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Original Research Article

A Prospective Observational Assessment of the Thyroid Profile Among the First Trimester Pregnant Women

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Abstract

Aim: Study of thyroid profile among the first trimester pregnant women attending tertiary care hospital.

Methods: 100 first trimester pregnant women were included in this study. A detailed history was taken regarding the symptoms, and signs of thyroid disorders. Menstrual history, obstetric history, past history, medical history, family history, personal history. A thorough general physical examination with reference to Pulse, blood pressure, temperature, respiratory rate was noted followed by cardiovascular system, Central nervous system, Respiratory system, Local Thyroid examination and abdominal examination was done. Women are sent for thyroid hormone profile testing FT3, FT4 & TSH by ELISA reader method. The normal range of TSH in first trimester is 0.1 -2.5 μu/dl values outside this range was considered abnormal. All such women were asked to undergo Thyroid Peroxidase antibody testing.

Results: Maximum number of cases 56(56%) were belongs to in the age group of 21-25 years and minimum no. of cases were 6(6%) belong to the age group of ≥ 31. The mean and SD of age was 25.4 ± 2.57. Maximum number of cases were multigravida 60(60.0%). Out of which G2 were 38(38%), G3, G4 and G5 cases were 16(16%), 5(5%) and 1(1%) respectively. There were 40 (40.0%) of primi case. Maximum number of cases 51 (51%) were belongs to in the gestational age group of 9--11 weeks and minimum no. of cases (9%) belonged to the gestational age group of ≥ 12 weeks. The mean and SD of gestational age was 10.20 ± 1.43. there were 20 (20%) of thyroid dysfunction cases in the study. The hospital incidence rate of thyroid dysfunction in first trimester pregnant women was 20% Study reveals that, there was no statistical significance difference of normal and thyroid dysfunction cases in relation with age (P>0.05). there were statistically very highly significance association normal and thyroid dysfunction cases in relation with period of gestation (P< 0.001). Higher the period of gestation age has significantly more number of thyroid dysfunction cases as compare to lower gestation age in relation with normal cases. Study observed that, there were 19 (95%) of thyroid dysfunction cases in which TPO was done and found out to be negative. Only one case 1(5%) had positive TPO among thyroid dysfunction in the study. In the study hospital TPO rate was 5%.

Conclusion: A high proportion of hypothyroid was observed in first trimester of pregnancy, and hence a routine antenatal screening is suggested to diagnose the thyroid dysfunction at the earliest gestation.

Keywords: First Trimester Pregnancy, TSH, Thyroid Peroxidase Antibody, Thyroxine, Triiodothyronine.

Introduction

Thyroid disorders are the second most common endocrine dysfunction seen in pregnancy [1]. Various changes occur in thyroid function during pregnancy, and poor adjustments to these physiological changes result in thyroid dysfunction [2,3]. These changes occur due to increased thyroid hormone-binding globulin (TBG) concentration, increased iodine clearance in the kidneys, and thyrotrophic effect of human chorionic gonadotropin (HCG) [4,5].

During pregnancy, optimum maternal thyroid function is essential for both the mother and the fetus. Thyroid dysfunction can have an immense impact on pregnancy outcomes and fetal development. Various adverse effects such as miscarriage, preeclampsia, anemia, low birth weight, preterm birth, increased maternal and fetal morbidity, and mortality is reported [6].

Hence the present study was conducted with the aim to evaluate the thyroid profile among the first trimester pregnant women attending tertiary care hospital.

Material and methods

This prospective observational study was carried out in the Department of Obstetrics and Gynaecology, JLNMCH, Bhagalpur, Bihar, India for 1 year, after taking the approval of the protocol review committee and institutional ethics committee. 100 first trimester pregnant women were included in this study. Informed consent was then obtained for the participant in the study.

Inclusion criteria

- < 14 weeks gestation
- Singleton pregnancy
- Age group of 18 to 45 years.

Exclusion criteria

- Known chronic disorders diabetes mellitus and hypertension
- Pregnant women with known thyroid abnormalities and on treatment.
- Pregnant women not willing to give consent.

Methodology

A detailed history was taken regarding the symptoms, and signs of thyroid disorders. Menstrual history, obstetric history, past history, medical history, family history, personal history. A thorough general physical examination with reference to Pulse, blood pressure, temperature, respiratory rate wise noted followed by cardiovascular system, Central nervous system, Respiratory system, Local Thyroid examination and abdominal examination was done. Women are sent for thyroid hormone profile testing FT3, FT4 & TSH by ELISA reader method. The normal range of TSH in first trimester is 0.1 -2.5 μu/dl values outside this range was considered abnormal. All such women were asked to undergo Thyroid Peroxidase antibody testing.

Results

Study observed that, maximum number of cases 56(56%) were belongs to in the age group of 21-25 years and minimum no. of cases were 6(6%) belong to the age group of ≥ 31. The mean and SD of age was 25.4 ± 2.57.(table 1)

Study observed that, maximum number of cases were multigravida 60(60.0%). Out of which G2 were 38(38%), G3, G4 and G5 cases were 16(16%), 5(5%) and 1(1%) respectively. There were 40 (40.0%) of primi case. (Table 2.)

