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Original Research

Level of thyroid hormone status in normal newborn and low birth weight neonates

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ABSTRACT:
Congenital hypothyroidism (CH) can be the common causes of permanent mental and physical disability if undetected and remain untreated in the neonatal. The aim of this study is to measure the thyroid hormone levels mainly T4 and TSH in normal newborns and low birth weight babies within 4 month of age which will help in the early detection of hypo functional state of thyroid gland and thus treat accordingly. **MATERIAL AND METHOD:** A total of 100 children below the age group of 4 months were taken in this study. Out of which 50 were normal neonates as control and 50 were known cases of low birth weight neonates. Aseptically, 1ml of blood was drawn from the antecubital vein from each patient. The blood samples were then transported to the central laboratory within an hour of collection for analysis of serum TSH and serum FT_4. Statistical analysis of collected data has been done by using SPSS (16.0). P value <0.05 was considered as statistically significant. **RESULT:** Statistically significant differences were observed in the mean serum TSH level of controls (3.57± 1.5 µIU/ml) and neonates with low birth weight (5.2± 2.7 µIU/ml). (p = 0.002). Statistically significant differences were observed in the mean serum Ft4 level of controls (14.1± 3.1pg/ml) and neonates with low birth weight (8.9 ± 2.7 pg//ml). (p = 0.03). After applying Pearson's correlation coefficient it was found that there is a negative correlation between serum TSH and FT4 level (r =-0.310) in cases. Whereas, in control it do not shows any significant correlation. **CONCLUSION:** From this study it can be concluded that preterm or low birth weight neonates are more likely to develop hypothyroidism i.e. high TSH level as compared to normal neonates and need to be diagnosed for FT4 and TSH level.
Keywords: Hypothyroidism, low birth weight neonates, thyroid hormone.

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INTRODUCTION

Thyroid status in the newborn is also influenced by maternal thyroid disease, with maternal thyroid disease associated with adverse pregnancy outcomes including neonatal encephalopathy[1,2]. Among them congenital hypothyroidism (CH) can be the common causes of permanent mental and physical disability if undetected in the neonatal[3]. Many researches have shown congenital hypothyroidism (CH) is the most common disorder seen in the newborns (1 in 4,000 births)[4]. It causes irreversible mental and physical disability if remains undetected or untreated. Diagnosis and treatment of congenital hypothyroidism before 3 months are mandatory to avoid cretinism[4]. Low birth weight (LBW) babies are those whose birth weight is less than 2.5 kg. It has two types: Preterm baby (Babies which are born before 37th weeks of gestation) and small for gestational age baby. Preterm newborn babies are more likely to develop hypo-functional state of thyroid gland due to immaturity of hypothalamo-pituitaty-thyroid axis, immature thyroid

hormone synthesis, immature thyroid hormone metabolism and systemic diseases[5]. Therefore, screening program has become a routine practice in all developed countries and many developing countries in South East Asia have adopted neonatal screening for CH as an essential part of their health services[6] whereas in India it is still to be marked. CH is usually sporadic and occurs in one in 3000-4000 infants. Most infants with CH are normal at birth and show no signs, emphasizing the importance of screening programs in early detection of CH[7,8]. Therefore same author also suggested routine T4 supplemented by TSH estimation be used in mass screening. Although more sensitive, screening by T4 and TSH together is not cost effective, therefore, mostly TSH, and rarely T4 screening, is used around the world. In Europe, TSH screening is preferred, Whilst some centers in the USA prefer primary T4 testing supplemented by TSH [9-13]. The recall rate for primary hypothyroidism in both approaches is 0.05% and the rate of false positive results is higher using primary T4 strategy. TSH screening was shown to be more specific in the diagnosis of CH, while T4 screening was more sensitive in detecting newborns with rare hypothalamic-pituitary hypothyroidism but less specific with a high frequency of false positives mainly in low birth weight and premature babies. Therefore the aim of this study is to measure the thyroid hormone levels mainly T4 and TSH in normal newborns and low birth weight babies within 4 month which will help in the early detection of hypo functional state of thyroid gland and thus treat accordingly.

MATERIAL AND METHOD:

A total of 100 children below the age group of 4 months were taken in this study. Out of which 50 were normal neonates as control and 50 were known cases of low birth weight neonates. Patients were identified by the principal investigator at IPD, ICU, wards and OPD. Complete history and physical examination were taken to confirm diagnosis. If neonates met the inclusion criteria, informed consent was sought from the guardian or the parent after explaining to him or her about the study. Aseptically, 1ml of venous blood was drawn from the antecubital vein from each patient. The blood samples were then transported to the central laboratory within an hour of collection for analysis of serum TSH and serum FT_4.

