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Maternal hypothyroidism to congenital hypothyroidism in neonates and neonatal outcomes

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Abstract
Introduction: Hypothyroidism is widely prevalent in pregnant women and the rate of detection, especially on a developing country like India, has not kept pace with the magnitude of the problem (1).
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 (1).
Congenital hypothyroidism can be caused due to thyroid dysgenesis, disorders of thyroid hormone synthesis, iodine deficiency or excess as well as trans-placental transfer of maternal antibodies or medications. (1). Congenital hypothyroidism is a preventable cause of intellectual disability. Hence it is important to monitor neonates born to mothers with hypothyroidism
Hypothyroidism is widely prevalent in pregnant women and the rate of detection, especially in a developing country like India needs to be treated and detected early (3).
Aims and Objectives: To detect and prevent congenital hypothyroidism in neonates born to mothers with hypothyroidism and their neonatal outcomes. To screen the neonates for congenital hypothyroidism.
Methods: All the pregnant women visiting the antenatal OPD at KIMS Narketpally were screened for hypothyroidism during the first antenatal visit.
The present study was conducted on 27 women with the diagnosis of hypothyroidism in pregnancy who came to the antenatal OPD and who were delivered at KIMS Narketpally.
The neonates born to these mothers were screened for hypothyroidism on day 5 of life in order to detect congenital hypothyroidism in the neonate.
Results: In the present study all the 27 mothers diagnosed with Hypothyroidism in pregnancy were taken. The TSH value of most of the mothers with Hypothyroidism was between 3 to 4.9 and most of the mothers were controlled on treatment with Tab.Thyronorm 25mcg.The neonates born to these mothers were screened on Day 5 of life to detect congenital Hypothyroidism. In the present study it showed that none of the neonates born to these Hypothyroid mothers had congenital hypothyroidism because of early diagnosis and Treatment of the mothers in the antenatal period.
Conclusion: In the present study it was observed that all the neonates born to the mothers with Hypothyroidism had normal TSH values and none of the neonates had congenital hypothyroidism dues to early diagnosis and treatment.

Keywords: Maternal hypothyroidism, congenital hypothyroidism in neonates, thyroid function test screening

Introduction

Hypothyroidism is widely prevalent in pregnant women and the rate of detection, especially on a developing country like India, has not kept pace with the magnitude of the problem [1]. 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 [1].
Pregnancy influences thyroid function in multiple ways [1]. Maternal hypothalamo pituitary thyroid axis undergo a series of adjustments, fetus develops its own HPT axis and the placenta plays an active role in iodide and T4 transport and metabolism [1]. Maternal thyroxine binding globulin begins to increase early in the first trimester plateaus during mid-gestation and persists until shortly after delivery [1]. Congenital hypothyroidism can be caused due to thyroid dysgenesis, disorders of thyroid hormone synthesis, iodine deficiency or excess as well as trans-placental transfer of maternal antibodies or medications [1]. It has been proven over the years about the role of thyroxine in the normal development of the fetal brain [1]. Congenital hypothyroidism is a preventable cause of intellectual disability. Hence it is important to monitor neonates born to mothers with hypothyroidism [1].

Hypothyroidism has been reported to complicate between 2 and 12 per 1000 pregnancies [2]. It is characterised by insidious non-specific clinical findings that include fatigue, constipation, cold intolerance, muscle cramps, and weight gain [2]. Pathologically enlarged thyroid gland depends on the etiology of hypothyroidism and is more likely in women in areas of endemic iodine deficiency [2]. Universal newborn screening for neonatal hypothyroidism was introduced in 1974. [2]. It develops in 1 in 3000 newborns and is one of the most preventable causes of mental retardation. [2], Early and aggressive thyroxine replacement is critical for new borns with congenital hypothyroidism. [2]. In addition to timing of treatment, the severity of congenital hypothyroidism is an important factor in long-term cognitive outcomes [2].

Hypothyroidism is widely prevalent in pregnant women and the rate of detection, especially in a developing country like India needs to be treated and detected early [3].

