

SCREENING FOR CONGENITAL HYPOTHYROIDISM IN GREATER NOIDA BY MEASUREMENT OF UMBILICAL CORD THYROXINE (FREE) AND THYROID STIMULATING HORMONE: A MULTICENTRIC HOSPITAL BASED STUDY

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ABSTRACT

Introduction: Congenital hypothyroidism (CH) is the deficiency of thyroid hormone present at birth. It is most commonly caused by the poor development of the thyroid gland or disorder in the production of thyroid hormone. CH is of two types namely permanent and transient CH. Permanent CH associated with deficiency of thyroid hormones which requires life- long treatment but Transient CH associated with temporary deficiency of thyroid hormones, find out at the time of birth, but in the transient CH the treatment will be continued till recovering to normal thyroid hormones production. **Aim:** To screen the neonates for congenital hypothyroidism (CH) by measuring Umbilical cord blood Thyroid Stimulating Hormone (TSH) and T4 (free) levels in neonates. **Materials and Methods:** The present multicentric hospital based study carried out in the tertiary care centres of Greater Noida, Gautam Budha Nagar district. It is based on the findings of Umbilical

cord blood to screen the CH whose mothers having no known history of thyroid disorders. Umbilical cord blood TSH and T4 (free) levels were analyzed to screen the neonates for presence of CH in study area. **Results:** Observed mean \pm SD in umbilical cord blood T4 (free) 1.14 ± 0.30 ng/dl and TSH 10.14 ± 6.14 uIU/ml in neonates patients. Nearly 30.48% of the samples showed levels of TSH >10.0 uIU/ml. Two neonates were found as transient

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hypothyroidism, out of 82 neonates whereas not a single neonate detected as permanent hypothyroidism. **Conclusion:** The present study highlights the importance of neonatal screening programme for the dysfunctions of thyroid gland. Higher prevalence of CH in India may be due to lack of awareness & poor infrastructure. Total 82 neonates screened for the presence of CH in which 39 neonates (47.56%) were male and 43 neonates (52.43%) were female. Out of these two neonates were finally confirmed as transient hypothyroid. To perform the more studies with more population helps as a best indicator of more precise evaluation of thyroid status in neonates. In most of the studies, only TSH levels monitored to ensure optimal neurocognitive outcome. The TSH and T4 (free) should be assayed to screen the neonates for CH. The CH detected neonates by screening kept on treatment as early as possible.

KEYWORDS: Thyroid stimulating hormone (TSH) and free thyroxine, Congenital hypothyroidism (CH), Screening, Umbilical cord blood.

INTRODUCTION

Thyroid hormones are constitutive for normal development of brain in newborns. The CH referred as thyroid hormone deficiency present at birth. The deficiency of thyroid hormone commonly associated with dysgenesis of thyroid gland or dyshormonogenesis of thyroid hormone biosynthesis. The common cause of CH is complete or partial development of thyroid gland during the foetal period.^[1] The CH is classified into permanent and transient CH. The permanent CH associated with persistent deficiency of thyroid hormones which requires life- long treatment. Transient CH associated with a temporary deficiency of thyroid hormone which have been reported in iodine deficient areas^[2] to find out at the time of birth, and treatment will be continued till recovering to normal thyroid hormone production. Some neonates may present with mild symptoms like excessive sleep, low body temperature, reduced interest in feeding, slowness of growth, poor muscle tone, low or hoarse cry, infrequent bowel movements^[3] etc. In developing countries the neonatal screening programme for CH carried out at different scales. Early diagnosis of CH is usually initiated with delay due to the low and non-specificity of signs and symptoms in the first day of life and this concern is associated with the loss of Intelligence Quotient (IQ) to disparate degrees in neonate. It may decline 5 to 10 point in IQ, leads to delays in speech, language development and suppress the attention, memory and skills.^[4] In general, the incidence rate of disease in the world has been estimated 1 in every 3,000-4,000 live births. According to

previous studies, prevalence spectrum of CH in the world varies from 14 per 1000 births in Japan,^[5] 1 in 650 in Turkey,^[6] 1 in 1000 in France,^[7] 1 in 800 in Greece,^[8] 1 in 2,372 in America^[9] and 1 in 1,557 in India respectively.^[10]

MATERIAL AND METHODS

Present multicentric hospital based study was conducted over a period of 2 years from Feb 2014 to Feb 2016. The study was approved by institutional ethics committee. The neonates born in private hospitals of Greater Noida (District Gautam Buddha Nagar) only full term neonates include in the present study. The exclusion criteria were -

1. Baby's mother a case of thyroid disorders/ under treatment for thyroid disorders.
2. Baby's family not permanent resident of study area.

On the first day delivery of baby, detailed head to toe and systemic examination was undertaken by paediatrician. All suspected neonates with CH screening for levels of T4 (free) and TSH. Total 3ml of umbilical cord blood was taken and analyzed for T4 (free) and TSH. The TSH concentration >25 μ IU/ml in the cord blood and T4 (free) below 1.0 ng/dl on initial screening of neonate, sample was rechecked with same sample if the value is same as previous, considered as a positive screening result and classified as transient congenital hypothyroid (TSH level between 25-50 μ IU/ml) and permanent congenital hypothyroid (TSH level > 50 μ IU/ml). Any doubtful abnormal levels of T4 (free) and TSH were repeated within 3 days for confirmation. Patients were followed up till discharge and further follow up was conducted in those cases with CH.

