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Prevalence of Thyroid Dysfunction Among Pregnant Women in First Trimester: A Hospital-Based Study From Mysuru, South India

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ABSTRACT

Introduction: Hypothyroidism during pregnancy can lead to multiple adverse effects on both mother and child. Children born to untreated or undertreated mothers suffer profound effects on intellectual development. Subclinical hypothyroidism (SCH) is another important subset and knowledge of SCH in pregnancy is evolving. There are only a few studies on this aspect from South Asia.

Objectives: 1. To estimate the prevalence and patterns of hypothyroidism in pregnant women 2. To assess SCH and its association with clinic-demographic variables such as age, residence, consanguinity, duration of pregnancy, parity, diet, obesity and autoimmunity.

Methodology: This was a cross-sectional study conducted at JSS Hospital, a Tertiary Care Teaching Hospital, Mysore between Jan 2017 to June 2019. 500 women in the first trimester of pregnancy were included. Detailed history and clinical examination were recorded and blood samples were analysed for Hb, T3, T4, TSH and anti-TPO antibodies. Data were analyzed concerning associations.

Results: Out of 500, the results of 9 subjects were ineligible for analysis because of preanalytical lab error. The prevalence of Hypothyroidism in first trimester pregnant women was 156/491 (31.77%), Of this9(5.76%) had overt hypothyroidism and 147(94.23%) had subclinical hypothyroidism, and7 (1.42%) had hyperthyroidism. Clinicodemographic variables as mentioned above were not significantly associated with SCH except the presence of anti-TPO antibody($p<0.001$).

Conclusions: The prevalence rate of hypothyroidism was very high in our setting compared to that seen in other published reports. Positive Anti-TPO antibody was significantly associated with SCH. There is a need for routine screening of hypothyroidism in the first trimester itself.

Key Words: Thyroid diseases, Gestation, Anti-TPO antibody, First trimester, Subclinical Hypothyroidism, Thyroid Gland

INTRODUCTION

Thyroid gland and function is significantly impacted during Pregnancy. The thyroid gland enlarges in size by a tenth of its pre-pregnancy state. The increase in size is more pronounced in iodine-deficient populations.[1]Along with the increased requirement of iodine, the production of thyroid hormone also increases by as much as 50 %.[2] The stress of pregnancy pushes the gland into hypofunction especially in those with an already limited thyroid reserve.

2.5% of pregnant women have hypothyroidism according to literature from West.[3] Data for the Indian population is scarce with only a few studies done on the Indian population. The prevalence rates ranged from 4.8% to 11% in the Indian studies.[4, 5] In a large study[6] the prevalence of hypothyroidism in pregnancy was 13.13% and the majority of these hypothyroid pregnant women had subclinical hypothyroidism.

Both mother and child are affected by Hypothyroidism. Children born to untreated or undertreated mothers suffer profound effects, especially on intellectual development.[6] Miscarriages

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are common in hypothyroid women. Even those with normal thyroid function tests results have an increased risk of miscarriages if they have TPO antibodies. Subclinical hypothyroidism is associated with an increased risk of anaemia during pregnancy and increased risk for preterm delivery before 34 gestational weeks and low birth weight babies.

There are not many studies on the Indian population from South India, hence this study was taken up with objectives of 1. To estimate the prevalence and patterns of hypothyroidism in pregnant women in a tertiary care teaching hospital setting in South India 2. To assess SCH and its association with clinic-demographic variables such as age, residence(urban/rural), consanguinity, duration of pregnancy, parity, diet pattern, obesity and autoimmunity.

METHODOLOGY

This was a cross-sectional study conducted between Jan 2017 to June 2019 at JSS Hospital, a tertiary care teaching and research hospital attached to JSS Medical College .500consecutive pregnant women aged 18-45 years in the first trimester of pregnancy were recruited. Informed written consent was taken from all women. Ethical Clearance was obtained from JSS Medical College Institutional Ethical Committee[IEC/14/6047].

Pregnant women who had any past or present history of thyroid dysfunction/disease, family history of thyroid disease, previous head or neck irradiation, usage of drugs such as levothyroxine, methimazole, iodide, lithium, amiodarone and corticosteroids, patients diagnosed with autoimmune and connective tissue diseases were excluded from the study. Detailed history and clinical examination were recorded in clinical proforma. Age, residence, consanguinity, duration of pregnancy, parity, hypothyroid symptoms and diet history were collected. Height, Weight, Body Mass Index, Blood Pressure and presence of goitre were all noted.