Statistical analysis of collected data has been determined by using SPSS (16.0). The results of laboratory tests of this study have been summarized as mean ± standard deviation. Mean difference (both participating groups) have be analysed by using student's t-test and chi-square test was used to show the co-relation. P value < 0.05 was considered as statistically significant.

INCLUSION CRITERIA

1. Children below 4 months with a diagnosis of low birth weight and age matched normal children were considered as control.
2. Parent with no history of abnormal Thyroid profile.
3. Only children for whom consent is obtained from parent(s) or legal guardian(s) to participate in the study have been included.

EXCLUSION CRITERIA

1. The neonate with Cardiac disease
2. Kidney disorders,
3. Gastroenteritis and children who are on drugs which can cause thyroid hormones imbalance were excluded from this study.

RESULTS

Comparison of serum TSH level between controls and neonate having low weight by Student's t-test

Parameter	Control group (n=50) Mean ± SD	Neonates having low body weight (n=50) Mean ± SD	p- value
Serum TSH level (µIU/ml)	3.57± 1.5	5.2± 2.7	0.002

Statistically significant differences were observed in the mean serum TSH level of controls (3.57± 1.5 µIU/ml) and neonates with low birth weight (5.2± 2.7 µIU/ml). (p = 0.002)

Comparison of FT4 between controls and neonate having low weight by Student's t-test

Parameter	Control group (n=50) Mean ± SD	Neonates having low body weight (n=50) Mean ± SD	p-value
Serum FT4 (pg/ml)	14.1± 3.1	8.9 ± 2.7	0.03

Statistically significant differences were observed in the mean serum Ft4 level of controls (14.1± 3.1pg/ml) and neonates with low birth weight (8.9 ± 2.7 pg//ml). (p = 0.03)

Tabular representation showing Pearson correlation coefficient (r) and p-value

Parameters	r- value	p-value
TSH-FT4 (in Cases)	-0.310	0.02
TSH- FT4 (in Control)	0.072	0.23

After applying Pearson's correlation coefficient it was found that there is a negative correlation between serum TSH and FT4 level (r = -0.310) in cases. Whereas, in control it do not shows any significant correlation.

DISCUSSION

Thyroid hormones screening in the neonatal stage is important to detect the hypo-functional state of thyroid gland. Most neonates born with congenital hypothyroidism (CH) have normal appearance and usually no demonstrable physical signs. Hypothyroidism in the newborn period is almost always overlooked and delayed diagnosis leads to the most severe outcome of CH, mental retardation, emphasizing the importance of newborn screening. In developed countries, this screening program was initiated in the last century and now it is well established. But in developing country like India, this screening program for thyroid status in newborn can provide the valuable improvement in the morbidity of children's [14,15].

A total of 100 children below the age group of 4 months were taken in this study. Out of which 50 were normal neonates as control and 50 were known cases of low birth weight. Patients were identified by the principal investigator at IPD, ICU wards and also from OPD. After comparison of TSH value this study suggests statistically significant differences in the mean serum TSH level of controls (3.57± 1.5 µIU/ml) and neonates with low birth weight (5.2± 2.7 µIU/ml). (p = 0.002). Which similar to the study of Carrascosa A, et al, 2008[16]. Whereas, the value of FT4 statistically significant differences were in the mean serum FT4 level of controls (14.1± 3.1pg/ml) and neonates with low birth weight (8.9 ± 2.7 pg//ml). (p = 0.03). Which is similar to the value of Mercado M, et al. 1988[17] and contradictory to the result of Carrascosa A, et al, 2008[16] which shows high FT4 value in low birth weight neonates. The reason for low FT4 and high TSH may be due to Primary CH is the most cases. However, transient cases, which may be caused by maternal anti-thyroid medication, exposure to topical iodine, maternal iodine deficiency or excess, maternal TSH receptor blocking antibodies, medications (dopamines, steroids), or prematurity (<30 weeks), may be the reason for such cases in neonates. On the other hand after applying Pearson's correlation coefficient it was found that there is a negative correlation between serum TSH and FT4 level (r = -0.310) in cases. Whereas, in control it do not shows any significant correlation this may be due to the influence of maternal hormone in preterm neonates. The major limitations of this study are the small numbers of patients and all neonates below 4 month of life as a study subject as thyroid hormones level seen to be change according to age of neonates. The results of this present study need to be confirmed in further studies with large sample size and considering the different age group of the patients.

CONCLUSION

From this study it can be concluded that preterm or low birth weight neonates are more likely to develop hypothyroidism i.e. high TSH level as compared to normal neonates and need to be diagnosed for FT4 and TSH level. This disturbance in hormones can lead to different complication during the child development. The newborns that were found hypothyroid were informed to their parents for consultation with the concerned physicians. The physicians then took necessary steps to correct the hypo-functional state of thyroid gland. In this way this study contributed in preventing serious complications of hypothyroidism in future.

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