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Original Research Article

Prevalence of hypothyroidism in first trimester screening and its association with maternal and foetal outcomes

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ABSTRACT

Background: Maternal hypothyroid is one of the common thyroid disorder. Hypothyroidism in pregnant women who are not treated can cause premature birth, low birth weight, and respiratory distress in the newborn. Objectives were to find out the prevalence of hypothyroidism in pregnant women during first trimester screening and its association with maternal and foetal outcomes.
Methods: The present study was a hospital based study carried out in the department of obstetrics and gynaecology, Chettinad Hospital and Research Institute, Kelambakkam, Chennai, India between January 2021 and January 2023. The study was carried out among the pregnant women in the first trimester visiting the outpatient department of the OBG department during the study period. Based on the thyroid profile obtained, the participants were classified into normal, subclinical hypothyroidism and overt hypothyroidism. They were then followed up to record the maternal and foetal outcome.
Results: A total of 2017 patients were included in the study. The prevalence of hypothyroidism was 15.3%. The distribution of type of delivery was found to be different between hypothyroid and normal groups with more number of women underwent Caesarean delivery (18.24%) in the hypothyroid group than those in normal group. The proportion of low birth weight was also statistically higher (45.28%) in the hypothyroid group than in the normal. Similar pattern was observed with birth asphyxia. The APGAR scores recorded were also significantly lower in the hypothyroid group than in the euthyroid group with p value of less than 0.05.
Conclusions: The prevalence of hypothyroidism was 15.3%. In our study, women with hypothyroidism showed adverse maternal and foetal outcome such as more caesarean deliveries, low birth weight, and poor APGAR scores and were found to be statistically significant when compared to euthyroid women.

Keywords: APGAR score, Birth weight, Caesarean delivery, Hypothyroidism

INTRODUCTION

Pregnancy is associated with a number of physiological changes that occurs as an adaptive response to the demand for fetal development and any inadequate adaption results in dysfunction that poses a serious risk to the mother as well as the baby. One such response is the changes that takes place in the thyroid glands of mother, which is vital for the development of the fetus failing which manifest as thyroid disorders of pregnancy. Maternal hypothyroid is one of the common thyroid disorders resulting due to a suboptimal level of thyroid hormone production from the mother. The foetal thyroid gland begins to form by 10 to 12 weeks' gestation, and it begins to produce thyroid hormone only by 18 to 20 weeks' gestation. It takes 36 weeks of pregnancy for the foetal serum thyroid hormone levels to reach adult levels. As a result, during the first trimester's crucial developmental stage, the foetus is dependent on maternal thyroid hormone crossing the placenta.[1] Hypothyroidism in pregnant women who are not

treated can cause premature birth, low birth weight, and respiratory discomfort in the newborn. Studies have convincingly shown that IQ scores, cognitive developmental indices, and learning capacities were considerably more likely to be impaired in children born to mothers with hypothyroidism. It also adversely affects the maternal health during pregnancy by increasing the risk of postpartum haemorrhage, gestational hypertension, anaemia, abruptio placenta, and abortion.[2,3] Primary maternal hypothyroidism can be defined as presence of increased levels of thyroid stimulating hormone (TSH) in the mother during pregnancy. Hypothyroidism manifests in two forms: overt (OH) and subclinical (SCH). Serum TSH levels are high and serum T_4/free T_4 (FT_4) levels are low in overt hypothyroidism. TSH levels in SCH are increased, whereas serum T_4 and FT_4 levels are normal.[4] Globally, it was estimated that 1.5-4% of pregnant women had hypothyroidism, of which 0.3-0.5% had overt cases and the remainder had SCH. In Indian women, the frequency of maternal hypothyroidism ranged from 1.2% to 67.0%.[5] Yadav et al observed that in India, the prevalence of hypothyroidism was 11.07%, that of SCH was 9.51%, and that of OH was 2.74%.[6] By identifying hypothyroidism early, healthcare providers can initiate treatment and management strategies to optimize maternal thyroid function and support the healthy development of the fetus. While universal thyroid screening is advised in some nations, such as Spain, China, and Poland, other nations, such as the United Kingdom and the United States, follow a case-finding approach aimed at women who are at high risk of thyroid dysfunction.[7] The Indian Thyroid Society recommends a universal screening of all pregnant mothers during first trimester and prefers it over the target based screening.[5] This study aimed at assessing the prevalence of hypothyroidism in pregnant women during first trimester screening and its association with maternal and foetal outcomes.

