown increased levels of TSH in preterm rather than in term newborns. The study done by Gupta, Kim and Armanian did not find any influence of gestational age on it.

The present study also shows that, there is a significant decrease in values of T4, among LBW infants compared to NBW infants. In contrast Desai etal has shown that cord TSH levels fell with increase in weight of newborns. According to studies conducted by Gupta, Kim, Armanian, Feleke Cord blood TSH was not influenced by birth weight. Since there is lot of differences in results of each study, further studies are required to frame best strategies to implement screening programs at national level.
Further scope of this study is to correlate the cord blood T4, TSH values with heal prick sample drawn on 3rd to 5th day after birth. Effect of other perinatal factors on thyroid profile is needed to study in the future.

Hence caution in their interpretation should be considered. It has also not yet been established whether and when substitutive therapy with levothyroxine (LT4) should be initiated in preterm and full-term LBW newborn

CONCLUSION: Perinatal factors have influence on cord blood TSH and T4 levels.

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