ASSESSMENT OF THYROID FUNCTION IN NEONATES BORN TO HYPOTHYROID MOTHERS

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ABSTRACT

Introduction

Congenital hypothyroidism is a preventable cause of intellectual disability in childhood. It is one of the commonest endocrine conditions encountered in the neonatal period. Maternal Thyroid Status has long been recognized as having an impact on the developing fetus, and more recently a family history of thyroid dysfunction has been implicated as a risk factor in congenital hypothyroidism (CH). Therefore, this study focused on thyroid screening in neonates born to hypothyroid mothers.

Objective

The aim of this study was to assess the thyroid function in neonates born to hypothyroid mothers.

Methodology

This was a hospital based cross-sectional observational prospective study conducted at Birat Medical College and Teaching Hospital from March 2021 to May 2022. A total of 109 neonates born to hypothyroid mothers were included in the study. Thyroid functions of these babies were assessed at 72 hours of life. The data was entered into Microsoft offices excel and analyzed using statistical package for social sciences (SPSS 20).

Result

Out of 109 neonates born to hypothyroid mothers, <1% was found to have a high TSH Level above the upper limit of reference cut off value (20miu/L) and was considered to be abnormal (congenital hypothyroidism).

Conclusion

All the newborns except one had normal TSH levels which were probably due to early diagnosis and timely initiation of treatment to the mothers with hypothyroidism.

KEYWORDS

Congenital hypothyroidism, maternal hypothyroidism, neonates, thyroid function test.

INTRODUCTION

Hypothyroidism is a very commonly encountered medical condition in the female population. Prevalence is estimated to be between 2.5% and 4.8% among women of childbearing age[1,2] with Hashimoto's disease being the commonest cause. Maternal thyroid status has long been recognized as having an impact on the developing fetus, and more recently a family history of thyroid dysfunction has been implicated as a risk factor in CH.[3,4]

Since hypothyroidism is easily treated, timely detection and treatment of the disorder could reduce the burden of adverse fetal and maternal outcomes, which are very commonly encountered.

In normal pregnant women, the thyroid gland maintains euthyroidism with only minor fluctuations in serum T4 and TSH. However, in women with limited thyroid reserve, due to thyroid autoimmunity or iodine deficiency, hypothyroidism can develop. Untreated hypothyroidism is associated with several complications, most notably preeclampsia, abruption placentae and increased risk of spontaneous miscarriage, perinatal mortality, preterm delivery and low birth weight.[5] More recently, the potential adverse impact of maternal hypothyroidism even when subclinical, on neuro developmental outcomes in the offspring has been recognized.[6] Hence, Hypothyroidism should be corrected before initiation of pregnancy, replacement dosage should be augmented early in pregnancy, and euthyroidism should be maintained throughout.[7]

Congenital hypothyroidism is one of the commonest endocrine conditions encountered in the neonatal period with an incidence of between 1:3000 and 1:4000.[3,8]

It is considered the commonest preventable cause of intellectual impairment in childhood.[8,9]

Congenital hypothyroidism (CH) is a condition characterized by a deficiency in thyroid hormone present from birth and may be due to a problem with the thyroid gland itself or may result from suppression of thyroid function secondary to disease processes outside the gland.

Primary congenital hypothyroidism consists of disorders of thyroid development or of thyroid hormone synthesis.[10] Transient congenital hypothyroidism can be due to iodine deficiency or excess, maternal consumption of goitrogens or antithyroid medications during pregnancy, transplacental passage of TSH receptor-blocking antibodies, and neonatal very low birth weight and prematurity.[11] Even transient hypothyroidism can cause adverse neurologic outcome in a newborn.

Several risk factors have been associated with CH and although none of these have been proven as causative in the pathophysiology of CH. There has historically been a strong focus on the familial association as a risk factor for the disease.[12,13]

Based on a publication by Ogilvy-Stuart in 2002, it has been the practice of many pediatric centers to perform serum thyroxine (T4) and thyroid stimulating hormone (TSH) on babies born to mothers with hypothyroidism in the weeks following birth.[14] This testing is performed as it has traditionally been perceived that these infants are higher risk of CH, with family history of hypothyroidism acting as an independent risk factor for the condition and the transfer of maternal antibodies causing transient hypothyroidism. Hence it is important to monitor babies born to mothers with hypothyroidism.

The aim of this study was to investigate thyroid function tests of neonates born to mothers with hypothyroidism.

METHODOLOGY

This was hospital based cross-sectional observational prospective study conducted at Birat Medical College and Teaching Hospital from March 2021 to May 2022.

A total of 109 neonatal cases born to hypothyroid mothers irrespective of mode of delivery were included .Thyroid functions of these babies were assessed at 72 hours of life (as per the newborn thyroid screening protocol). Neonates born with complex congenital abnormalities were excluded. The study was conducted after obtaining ethical clearance from IRC (Ref: IRC-PA-102/2077-78) of Birat Medical College and Teaching Hospital. The personal details of the newborn, clinical findings, thyroid function test reports, and maternal history of hypothyroidism were noted. The definition of maternal hypothyroidism was based on the diagnosis of an obstetrician, and thyroid hormone replacement done throughout pregnancy. Informed consent was taken from the guardian of neonate. The data was entered into Microsoft office excels and analyzed using statistical Package for social sciences (SPSS 20.0). TSH values>20mu/l after 72 hours of neonatal life being considered abnormal (Nelson textbook of pediatrics).

RESULTS

Out of 109 neonates born to hypothyroid mothers, Seventy Eight (71.55%) babies were found to have TSH levels ranging from 1-5 miu/L, Twenty (18.34%) babies had TSH levels ranging from 5-10 miu/L, 8 (7.33%) babies had TSH Levels ranging from 10-15mu/L, 2(1.83% babies had TSH Levels ranging from 15-20 mu/L), 1 (0.91%) Baby had TSH Levels ranging from 30-35 miu/L with a mean TSH 4.81 mu/L.