METHODS

The present study was hospital based prospective study carried out in the department of obstetrics and gynaecology, Chettinad Hospital and Research Institute, Kelambakkam, Chennai, India between January 2021 and January 2023. The study was carried out among the pregnant women in the first trimester visiting the out patient department of the OBG department during the study period. The sample size for the study was estimated to be 2017, using the formula $n=z^2*[(1-p)/e^2*P]$ where $Z\alpha=0.05=1.96$, P, prevalence =0.16 and e, relative precision -0.1. Convenient sampling was followed. Ethical clearance was obtained from the institutional ethics committee and informed consent was obtained from all the participants included into the study.

The data was collected using a semi structured proforma. The details collected during the first visit included age in completed years, gestational age in completed weeks, systolic and diastolic blood pressure in mmHg and thyroid profile in the first trimester. Thyroid profile included measurement of free T_3, Free T_4 and TSH values measured as per standard laboratory procedures. Since they are done as a part of routine investigation the values are obtained from them. Based on the values obtained, the participants were classified into subclinical hypothyroidism, overt hypothyroidism and normal. Subclinical hypothyroidism was defined as a serum TSH between 2.5 and 10 mIU/l with normal FT_4 concentration and overt hypothyroidism was defined as serum TSH of more than 3 mIU/l with low FT_4 levels or TSH more than 10 mIU/l irrespective of FT_4 levels.

All the participants included into the study were then followed up till 3rd trimester to know the type of delivery, gestational age at delivery, birth weight, birth asphyxia and APGAR score at 1 minute and 5 minutes. All the parameters were recorded.

The data collected were made into master chart using Microsoft excel 2019 and imported into SPSS version 26 for statistical analysis. The qualitative variables were expressed using frequency and percentages. The quantitative variables using mean and standard deviation. To compare the distribution of qualitative variable between hypothyroid and normal groups, chi square test was employed and compare mean of quantitative variable between hypothyroid and normal, independent samples t test was employed. A p value of less than 0.05 was considered to be statistical significance.

RESULTS

A total of 2017 pregnant women in the first trimester who visited the outpatient department during the study period were screened for thyroid hormone status. The mean age of the study participants was 26.53±3.89 years. Pregnant women in first trimester were included in the study and their mean gestational age were 9.3±3.2 weeks. They were checked for the hypertensive status and the mean systolic and diastolic BP were found to be 116.41±11.54 mmHg and 78.53±11.38 mmHg respectively.

Table 1: Baseline characteristics among the study participants (n=2017).

Variables	Mean±SD
Age (in years)	26.53±3.89
Gestational age (in weeks)	9.3±3.2
Systolic blood pressure (mmHg)	116.41±11.54
Diastolic blood pressure (mmHg)	78.53±11.38
FT3 (pmol/l)	2.33±1.05
FT4 (pmol/l)	11.66±2.58
TSH mIU/l	2.69±1.77

On thyroid screening, FT_3, FT_4 and TSH values were assessed and the mean values were found to be 2.33±1.05 pmol/l, 11.66±2.58 pmol/l and 2.69±1.77 mIU/l respectively (Table 1). The analysis showed that out of 2017 pregnant women, 1710 (84.8%) women had normal

thyroid values. Subclinical hypothyroidism was found in 286 (14.2%) of pregnant women and 21 (1.1%) women had overt hypothyroidism (Figure 1).