Thyroid physiology is modified during normal pregnancy. The alterations take place throughout gestation, which help to prepare the maternal thyroid gland to cope with the metabolic demands of pregnancy [3].

Untreated hypothyroidism is associated with several pregnancy related disorders. The maternal thyroid disorders in early pregnancy are closely related to fetal development [6]. Neurological deficits in infants including low IQ score, cognitive delay and psychomotor development impairment are the main complications of maternal hypothyroidism during early pregnancy [6].

The various adverse maternal outcomes and perinatal complications associated with hypothyroidism in pregnancy include miscarriage, pre-eclampsia, pre-term labor [6].

Aims and Objectives

To detect and prevent congenital hypothyroidism in neonates born to mothers with hypothyroidism and their neonatal outcomes.

To screen the neonates for congenital hypothyroidism.

Methods and Materials

All the pregnant women visiting the antenatal OPD at KIMS Narketpally were screened for hypothyroidism during the first antenatal visit.

The present study was conducted on 27 women with the diagnosis of hypothyroidism in pregnancy who came to the antenatal OPD and who were delivered at KIMS Narketpally.

The neonates born to these mothers were screened for hypothyroidism on day 5 of life in order to detect congenital hypothyroidism in the neonate.

Results

Table 1: Distribution of patients according to age

Age in years	Total (n=27)	Percentage (%)
20 - 23 Years	9	33.3%
24 - 27 Years	11	40.7%
28 - 31 Years	7	25.9%

Out of the total 27 cases 11 of them were between 24 to 27 years which accounted for 40%.

Table 2: Distribution of patients according to parity

Parity	Total (n=27)	Percentage
Primigravida	8	29.6%
Multiravida	19	70.3%

In the present study 19 cases were multigravida which accounted for 70.3%.

Table 3: Distribution of patients according to maternal TSH value

TSH of mother (Micro lU/ml)	Total (n=27)	Percentage
3-4.9	15	55.5%
5-6.9	13	48.1%
>7	1	3.7%

The TSH value of most of the mothers diagnosed with hypothyroidism was between 3 – 4.9 which accounted for 55.5%.

Table 4: Distribution of patients according to the dosage of tab. Thyronorm

TAB. Thyronorm dosage (Mcg)	Total (n=27)	Percentage
12.5 Mcg	3	11.1%
25 Mcg	18	66.6%
50 Mcg	6	22.2%
75 Mcg	1	3.7%

Out of the 27 cases diagnosed as hypothyroidism and who received L-Thyroxine 3(11.1%) of them received 12.5mcg, 18 (66.6%) of them received 25mcg, 6 (22.2%) of them received 50mcg and 1 (3.7%) received 75mcg.

Table 5: Distribution of patients according to the mode of delivery

Mode of delivery	Total (n=27)	Percentage (%)
LSCS	17	62.9%
Pre-term LSCS	2	7.4%
FTNVD	5	18.5%
Pre-term NVD	3	11.1%

Out of the 27 cases 19 mothers delivered through LSCS which accounted for 70% in which 62.9% delivered through full term LSCS and 7.4% delivered by pre-term LSCS.

Out of the total 27 cases 14 mothers had obstetric complications like PROM (1 mother), Gestational Diabetes Mellitus (4 mothers), Gestational Hypertension (2 mothers), and previous LSCS (7 mothers).

Out of the 27 cases 5 mothers delivered by Full term normal vaginal delivery (18.5%) and 3 mothers delivered by Pre-term NVD (11.1%). The TSH values of the 3 mothers who delivered by pre-term normal vaginal delivery were 4, 5 and 5 micro IU/ml.

Table 6: Distribution of patients according to birth weight of the new born

Birth weight (Kgs)	Total (n=27)	Percentage (%)
Very low birth weight (<1.5kgs)	1	3.7%
Low birth weight (1.6-2.4 kgs)	6	22.2%
Normal	20	74%

Out of the 27 cases the babies born to these hypothyroid mothers 20 babies were found to have normal birth weight (2.5-3.5kgs) which accounted for 74%.

There was 1 baby which was born with very low birth weight (<1.5 kgs) which accounted for 3.7% which was delivered by pre-term normal vaginal delivery.