1 (<1%) Case was found high TSH Level above the upper limit of reference cut off value (20miu/L) and was considered to be abnormal (congenital hypothyroidism). Thus only this patient went to have treatment for CH.

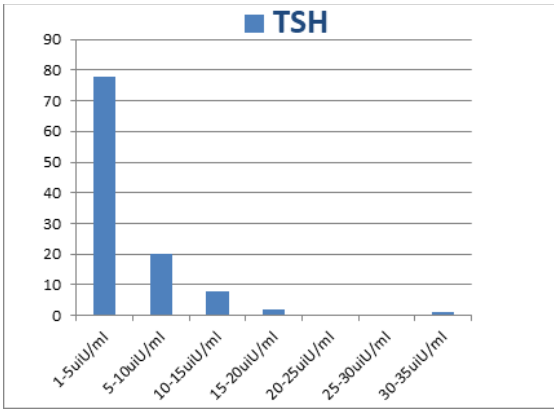

Figure 1: Newborn TSH levels

DISCUSSION

Congenital hypothyroidism is a serious condition that is being screened as part of the National Newborn Screening Programme in many countries. In this study only one case was found to have abnormal thyroid function test among babies born to mothers with hypothyroidism. This study was similar to Ireland study (conducted by Matthew McGovern et al) where <1% of the babies born to hypothyroid mothers went on to have treatment for CH. This could be probably a result of mothers being screened early and early initiation of appropriate treatment. However, Infants of mothers with thyroid problems are more likely to have elevated TSH and higher recall rate on neonatal thyroid screening.[15]

There is limited study found of practicing TSH screening in context to Nepal. But practicing neonates TSH screening was adopted in the USA and many other countries as part of the newborn screening programme since 1970s.[8,9] Although methodology differs internationally, the goal of screening is the detection of primary CH which accounts for 85% of cases.[9]

The American academy of pediatrics (AAP) has published a guideline on Screening for CH which was reaffirmed in 2012. As part of the guideline, there is a recommendation that neonates with a family history of hypothyroidism be screened at birth with blood from the umbilical cord to promote early detection and subsequently provides recommendations based on initial results.[16]

The European society of pediatrics endocrinology has also published a guideline on screening, diagnosis and management of CH where a policy of second screening 2 weeks after the initial bloodspot is recommended in high-risk cases; however a family history of hypothyroidism is not included in this category. [17]

A three year duration of study from the UK, which followed 406 infants who had TFTs checked due to maternal thyroid dysfunction, did not identify any infants requiring thyroid replacement therapy for thyroid dysfunction.[18]However, one Italian study reports prospectively following infants of mothers with hypothyroidism (secondary to autoimmunity) with TFTs over the 1st month of life.[19] Three out of 129 of these infants had thyroxin therapy initiated based on mild TSH elevation (range 10.5-13.6 IU/L) at either 2 or 4 weeks of age. All three-discontinued thyroxin treatment permanently between year one and two of life. Neuropsychological evaluation of these infants was normal using Griffith's scale 4 years of age.

Effects of maternal hypothyroidism on fetal brain development are not well defined; several recent reports indicate that IQ is modestly affected. These studies have increased the concern that even mild hypothyroidism can interfere with normal brain development. Indeed, several authors have proposed screening programs for thyroid dysfunction during or even before pregnancy.

Rovet reported the long-term outcome in a large cohort of Toronto based children with congenital hypothyroidism identified by newborn screening from infancy to adolescence. Early findings revealed a 5-10- point decline in IQ, poorer visuomotor and visuospatial abilities, delayed speech and language development, selective neuromotor deficiencies, and poorer attention and memory skills, which were correlated with different disease and treatment factors. Furthermore, 30% of these adolescent patients were not receiving an adequate l-thyroxin dose.[20]

Derksen-Lubsen et al in a meta-analysis suggested that at least part of the brain damage in patients with CH was caused in utero and may not be prevented by initiation of early treatment after birth. All studies analyzed by them had shown a trend toward lower IQ and poorer motor skills in congenital hypothyroidism patients compared with controls; meta-analysis showed the deficit to be significant. The most important independent risk factor for the eventual outcome was the severity of congenital hypothyroidism (defined by initial T4 at the moment of diagnosis and skeletal maturation). However, two changes in management, early initiation of treatment, and higher dose l-thyroxin therapy to mother may abrogate or ameliorate any impact of thyroid hormone deficiency on intellectual development.[21] This explains need for screening of all pregnant mothers for hypothyroidism in early part of gestation.

Women with thyroid disorders should be followed closely throughout pregnancy for the prevention of obstetric complications, and their newborn infants should be followed closely in the first months of postnatal life for thyroid dysfunction.

CONCLUSION

All the newborns except one had normal TSH levels which were probably due to early diagnosis and timely initiation of treatment to the mothers with hypothyroidism. Infants of mothers with thyroid problems are at risk for elevated TSH. Therefore Thyroid screening should be mandatory to all neonates born to hypothyroid mothers. Early detection of congenital hypothyroidism and their prompt treatment is essence to prevent the child from intellectual disability.

RECOMMENDATION

Such studies could be done in multiple Centers so that conclusion can be generalized. Number of the study subject could be increased to increase the power of the study.

LIMITATION OF THE STUDY

This study was focused only on thyroid screening on limited number of the subject. Still, further research is warranted to detect the causes of congenital hypothyroidism with greater sample size.

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CONFLICT OF INTEREST

None

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