



INFLUENCE OF MATERNAL THYROID DYSFUNCTION ON NEONATAL TSH LEVELS

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ABSTRACT Thyroid hormones play a critical role in normal CNS maturation. Fetus is entirely dependent on maternal thyroid hormone before the onset of endogenous thyroid hormone production. Maternal hypothyroidism alone during early gestation can lead to mild but significant cognitive impairment of the offspring. Infants of mothers with thyroid problem are more likely to have elevated TSH during newborn screening. **Aim of the Study:** The study was done to know whether maternal thyroid dysfunction can influence neonatal thyroid profile. **Materials and Methods:** This was a prospective cohort study in which 118 neonates who satisfied the inclusion criteria were serially enrolled during the study period. Of the 118 neonates enrolled, 59 neonates were born to mothers with thyroid dysfunction and 59 neonates were born to normal mothers. TSH estimation was done in all enrolled neonates at 72 hrs and result interpreted using ISPAE guidelines. **Results:** Out of 118 neonates, 107 babies (90%) had a TSH value of < 10 mIU/L, 10 (8.5%) had TSH between 10 and 40 mIU/L and 1 baby (0.8%) had TSH > 40 mIU/L. All the neonates who had TSH > 40 mIU/L were born to mothers with thyroid dysfunction. Percentage of neonates had TSH bw 10-40IU/L is two time higher in neonates born to hypothyroid mother in comparison to euthyroid mothers. **Conclusion:** It may be concluded that maternal thyroid hormones play a crucial role in the thyroid function status of newborns and their early neurodevelopment.

KEYWORDS : Congenital Hypothyroidism, Thyroid Hormones, Thyroid Stimulating Hormone, Maternal Thyroxine, Newborn screening

INTRODUCTION:

Congenital hypothyroidism(CH) is the most common cause of preventable intellectual disability. In India, the first New born screening (NBS) programme for CH was done at BJ Wadia Hospital, Mumbai in 1982 using cord blood TSH and subsequently in 1984 using postnatal Dried blood sample T4. The prevalence was 1:2481 and 1:2804 respectively which was 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

Maternal thyroxine is critical for early neurodevelopmental maturation in the fetus⁽¹⁾, fetus is entirely dependent on maternal thyroid hormones before the onset of endogenous thyroid hormones productions which starts at 10-12 weeks of gestational age. Its supply to the fetus is controlled by placental metabolism⁽²⁾ and thyroid status of the mother. In pathological situations like maternal thyroid dysfunctions during pregnancy can result in Inadequate passage of thyroid hormones to fetus which might contribute to the neurodevelopmental delay⁽³⁾, impaired motor function and growth

Infants of mothers with thyroid problems are more likely to have elevated TSH during screening. Among half of newborns with abnormal screening values will have transient hypothyroidism – one of the causes for this being maternal thyroid receptor binding 3 antibodies. Other causes are intrauterine exposure to maternal antithyroid drugs, mutation in TSH-R⁽⁴⁾, endemic iodine deficiency, prenatal or postnatal exposure to excess iodide (povidone iodine). As there are lack of studies to know the effect of maternal thyroid dysfunction on neonatal TSH levels. Hence The present study is designed to access the influence of maternal thyroid dysfunctions on neonatal TSH level and to aid in prevention of mental retardation due to congenital hypothyroidism by prompt early initiation of treatment based on screening and confirmatory tests

I. METHODOLOGY

The prospective cohort study was conducted at Vydehi Medical college Hospital, Whitefield Bengaluru, for 18 months from February 2021. A total of 118 newborns, from mothers who qualify the inclusion criteria and agree to participate in the study was enrolled

Selection Criteria Of The Patients:

Inclusion Criteria:

1. Full-term pregnancy (37-42 week)
2. APGAR score of >7 at one minute and >9 at five minutes of birth
3. Absence of significant illness or major congenital malformations

Exclusion Criteria:

1. Neonates born with perinatal asphyxia.
2. Newborns with birth weight 4 kg.
3. The mothers had complications such as cardiac disease, GDM/hypertension

Data regarding the mother's age, parity, antenatal events or complications as well as maternal health problems, maternal TSH levels measured in 1st trimester, medications used and type of delivery was collected. In all the enrolled newborns, TSH estimation was done at 72 hr of age. The Indian society for Paediatric and Adolescent endocrinology (ISPAE) guidelines⁽⁵⁾ was used to interpret the TSH values in the neonates.