Out of the 27 cases 6 babies were born with low birth weight (1.6-2.4 kgs) which accounted for 22.2%.

Table 7: Distribution of patients according to the levels of tsh of neonates

TSH (Normal 0-20 mIU/L	Total (n=27)	Percentage (%)
0-5	16	59.2%
6-10	10	37%
11-15	1	3.7%

The neonates born to these hypothyroid mothers were screened for congenital hypothyroidism on day 5 of life and most of these neonates TSH value was between 0 – 5 mIU/L which accounted for 59.2%.None of the neonates born to the hypothyroid mothers in mt study had TSH values >20Miu/L.

Discussion

In our study out of the 27 cases most of the patients were between the age groups of 24 to 27 years which accounted for 40%.

In our study 8 mothers (29.6%) were Primigravida with hypothyroidism and 19 mothers (70.3%) were Multigravida with hypothyroidism.

In a study conducted by Shravani M,R, Tharashree C. D., *et al*, out of the 106 mothers 72 of them were Primi (67%) and 34 mothers (33%) were Multi with Hypothyroidism [1].

In our study it was found that most of the mothers diagnosed with hypothyroidism had TSH values between 3-4.9 (55.5%).

In our study it was found that out of the 27 mothers diagnosed with hypothyroidism and who were on treatment with Levothyroxine 3 mothers received 12.5 mcg, 18 mothers received 25mcg, 6 mothers received 50 mcg and 1 mother received 75mcg. Most of the mothers were controlled with 25mcg of levothyroxine (66.6%) throughout pregnancy.

In a study conducted by Shravani M,R, Tharashree C. D., *et al*, out of the 106 mothers who received Levothyroxine treatment, 5 mothers received 100mcg, 23 mothers received 75mcg, 72 mothers received 50mcg and 6 mothers were on 25mcg of levothyroxine. In this study most of the mothers received 50mcg of levothyroxine [1].

In our study out of the total 27 cases 14 mothers had obstetric complications like PROM (1 mother), Gestational Diabetes Mellitus (4 mothers), Gestational Hypertension (2 mothers), and previous LSCS (7 mothers).

In a study by Chang-Qing Gao *et al*, among 8012 pregnant women 371 women were diagnosed as hypothyroid in pregnancy and these women were associated with higher rates of Gestational HTN,PROM, IUGR and LBW [6].

In our study Out of the 27 cases the babies born to these hypothyroid mothers 20 babies were found to have normal birth weight (2.5 – 3.5kgs) which accounted for 74%.

There was 1 baby which was born with very low birth weight (<1.5kgs) which accounted for 3.7% which was delivered by pre-term normal vaginal delivery because of Oligohydramnios.

In our study out of the 27 cases 6 babies were born with low birth weight (1.6 – 2.4kgs) which accounted for 22.2% whose mothers had TSH values between 4 to 6.

In a study conducted by Shravani M,R, Tharashree C. D., *et al*, the birth weight of the babies born to hypothyroid mothers were recorded. None of the babies had overweight. Low birth weight babies were found (1.6 to 2.4kgs) were found to be 18 (16%). 4% of the babies had birth weight >2.5kgs [1].

In our study out of the 27 cases 19 mothers delivered through LSCS which accounted for 70% in which 62.9% delivered through full term LSCS and 7.4% delivered by pre-term LSCS.

The indications for LSCS in my study were Fetal distress in 5, PROM In 1, GDM in 4, Gestational HTN in 2, Prev LSCS in 7, and Cephalo Pelvic Disproportion in 5 mothers respectively.

In a study conducted by Shravani M,R, Tharashree C. D., *et al*, out of the 106 mothers 37 mothers (35%) of them delivered through LSCS. Indications for LSCS was found to be repeat section in 14 cases, Cephalopelvic disproportion in 6 cases, Fetal distress in 9 cases and meconium stained liquor in 8 cases [1].

In our study out of the 27 cases 5 mothers delivered by full term normal vaginal delivery (18.5%) and 3 mothers delivered by pre-term normal vaginal delivery(11.1%).The indications for pre-term normal vaginal delivery was oligohydramnios in one and pain abdomen in active phase of labor in 2 mothers whose TSH values were 4, 5 and 5 respectively.