Among the pregnant women, majority of them (78.14%) had normal delivery. But the normal delivery was less prevalent in pregnant women with hypothyroid (57.33%) when compared to normal euthyroid individuals (81.87%). Similarly, the incidence of LSCS, forceps and vacuum delivery was also high among the hypothyroid pregnant women (18.24%, 16.61%, and 7.82% respectively) than the euthyroid mothers. As shown in the Table 3, there was a significant association between the hypothyroid status and mode of delivery.

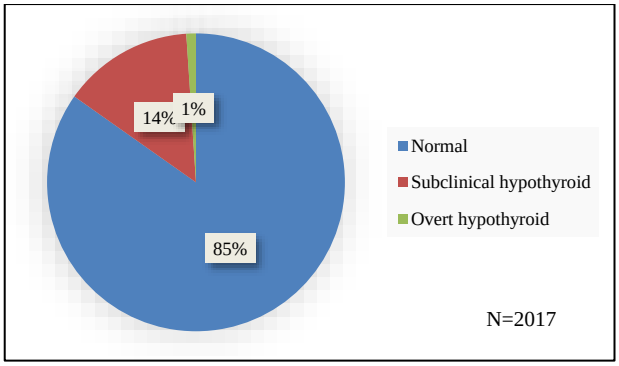

Figure 1: The proportion of subclinical and overt hypothyroidism.

Table 2: Distribution of participants according to maternal and foetal outcome.

Variables		Frequency (n=2017)	Percentage
Type of delivery	Labour natural	1576	78.14
	LSCS	242	12.00
	Forceps delivery	140	6.94
	Vacuum delivery	59	2.93
Preterm	Yes	253	12.54
	No	1764	87.46
Birth weight	Low	307	15.22
	Normal	1710	84.78
Birth asphyxia	Yes	261	12.94
	No	1756	87.06
APGAR 1		6.37±0.95	
APGAR 2		8.12±0.74	

Table 3: Association between hypothyroidism and maternal and fetal outcomes among the participants.

Variables		Hypothyroid (n=307)		Normal (n=1710)		χ^2	P value
		N	%	N	%		
Type of delivery	Labour natural	176	57.33	1400	81.87	110.2	0.001
	LSCS	56	18.24	186	10.88		
	Forceps delivery	51	16.61	89	5.20		
	Vacuum delivery	245	7.82	35	2.05		
Preterm	Yes	46	14.98	207	12.11	1.96	0.160
	No	261	85.032	1503	87.89		
Birthweight	Low	139	45.28	168	9.82	253.5	0.001
	Normal	168	54.72	1542	90.18		
Birth asphyxia	Yes	58	18.89	203	11.87	11.35	0.001
	No	249	81.11	1507	88.13		

Majority of the pregnant women had delivery at completion of full term and no significant association was seen regarding the incidence of preterm deliveries between hypothyroid and Euthyroid pregnant women. About 15.22% of the pregnant women in the study delivered low birth weight babies. The incidence of delivery of low-birth-weight babies were significantly higher among the hypothyroid mothers (45.28%) when compared to euthyroid mothers (9.89%). The incidence of birth asphyxia during delivery was slightly higher among the pregnant mothers with hypothyroid (18.89%) than the normal thyroid mothers (11.87%). It was evident from the finding that the hypothyroid mother had lesser mean APGAR scores at both 1 and 5 minutes which is 5.41±0.94 and 7.65±0.87 respectively whereas in euthyroid mother it was 6.81±1.04, 8.51 0.74 respectively (Figure 2).

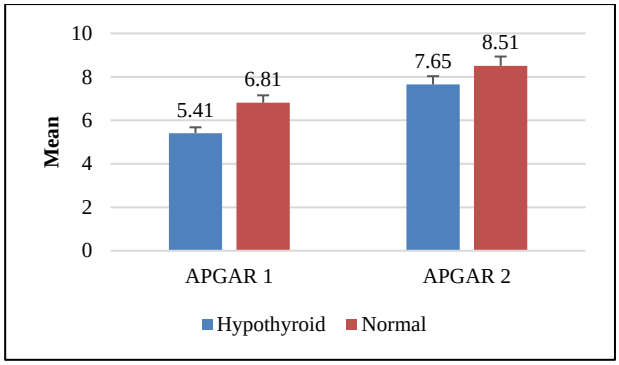

Figure 2: Bar chart showing difference in mean APGAR score among the foetus of hypothyroid and normal mothers.