Statistical Analysis-

Descriptive statistics such as percentage, mean, standard deviation were used to describe the background variables of the sample patients. Z test for proportion was used to find association between neonatal TSH and gender. Statistical analysis was carried out using SPSS 17.0 version.

II. RESULTS

In our study total 118 neonates fulfilling inclusive criteria were enrolled

Distribution of study group based on thyroid status of mother. Out of 118, 59 (50%) neonates were of normal mother and 59 (50%) neonates were of mothers suffering from hypothyroidism

Fig I: Distribution based on neonatal TSH levels

Out of 118 cases 107(90.7%) neonates had TSH levels < 10 uIU/ml, 10 cases (8.5%) had TSH between 10 – 40 uIU/ml and 1 case (0.8%) had TSH > 40 uIU/ml

Table I: Effect of maternal TSH levels on neonatal TSH levels

Among 118 neonates, 20 neonates had Maternal TSH Levels >3 IU/ml, of which 14 (70.0%) of cases had TSH level <10 uIU/ml, 5(25%) had TSH level 10-40uIU/ml, 1(5%) had TSH level >40 uIU/ml. 98 neonates had maternal TSH level < 3 IU/ml of which 93(94.9%) cases had TSH level <10 uIU/ml, 5(4.1%) had TSH level 10-40uIU/ml.

Table II: Distribution of neonatal TSH based on sex.

Among 118 neonates, 1 Neonate who had TSH >40 uIU/ml was female, 10 neonates had TSH between 10-40 uIU/ml out of which 4 (6.8%) were male and 6(10.2%) were female and 107 had TSH <10 uIU/ml out of which 55(93.2%) were male and 52 (88.1%) were female.

Table III: Comparison of TSH levels at 72 hr of life among infants born to hypothyroid and euthyroid mother

Among 59 neonates born for mothers with normal thyroid function 56 (94.9 %) had TSH values

<10uIU/ml, 3 (5.1%) had TSH values between 10-40uIU/ml Among 59 neonates born to hypothyroid mothers 51 (86.4 %) had TSH values <10 uIU/ml, 7 (11.9%) had TSH values between 10-40uIU/ml and 1 had (1.7%) had TSH value >40uIU/ml

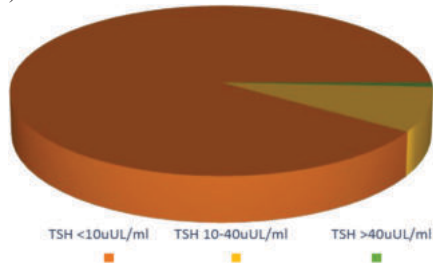


Figure I Distribution based on neonatal TSH levels

Table I

Maternal TSH level	Neonatal TSH level at 72 hours						Total
	<10IU/ml		10-40IU/ml		40IU/ml		
	count	%	count	%	Count	%	
<3U/ml	93	94.9%	5	5.1%	0	0.0%	98
>3U/ml	14	70%	5	25.0%	1	5.0%	20
Total	107	90.7%	10	8.5%	1	0.8%	118
	P:0.001						

Table II:

Neonatal TSH level at 72 hours	Gender			
	Male		Female	
	Count	%	Count	%
<10 uIU/ml	55	93.2%	52	88.1%
10-40 uIU/ml	4	6.8%	6	10.2%
>40 uIU/ml	0	0.0%	1	1.7%
Total	59	100.0%	59	100.0%
	P=0.48			