Venous blood samples of 5ml were collected under aseptic precautions and were sent for analysis of Hemoglobin%, T3, T4, TSH and anti-TPO antibodies. T3, T4, TSH and anti-TPO antibodies were measured by the chemiluminescence method. TSH value>2.5 µIU/ml but less than or equal to 10 µIU/ml with normal T4 are considered to have Subclinical Hypothyroidism, TSH value>10 µIU/ml irrespective of T4 values and TSH value >2.5 µIU/ml with low T4 values are considered to have Overt Hypothyroidism [American Thyroid Association and National Guidelines]. [24] The association of Subclinical Hypothyroidism with the above variables were statistically analysed.

STATISTICAL ANALYSIS

Data collected were entered in Microsoft Excel and analysed using SPSS version 22. Descriptive statistical measures like percentage, mean and standard deviation were calculated. Inferential statistical tests like the Chi-square test, Two-way ANOVA were used wherever relevant and statistical significance at the p-value of <0.05 was considered significant.

RESULTS

Out of 500 women included in the study, 9 were excluded because of pre-analytical error, hence there were 491 pregnant women in the first trimester of pregnancy. Most of them, 403 (82%) were in the age group 21-30 years, 363(74.75%) belonged to the urban category, most i.e,481(98%) were literate and 466(95%) were homemakers. 412(84%) had married when aged between 18-25 years age,407(83%) had a non-consanguineous marriage, 228(46%) were primigravida and 263 (53%) were multigravida, only 4 (0.8%) had previous caesarean section and 51(10%) had the previous history of irregular menstrual cycles.370(75%) were non-vegetarians, 418(85%) had an intake of cauliflower and cabbage weekly once.227(46%) had normal BMI,107(21%) were overweight,65(12%) were obese and 92(18%) were underweight [Table 1].

Among 491 pregnant women,156(31.77%) were hypothyroid out of which 9(5.76%) had overt hypothyroidism and 147(94.23%) had subclinical hypothyroidism,7(1.42%) had thyrotoxicosis [Figure 2].

Predominant symptom in Hypothyroid women was fatigue(35.6%) followed by hair loss(31.7%),cold intolerance(16.9%),dry skin(6.72%) ,constipation(2.65%), weight gain(2.24%) and poor memory(2.04%)[Figure 1]. Most of them belonged to age group 21-30years (123-78%), urban residency (123-78%), were multigravida (84-53%), 131(83%) had non-consanguineous marriage, only 20 (7.8%) had previous history of irregular menstrual cycles and 154(99%) had uneventful pregnancy previously.125 (80%) were non-vegetarians, about

131(83%) women had intake of cauliflower and cabbage weekly once [Table 2].

Among 156 hypothyroid women, 74(47%) had normal BMI, 23(14%) were underweight, 41(26%) were overweight and 18(11%) were obese.113 (72.43%) had normal HB, 43(27.56%) were anaemic. 20(12.82%) were found to be anti-TPO antibody positive.

Chi-square analysis indicated that age, residence, consanguinity, weeks of pregnancy, parity, diet and obesity were not significantly associated with subclinical hypothyroidism. However anti-TPO antibody was significantly associated with SCH(0.001)[Table 3].

DISCUSSION

In our study, the prevalence rate of hypothyroidism was found to be 31.77% which is significantly higher compared to previous studies. In Dhanwal et al. study conducted in India, prevalence was13.13% and the majority were subclinical. [6] Another study conducted by Prasad et al. in Delhi reported a 14.3% prevalence of hypothyroidism during the first trimester.[25]Another study conducted in a tertiary hospital in India on a total of 461 women showed a higher number of cases of SCH. [23] In our study also, the majority of cases were subclinical hypothyroidism similar to other studies. In a study done on Caucasian women by Knight et al.[7,] the prevalence was found to be 13.9%. In other countries, the prevalence of SCH ranged from 2% to 2.5% in the U.S, 6.8% in Belgium,13.7% in Spain and 8% in Congo.[8-10] In Iran, the prevalence of hypothyroidism was found to be 4.2%, of which 89.1% of cases were subclinical similar to our study.[11]

The reason for the higher incidence in our study might be low TSH cut off value >2.5 µIU/ml is used in our study as other studies have used TSH> 4 µIU/ml as cut off. Factors such as iron deficiency and iodine deficiency might also have played a role in the difference between our study and others. Excessive iodine intake, ethnicity, presence of goitrogens in food and selenium deficiency have also been associated with hypothyroidism.[14]

Subclinical hypothyroidism in pregnancy has a significant impact on pregnancy outcomes. Several studies have reported that it is associated with pregnancy complications such as gestational diabetes (GDM), hypertension, and preeclampsia.[12,13] In a study conducted on 508 pregnant women in Pakistan, SCH was shown to be strongly associated with GDM. High TSH levels were reported in 61.5% of women with GDM compared to 6% in healthy controls.[15] Women with SCH were found to be twice as likely to deliver prematurely compared to subjects whose thyroid function tests were normal. These women also had a 3 times higher chance of developing placental abruption.[16] Other studies have reported that pregnant women with SCH are more likely to suffer a miscarriage, especially during the first 20 weeks of gestation.[17]

Maraka et al.[18] found that SCH affected both the mother during pregnancy and also neonatal outcomes. Intrauterine growth restriction, small for gestational age, low birth weights, and low Apgar scores were all reported in neonates whose mothers were SCH patients.