In a study conducted by Shravani M,R, Tharashree C,D *et al*, out of 106 mothers 69 mothers (65%) delivered through full term normal vaginal delivery [1].

In our study the neonates born to these hypothyroid mothers were screened for congenital hypothyroidism on day 5 of life and most of these neonates TSH value was between 0 – 5 mIU/L which accounted for 59.2%.TSH values between 6 to 10 were 10 babies (37%) TSH between 11 to 15 were 1 baby (3.7%). None of the babies born to hypothyroid mothers in my study had TSH values >20.

In a study conducted by Shravani M,R, Tharashree C,D *et al*, 49 babies (46%)were found to have TSH levels ranging from 2.5 to 5.5 Miu/l, 57 babies (54%) had TSH levels ranging from 5.5 to 10 Miu/L [1].

None of the babies were diagnosed of congenital hypothyroidism who were born to mothers with hypothyroidism because of proper screening in the antenatal period and with proper treatment.

Summary

In our study out of the 27 cases most of the patients were between the age groups of 24 to 27 years which accounted for 40%.

In our study 8 mothers (29.6%) were Primigravida with hypothyroidism and 19 mothers (70.3%) were Multigravida with hypothyroidism.

In our study it was found that most of the mothers diagnosed with hypothyroidism had TSH values between 3-4.9 (55.5%).

In our study it was found that out of the 27 mothers diagnosed with hypothyroidism and who were on treatment with Levothyroxine 3 mothers received 12.5 mcg, 18 mothers received 25 mcg, 6 mothers received 50 mcg and 1 mother received 75 mcg. Most of the mothers were controlled with 25mcg of levothyroxine (66.6%) throughout pregnancy.

In our study out of the 27 cases 14 mothers had obstetric complications like PROM (1 mother), Gestational Diabetes Mellitus (4 mothers), Gestational Hypertension (2 mothers), and previous LSCS (7 mothers).

In our study Out of the 27 cases the babies born to these hypothyroid mothers 20 babies were found to have normal birth weight (2.5-3.5 kgs) which accounted for 74%.

There was 1 baby which was born with very low birth weight (<1.5 kgs) which accounted for 3.7% which was delivered by pre-term normal vaginal delivery because of Oligohydramnios.

In our study out of the 27 cases 6 babies were born with low birth weight (1.6 – 2.4 kgs) which accounted for 22.2% whose mothers had TSH values between 4 to 6.

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In our study the neonates born to these hypothyroid mothers were screened for congenital hypothyroidism on day 5 of life and most of these neonates TSH value was between 0 – 5 mIU/L which accounted for 59.2%.TSH values between 6 to 10 were 10 babies (37%) TSH between 11 to 15 were 1 baby (3.7%).None of the babies born to hypothyroid mothers in my study had TSH values >20.
In our study, none of the neonates born to mothers with hypothyroidism in pregnancy were diagnosed to have congenital hypothyroidism due to early diagnosis and prompt treatment.

Conclusion

Congenital hypothyroidism is a serious condition that is being screened as a part of the National Newborn Screening programme. Effects of maternal hypothyroidism on fetal brain development are not well defined, but several studies and recent reports indicate that IQ is mostly affected.
Pregnancy is a period that places great physiological stress on both the mother and the fetus. When pregnancy is compounded by endocrine disorders such as hypothyroidism, the potential for maternal and fetal adverse outcomes can be immense.
Fetal thyroid starts functioning by 12 to 14 weeks. Since the fetus is entirely dependent on the mother for its thyroxine supply during the first trimester and later for iodine, it is vital that supplemental thyroxine and iodine should be provided from early pregnancy to those who are diagnosed as hypothyroidism during pregnancy.
Normal TSH value in neonates taken on day 5 of life is 0 - 20 mIU/L.
In our study, none of the neonates born to mothers with hypothyroidism in pregnancy were diagnosed to have congenital hypothyroidism due to early diagnosis and prompt treatment.

Conflict of Interest

Not available

Financial Support

Not available

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