Table III:

Maternal TSH Levels	Neonatal TSH level At 72 hours						Total	
	<10 uIU/ml		10-40 uIU/ml		>40 uIU/ml			
	Count	%	Count	%	Count	%	Count	%
Neonates of Normal Mother	56	94.9%	3	5.1%	0	0.0%	59	100.0%
Neonates of Hypothyroid Mother	51	86.4%	7	11.9%	1	1.7%	59	100.0%
Total	107	90.7%	10	8.5%	1	0.8%	118	100.0%
P=0.24								

DISCUSSION:

Maternal hypothyroidism alone during early gestation can lead to mild but significant cognitive impairment of the offspring. This is because foetus is entirely dependent on the maternal thyroxine before the onset of endogenous thyroid hormone production. Infants of mothers with thyroid problems are more likely to have elevated TSH during newborn screening. Maternal thyroxine is critical for normal CNS maturation in the fetus. Inadequate passage of thyroid hormones, can lead to suboptimal fetal thyroid hormone levels which might contribute to the neuro developmental delay associated with such conditions. Thus maintaining normal maternal thyroid hormone status is likely to be the primary factor in ensuring adequate trans placental thyroid hormone passage and appropriate iodide supply to the fetus. Despite the critical importance of thyroid hormone on multiple organ systems especially the brain most infant with congenital hypothyroidism appear normal at birth. So every infant should be tested before discharge from the nursery optimally by 48 hours to 4 days of age.

In this study we investigated the thyroid status of the neonates at 72 hours of age who were delivered in our hospital during the study

period. We were able to enroll total of total of 118 subjects. Out of which 59 (50%) neonates were of normal mother and 59 (50%) neonates were of mothers suffering from hypothyroidism. TSH levels was done for all neonates at 72 hrs of life, out of 118 cases, 90%(107 cases) of cases showed normal TSH, 0.8% (1 case) showed high TSH level (>40uIU/ml) and 8.5% cases had TSH bw 10-40uIU/ml, incidence of Hypothyroidism is high in comparison to general population. The high prevalence of hypothyroidism may also be contributed by the dietary deficiency of iodine and geographic variation.

In our study the predominance of female neonates in groups of TSH level >40uIU/ml and TSH level 10-40uIU/ml in comparison to male This agrees with the study by Park et al⁽⁴⁾ who has reported a female to male ratio of 2:1 for true congenital hypothyroidism and 1:1 or lower in case of transient hypothyroidism. Nearly all screening programs report 2:1 female to male ratio in congenital hypothyroidism⁽⁵⁾

In our study the incidence of hypothyroidism (1.7%) and elevated TSH (11.9%) is high among neonates born to hypothyroidism mother compare to infants born to euthyroid mother which is statistically insignificant due to less study group, also incidence of hypothyroidism is more (5%) in Infants born to mother with high TSH levels (>3U/ml) in comparison to infants born to mother with normal TSH levels (<3U/ml) shows that there is significant influence of maternal thyroid function on neonates. Similarly in a study done by Menon et al⁽⁷⁾ 16 newborns with elevated TSH, 2 newborns with TSH >40mU/L and 8 out of 14 newborns with TSH between 10 and 40 mU/L, were born to mothers with thyroid dysfunction.

CONCLUSION:

Our study concludes that neonates born to mothers who had hypothyroid showed higher TSH level at 72 hours after birth when compared to neonates born to mothers who did not had hypothyroidism. It can also be concluded that the female neonates were mostly affected by hypothyroid mothers. On comparison between Neonates of Normal Mother and Neonates of Hypothyroid Mother the latter group showed higher number of neonates having >40uIU/ml TSH level. Thus it can be concluded that maternal thyroid hormones play a crucial role in the thyroid function status of newborns.

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