DISCUSSION

The study was conducted as a hospital based cross sectional study among 2017 pregnant women attending the OPD to assess the prevalence of hypothyroidism in pregnant women during first trimester screening and its association with maternal and foetal outcomes.

The prevalence of hypothyroidism was found to be 15.3%. Among this, a majority of them were found to be subclinical hypothyroid which constitutes for about 14.2% and overt hypothyroidism was prevalent among 1.1% of the study participants. The reported prevalence is similar to the finding of study by Dhanwal et al in New Delhi that reported the prevalence to be 14.3%. On this, subclinical hypothyroid was 13.5% and overt hypothyroid was 0.7%.[8] The study by Ajmani et al also observed similar results in which the prevalence of overt hypothyroidism was 3% and subclinical was 9%. For every 100 women 12 had hypothyroidism.[9] Similar results were also observed by Saki et al where 1.2% were found to have overt hypothyroidism and 11.3% subclinical hypothyroidism.[10] There are also studies done in various parts of the country showing a prevalence range between 5% to 20%. Rajput et al from Haryana observed a slightly higher magnitude of subclinical hypothyroid prevalence which was 21.5% and overt hypothyroidism was reported to be 1.3% during the first trimester.[11] The study by Poonam et al in northern India reported a 6% prevalence of hypothyroid in first trimester with 5.2% and 8% prevalence of subclinical hypothyroid and overt hypothyroidism respectively.[12] The study done by Prasad et al in Kerala observed 5.6% to have hypothyroidism. Out of which 4% were subclinical and the remaining overt.[13] Another study by Sahu et al examined thyroid function in high-risk pregnant women during the second trimester and found that prevalence of subclinical hypothyroidism to be 6.47% and overt hypothyroidism to be 4.58% respectively.[14] Diegueze et al in the study done in northern part of Spain reported the prevalence of hypothyroidism among similar study population as 5.5% with prevalence of subclinical hypothyroid and overt hypothyroidism as 3.6% and 1.9% respectively.[15] These differences in the prevalence can be attributed to the varied endemicity of the study areas for iodine deficiency disorders.

In the study it was found that the pregnant mothers with hypothyroidism had a difficult labour and increased incidence of LSCS and other assisted delivery methods. This was consistent with the finding of Shahu et al who reported an increase in caesarean rate among pregnant women with hypothyroid.[14] It was also found that the pregnant mother with hypothyroidism had an increased incidence of delivery of low-birth-weight babies. Shinohara et al in their review observed that maternal hypothyroid is associated with increased delivery of low-birth-weight babies, Ajmani et al also reported that the incidence of LBW is higher among pregnant women with overt hypothyroidism.[3,9]

The study observed that hypothyroidism in pregnancy increases the risk of birth asphyxia in the neonates. The study observed reduced APGAR scores at both 1 and 5 minutes among the neonates born to pregnant women with hypothyroid. This observation is consistent with the observation of Saki et al who also reported a decreased APGAR scores associated with subclinical and overt hypothyroidism in pregnant mothers.[10] The strengths of the study was its prospective nature which establishes the temporal relationship between thyroid values and maternal and fetal outcomes. Most of the parameters dealt in the study were of objective in nature. The limitation was that it was a single centre study. The study population in the study would not be of a diversified nature. Generalisability have to be done with caution.

CONCLUSION

The prevalence of hypothyroidism was 15.3%. In our study, women with hypothyroidism showed adverse maternal and foetal outcome such as more caesarean deliveries, low birth weight, and poor APGAR scores and were found to be statistically significant when compared to euthyroid women.

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