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Original Research Paper

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SCREENING FOR CONGENITAL HYPOTHYROIDISM IN TERTIARY CARE HOSPITAL OF NORTHERN INDIAN HILLY STATE

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ABSTRACT **Introduction:** Congenital hypothyroidism remains one of the most common preventable causes of mental retardation among children. Screening for congenital hypothyroidism remains one of the most cost-effective tools to prevent mental retardation in the population. **Objective:** To find out the incidence of Congenital Hypothyroidism in a tertiary care hospital of Shimla, Himachal Pradesh, using cord blood TSH level as a screening test. **Methods:** 3 ml of cord blood was collected from placental site of all the live newborns delivered during the study duration. TSH and FT4 levels were measured. **Results:** There were a total of 4057 newborns who were screened. On evaluation of serum TSH and serum FT4 levels no patient was reported with congenital hypothyroidism.

KEYWORDS : Congenital hypothyroidism, Screening, TSH, Cord blood

INTRODUCTION:

The term "newborn screening" is used to describe various types of tests that are done during the first few days of a newborn's life for certain conditions that cause severe health problems if they are left undetected.[1] Newborn screening that is appropriately planned and implemented has the potential for preventing unfavourable health outcomes.

The term 'congenital hypothyroidism' was introduced more than 65 years ago when Radwin et al. first described children with hypothyroid-associated features of severe intellectual disability and growth retardation. Congenital hypothyroidism (CH) is the commonest cause of preventable mental retardation and CH also satisfies all the criteria for being included in the new born screening (NBS).[2,3]

Congenital hypothyroidism is a common congenital endocrine disorder with an overall incidence ranging from 1 in 3000 to 1 in 4000 newborn infants.[4,5] The estimated incidence of CH in India is 1:2500-2800 live births.[6,7]

Primary congenital hypothyroidism, the most common form of congenital hypothyroidism, occurs as a result of developmental defects of the thyroid gland, known as thyroid agenesis or dysgenesis, or is due to disruptions in thyroid hormone biosynthesis, also known as thyroid dyshormonogenesis. Secondary congenital hypothyroidism, also termed central congenital hypothyroidism, is caused by deficiencies in TSH.

Less commonly, the hypothyroidism is transient which can be caused by transplacental passage of maternal medication, maternal blocking antibodies, or iodine deficiency. In rare cases, CH may result from a pituitary or hypothalamic abnormality.[8]

Newborn screening aims at the earliest possible recognition of disorders to prevent the most serious consequences by timely intervention. NBS for congenital hypothyroidism and for other metabolic disorders like phenyleketonuria and congenital adrenal hyperplasia is done in most of the developed world but not routinely done in developing countries including India.

In India, the first NBS programme for CH was at BJ Wadia Hospital, Mumbai in 1982 using cord blood TSH and subsequently in 1984 using postnatal DBS T4.[7]The prevalence was 1:2481 and 1:2804 respectively, higher than reported worldwide (1:3000–4000). Subsequent studies from various parts of India have reported higher prevalence which may be related to variations in ethnicity, consanguinity, nutritional and environmental factors including iodine deficiency, and improved hormone assays.[8,9,10]

Rationale of Screening for CH

It has been observed that most babies with CH appear normal at birth and show minimal evidence of thyroid deficiency.[9,10,11] Clinical diagnosis is made in only 10% children in the first month of life and 30% in the first 3 months. Hence there is a high risk of delayed diagnosis based on clinical examination alone.[12]

Presently there is no NBS screening programme exist in India. There is no national representative data on CH available at present however small data from different states is available.[1,6,13-15] A study conducted by Kapil U et al [16] in Kangra, Himachal Pradesh the prevalence of neonatal hypothyroidism was found to be 4.4%. So this study was planned to find out the incidence of congenital hypothyroidism in Shimla, Himachal Pradesh

MATERIAL AND METHODS:

This prospective observational study was conducted in the Department of Pediatrics, IGMC Shimla, from 1st November 2018 to October 2019. 4057 live newborns delivered at labour room and operation theatres of KNH, Shimla were included in this study after obtaining consent from either parent.