A meta-analysis by Fan et al, [20] which included 6 studies, showed that thyroid abnormalities in pregnant women may have an impact on the neuropsychological development of children. There is also increasing evidence linking SCH to attention deficit hyperactivity disorder (ADHD) and autistic symptoms in offspring.[21,22]

To find out the causes for SCH, we tried to find out any association between clinic demographic variables and SCH. As age increased, there was no increase in hypothyroidism in our study as all women were less than 40 years. Hypothyroidism was more in multigravida compared to primigravida but there was no significant statistical association. Hypothyroidism was more prevalent in normal BMI women(74) compared to obese women(59) in our study while previous studies have shown that hypothyroidism was common among obese women.[19] Subclinical hypothyroidism is most often caused by autoimmune (Hashimoto) thyroiditis.[26] In our study also, subclinical hypothyroidism was significantly associated with anti-TPO antibodies($p<0.001$). Even dietary practices had no significant association with hypothyroidism. In an extensive search through databases, we could not find any article showing the association between SCH and variables like age, residence, consanguinity, weeks of pregnancy, parity and diet. Our study may well be the first to look into this and our results do not show any correlation. Further research has to be done to find out causal factors for SCH.

The strengths of this study are the large sample size and the that all samples were analysed at the same central laboratory. A few limitations are that this being a cross-sectional study, the results may be subject to non-response bias. The study did not carry out tests for other antibodies such as antithyroglobulin antibody and thyroid receptor stimulating immunoglobulins which would have thrown more light on the precise role of autoimmunity and thyroid dysfunction in pregnancy.

CONCLUSIONS

The prevalence of hypothyroidism was very high in our setting compared to that seen in other published reports. There was no association found between SCH and factors such as age, residence, consanguinity, weeks of pregnancy, parity, dietary practices and obesity. Positive Anti-TPO antibody was significantly associated with SCH.

Because of the high prevalence of subclinical hypothyroidism both in our study and earlier studies from other regions of India, it is recommended that a National sub-clinical hypothyroidism screening programme must be taken up for benefit of pregnant women and their offspring.

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Authors' Contribution: Dr. Savitha. V collected data, analysed and wrote the article.

Dr. Mamatha helped in the collection of data.

Dr. Madhu. B helped in data analysis.

Dr. Mahesh. M guided me in all aspects of the study.

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Table 1: Characteristics of study subjects

Characteristics of study subjects	n-491(100 %)
Age	21-30 years –403(82.07%)
Residency	Urban-363(73.93%)
Literacy	Literate-481(97.96%)
Occupation	Housewives-466(94.90%)
Age of marriage	18-25 years-412(83.91%)
Consanguinity	Non consaguinousmarriage-407(82.89%)
Gravida	Primi-228(46.43%), multi-263(53.56%)
Caesarean section	4(0.81%)
Diet	Non vegetarians-370(75.35%)
Cauliflower and cabbage intake	Weekly once in 418(85.13%)
BMI	Normal-227(46.23%) Overweight-107(21.79%) Obese-65(13.23%) Underweight-92(18.73%)

Table 2: Characteristics of Hypothyroid women

Characteristics of Hypothyroid women	n-156(31.77%)
Age	21-30 years-123(78.84%)
Residency	Urban-123(78.84%)
Literacy	Literate-152(97.43%)
Occupation	Housewives-152(97.43%)
Age of marriage	18-25 years-128(82.05%)
Consanguinity	Non consaguinousmarriage-131(83.97%)
Gravida	Primi-46(15%), multi-84(53.84%)
Caesarean section	2(1.2%)
Diet	Non veg-125(80.12%)
Cauliflower and cabbage intake	Weekly once -131(83.97%)
BMI	Normal-74(47.43%) Overweight-41(26.28%) Obese-18(11.53%) Underweight-23(14.74%)
Goitre	10(6.41%)

Table 3: Factors associated with Subclinical hypothyroidism

	SCH		p-value
	No	Yes	
Age			
<=20	42	24	0.06
21-25	202	73	
26-30	78	43	
31-35	12	5	
36-40	0	2	