RESULTS

Total 82 neonates screened for the presence of CH in which 39 neonates (47.56%) were male and 43 neonates (52.43%) were female. Male: Female ratio was 39:43. A total of 22 neonates (46.80%) samples showed TSH ≥ 10.0 μ IU/ml. T4(free) values ranged from 0.5 ng/dl as the minimum and 1.82 ng/dl as the maximum value but on the other hand TSH values ranged from 2.28 μ IU/ml as the minimum and 32.3 μ IU/ml as the maximum value.

Out of the total 35 healthy normal neonates selected as control of which 21 neonates (60.0%) were male and 14 neonates (40.0%) were female. The mean \pm SD of selected control T4 (free) was 0.9 ± 0.18 ng/dl and TSH was 7.2 ± 2.2 μ IU/ml respectively.

The mean \pm SD levels of 47 neonate circulating T4 (free) was 1.14 ± 0.30 ng/dl and TSH was 10.14 ± 6.38 uIU/ml. Out of these two neonates were finally proved as transient hypothyroid after repeat and confirmation of T4 (free) level (0.88 ng/dl, 0.50 ng/dl) and TSH level of (32.3 uIU/ml, 32.1 uIU/ml) respectively. No neonate proved as permanent hypothyroidism, letter on during follow up one transient hypothyroid neonate reported expired.

Table 1: Sex wise distribution of neonates.

Sex	Control	Patients	Total
Male	21	18	39
Female	14	29	43
Male & Female	35	47	82

Table 2: Observed cord blood Mean T4 (free) and TSH of neonates.

Neonates cord blood samples	Male	Female	T4 (F) ng/dl Mean \pm SD	TSH uIU/ml Mean \pm SD	p-value
Control (n=35)	21	14	0.9 ± 0.18	7.2 ± 2.2	T4 (F) < 0.05 TSH < 0.05
Neonatal Patients (n=47)	18	29	1.14 ± 0.30	10.14 ± 6.38	
CH Detected	1	1	-	-	
CH Alive	1	-	-	-	
CH Expired	-	1	-	-	

p < 0.05 significant

Table 3: Distribution of neonates (%) by T4 (free) levels.

T4(free) Range (ng/dl)	No. of Neonates	Percentage (%) Distribution
<0.5-0.9	35	42.68
1.0-1.4	39	47.56
1.5-1.8	8	9.76
Total	82	100%

Table 4: Distribution of neonates (%) by TSH levels.

TSH Range (uIU/ml)	No. of Neonates (n)	Percentage (%) Distribution
0-10	57	69.51
10-20	22	26.83
>20	3	3.66
Total	82	100%

DISCUSSION

Screening programme for CH is being carried out worldwide for the last two decades. In India there are several factors like cost, lack of reliable laboratories on a large scale and non-availability of baseline data in Indian population. Our results high levels that 82 neonates screened (30.48%) of the samples showed TSH > 10.00 uIU/ml. This is comparable with Ethiopian study reported by Mekonnen et al.^[11] Klein et al.^[12] The mean value of TSH in our

study is 10.14 ± 6.38 uIU/ml, but Feleke et al observed TSH value was 9.6 ± 7.8 mIU/L in 4206 new-borns. In our study T4 (Free) and TSH both parameter used for the screening of neonates, T4 (Free) is used as backup of TSH. The observed TSH value 2.28u IU/ml as the minimum and 32.3uIU/ml as the maximum. For the screening purpose, we have used TSH cut-off value 25.0 uIU/ml. In an earlier study, Manglik et al.^[13] used TSH cut-off value 20 mIU/L, Feleke et al^[14] measured TSH from heel pricks in neonates from 6 h of life up to 7 days old neonates and used the TSH cut-off value 29.4 mIU/L. In our study, two neonates diagnosed CH (transient) out of 82 but literature reported other Indian studies probably geographic and ethnic differences may be responsible and of course this study of 82 samples is too small to access the prevalence of CH. Previous studies of India suggested incidence of CH in Mumbai 1:2800 live births.^[15] Incidence of CH in Manipur 1:1000^[16] and incidence of CH in Karnataka was 1:600.^[17]

To resolve the disease characteristics researchers will need to conduct a study with more population coverage. The incidence of neonatal hypothyroidism as emulated in cord blood thyroxine and thyrotrophin levels is significantly higher in regions with iodine deficiency and endemic iodine deficiency disorders (IDD). To find out the incidence of CH by measuring the cord blood thyroxine levels at birth is most useful and reputable method to assess the risk of brain damage in infants and children growing up in an iodine deficient climate.^[18] In a study reported by Chandra et al in selected areas of Imphal west district of Manipur showed that the total goitre rate was 34.96% showing that Iodine deficiency disorders is a severe public health problem. Iodine content in drinking water ranged from 1.8 ug/L to 2.6 ug/L showing that the studied region is environmentally deficient. Manipur is located in the foothills of the Himalayas. Owing to its geographical location, the entire state is in the environmental iodine deficient belt of India.^[19] Elevated TSH in the newborn indicates the poor supply of thyroid hormones to the developing brain, and therefore constitutes the only signal that allows the prediction of possible impairment of mental development at population level, which is the main consequence of iodine deficiency, in the absence of iodine deficiency.^[20]

CONCLUSION

The present study is based on the findings of 82 neonates screened for thyroid hormones (TSH) reported that 30.48% of the studied neonates have TSH values in the upper normal range. Furthermore, in the study there was two neonates diagnosed with CH out of 82 which is much higher than the world documented report. To find out the incidence of CH by

detecting the cord blood TSH levels at birth which is most useful and reliable diagnostic criteria to assess the risk of brain damage of infants and growing children in an iodine deficient areas. Higher TSH levels in the neonate indicate insufficient supply of thyroid hormones to the developing brain, and therefore constitutes the only indicator that allows the prediction of possible impairment of mental development at infancy stage, which is the main consequence of iodine deficiency.

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