Method of sample collection:

3 ml of cord blood was collected from placental site of newborn and were then transported to the laboratory within 24 hours for processing in Biochemistry laboratories for analysis of TSH levels. TSH levels were measured using Electro-chemiluminescence method.

RESULTS:

During study period, 4057 newborns were screened who were delivered in Kamla Nehru Hospital Shimla. Detailed history of mother was taken and cord blood investigation of newborns was done. Newborns who had cord blood levels of more than 20 μIU/ml underwent further investigations i.e. Serum TSH and Serum FT4 levels.

Table 1: Values of cord blood TSH and FT4 in newborns screened

PARAMETER	NUMBER	MEAN	SD
CORD BLOOD TSH	4057	10.03	7.35
CORD BLOOD FT4	4057	0.74	0.16

Table 2: Cord blood TSH value (μIU/ml) in newborns.

Cord blood TSH Levels	NUMBER	PERCENTAGE
<20	3716	91.6
>20	341	8.4
TOTAL	4057	100

In our study, out of total 4057 newborns who were screened, 341 (8.4%) came out to be positive for congenital hypothyroidism on cord blood TSH value of more than 20 μIU/ml. Out of these 341 newborns we were able to further evaluate only 248/341 (72.7%) of newborns. There was loss to follow up of 28% subjects as the newborns comprised of migratory population who left the place, some had given wrong contact number so we were not able to contact them and some were from far flung areas so they were not able to come for follow up. On further evaluation of serum TSH and serum FT4 levels no patients was reported with congenital hypothyroidism.

Table 3: Serum TSH and FT4 mean values in newborns screened positive on cord blood TSH value

PARAMETER	NUMBER	MEAN	SD
SERUM TSH	248	5.24	3.26
SERUM FT4	248	1.25	1.21

DISCUSSION:

We have used a cut-off of 20 mIU/L, which has also been used in studies across the world. Newborns with cord blood TSH value of more than 20 μU/ml were considered as positive and were further evaluated. Newborns with levels of cord blood TSH more than 20 μIU/ml were screened further at 72 hours of life through venous blood sampling for serum TSH and serum FT4 levels.

We observed that a total of 341 (8.4%) newborns screened were positive for congenital hypothyroidism where as Nasheeda CM et al [17] observed 5.8% newborns as screen positive. The lower percentage of screen positive in their study can be due to less sample size than our study and inclusion of only term newborns in their study. Chaudhary M et al [18] in their study observed that with a cut-off value of 20 μU/ml the newborns who were screened positive were 5.57% (533/9558). Keeping cord TSH cutoff 20 mIU/L, our recall rate was much higher than reported by Manglik et al [19] (1.833% in Kolkata). However, their sample size was quiet small and included only term neonates.

Anand MR et al [20] in their study observed that all the newborns who were diagnosed as case of congenital hypothyroidism had cord blood TSH levels of more than 20 μU/ml but one case where the level was 18 μU/ml. They observed the incidence of congenital hypothyroidism in their study as 4.1 per 1000 live births (8/1950). However in our study no case of congenital hypothyroidism was reported.

Strengths and limitations:

The major strength of our study was large and adequate sample size. Another strength of our study was that we used both cord blood TSH and FT4 and further serum TSH and FT4 were evaluated in patients with cord blood TSH value of more than 20 μIU/ml. However there was limitation in our study that we were not able to follow up all patients resulting in drop out of about 29% of subjects.

Recommendation:

Only one episode of evaluation of TSH levels may have the chance to miss delayed rise of TSH. In order to reduce the missing cases of congenital hypothyroidism especially in preterm infants, there is great need for a practicable systematic screening test with high sensitivity.

Few approaches in order to reach this goal are either to reduce the cut off value to increase the sensitivity of screening test or repetition of the screening test can be done in LBW and preterm infants in order to not miss the delayed rise of TSH which can lead to further complications if not treated on time. In order to avoid growth and developmental complications later in life, improvements in the NBS program are needed to identify and treat CH. Appropriate and adequate initial therapy and follow-up are essential in CH.

Conclusions and implications:

Screening in the first days of life seems to be the most important step in the approach to CH and replacement of related deficient hormones, thus preventing consequences that cannot be remedied. Hence, optimizing the sensitivity of the screening test has great importance especially for this high risk group of neonates.

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