Table 3: ***(Continued)***

	SCH		p-value
	No	Yes	
Residence			
Urban	243	115	0.20
Rural	91	32	
Consanguinity			
No	280	123	0.96
Yes	54	24	
Weeks of pregnancy			
0-4	4	2	
5-8	178	81	0.91
9-12	152	64	
Gravida			
Primi	155	70	0.80
Multi	179	77	
Veg/NonVeg			
Non-veg	244	117	0.12
Veg	90	30	
Cauliflower/Cabbage			
None	6	2	
Weekly once	286	124	0.76
Fortnight once	24	13	
Monthly once	15	5	
Rare	3	3	
BMI			
<18.5	68	22	
18.5-22.9	153	71	
23-24.9	66	39	0.33
245-27.9	31	10	
28-29.9	10	2	
>30	6	3	
ANTI TPO AB			
<=34	325	133	<0.001
>34	9	14	

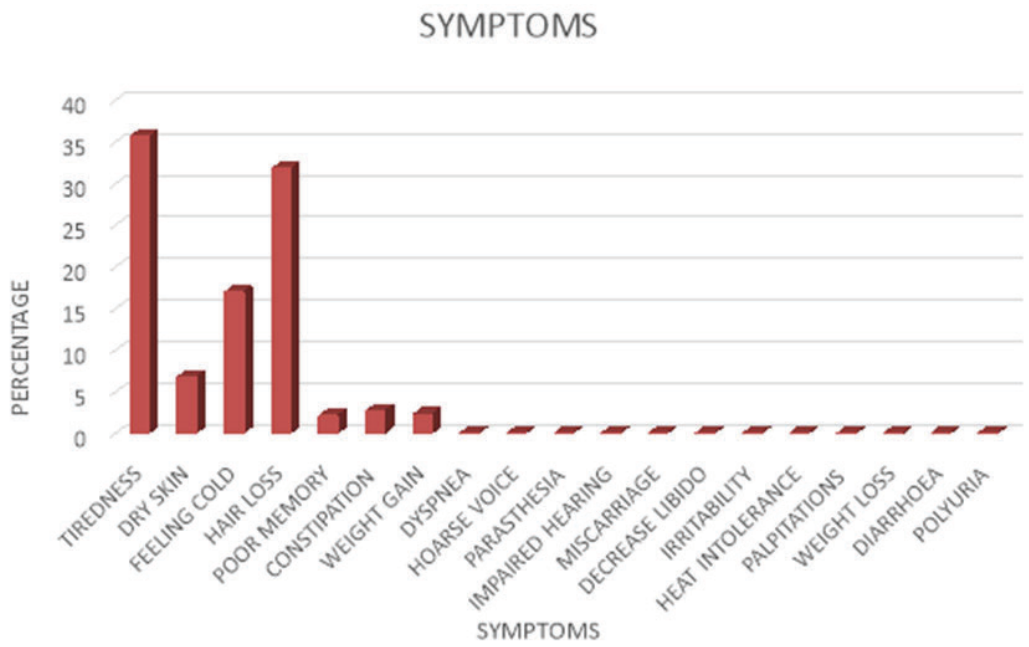

Figure 1: Symptoms of Hypothyroidism.

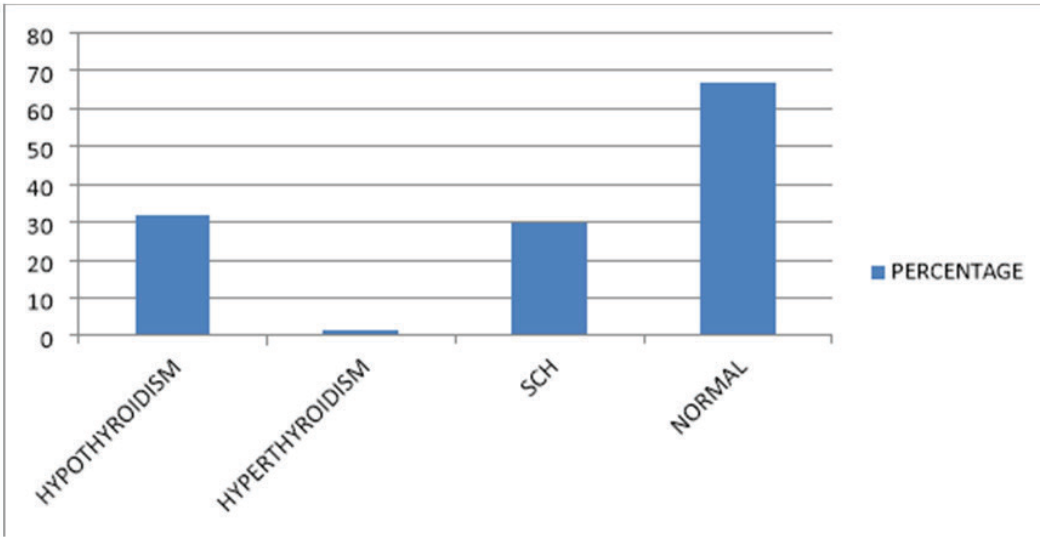

Figure 2: Thyroid functional status.