Study observed that, maximum number of cases 51 (51%) were belongs to in the gestational age group of 9--11 weeks and minimum no. of cases (9%) belonged to the gestational age group of ≥ 12 weeks. The mean and SD of gestational age was 10.20 ± 1.43. (Table 3)

Study observed that, there were 20 (20%) of thyroid dysfunction cases in the study. The hospital incidence rate of thyroid dysfunction in first trimester pregnant women was 20% Study reveals that, there was no statistical significance difference of normal and thyroid dysfunction cases in relation with age (P>0.05) (table 4.)

Study reveals that, there was statistically very highly significance association normal and thyroid dysfunction cases in relation with period of gestation (P< 0.001). Higher the period of gestation age has significantly more number of thyroid dysfunction cases as compare to lower gestation age in relation with normal cases. (Table 5.)

Study observed that, there were 19 (95%) of thyroid dysfunction cases in which TPO was done and found out to be negative. Only one case 1(5%) had positive TPO among thyroid dysfunction in the study. In the study hospital TPO rate was 5%. (Table 6.)

TSH values among normal and thyroid dysfunction cases (P<0.001). The mean TSH values of thyroid dysfunction were significantly higher as compare with mean TSH normal values. Study reveals that, there were no statistical significance difference of mean FT3 and FT4 values among normal and thyroid dysfunction cases (P>0.05).

Table 1: Age wise distribution of cases

Age in years	No. of cases	Percentage
≤ 20	13	13
21-25	56	56
26-30	25	25
≥ 31	6	6
Total	100	100
Mean ± SD	25.4 ± 2.57	

Table 2: Obstetrics parity wise distribution of cases

Obstetrics parity		No. of cases	Percentage
Primi		40	40
Multigravida	G2	38	38
	G3	16	16
	G4	5	5
	G5	1	1
Total		100	100.0

Table 3: Period of Gestation wise distribution of cases

POG In weeks	No. of cases	Percentage
≤ 8 weeks	10	10
8--9 weeks	13	13
9--10 weeks	24	24
10—11 weeks	27	27
11—12 weeks	17	17
12-14 weeks	9	9
Total	100	100
Mean ± SD	10.75 ± 1.58	

Table 4: Age wise comparison of normal and thyroid dysfunction cases

Age in years	Normal		Thyroid dysfunction		Total	
	No	%	No	%	No	%
<20	12	92.3	1	76.9	13	13
21-25	46	82.1	10	78.5	56	56
26-30	17	68	8	32	25	25
>31	5	83.3	1	16.6	6	6
Total	80	80	20	20	100	100

Table 5: Comparison of Period of Gestation with normal and thyroid dysfunction

POG in weeks	Normal		Thyroid dysfunction		Total	
	No	%	No	%	No	%
≤ 8 weeks	9	90	1	10	10	10
8--9 weeks	12	92.3	1	76.9	13	13
9--10 weeks	17	70.8	7	29.1	24	24
10—11 weeks	19	70.3	8	29.6	27	27
11—12 weeks	10	58.8	7	41.1	17	17
≥ 12 weeks	5	55.5	4	44.4	9	9
TOTAL	72	72	28	28	100	100

Table 6: TPO wise distribution of thyroid dysfunction cases

TPO	Thyroid dysfunction	Percentage
Positive	1	5%
Negative	19	95%
Total	20	100%

Table 7: Comparison of mean TSH, FT3 and FT4 with normal and thyroid dysfunction cases

Thyroid profiles	Normal case	Thyroid dysfunction case	t- test value, P-value & mean ± SD Mean ± SD Significance
	Mean ± SD	Mean ± SD	
TSH	1.86 ± 0.79	9.18 ± 2.21	t = 16.48 P= 0.00, VHS
FT3	2.63 ± 0.51	2.68 ± 0.63	t = 0.869 P= 0.453, NS
FT4	12.58 ± 0.80	12.62 ± 0.77	t = 0.902 P= 0.434, NS

Discussion

Pregnancy can be viewed as a state, in which a combination of events occurs to modify the thyroid economy [7]. There occur the changes in thyroid hormone levels, TSH levels and even in thyroid binding globulin levels during normal pregnancy. thyroid dysfunction can be overlooked in pregnancy because of nonspecific symptoms and hyper metabolic state. Maternal thyroid dysfunction is associated with complications during pregnancy and can affect both the maternal and fetal outcome [8] Therefore it is important to identify the thyroid disorders, early in pregnancy, so that appropriate measures can be initiated. Table 1 shows the age distribution of the subjects; majority of the subjects were in the age group of 21-25 years (56%).

In the present study it was observed that 51(51%) were belong to in gestation age group of 9-11 weeks. This is similar to study conducted by Nambiar V et al [7]. which showed that mean gestational age at presentation was 10.03 ± 1.87wks.

Present study showed that there were 20 (20%) of thyroid dysfunction cases in the study. The proportion of thyroid dysfunction with normal cases were 5.4:1 and the hospital incidence rate of thyroid dysfunction in first trimester pregnant women was 20%. Study reveals that, there was no statistical significance difference of normal and thyroid dysfunction cases in relation with age (P>0.05).

This Study reveals that, there was statistically very highly significance association normal and thyroid dysfunction cases in relation with period of gestation (P<0.001). Higher the period of gestation age has significantly more number of thyroid dysfunction cases as compare to lower gestation age in relation with normal cases.

TPO wise distribution of thyroid dysfunction showed that there were 19 (95%) of thyroid dysfunction cases have negative TPO among thyroid dysfunctions. Only one case 1 (5%) had positive TPO among thyroid dysfunction in the study. In the study hospital TPO rate was 5%.

Similar study done by Prasad et al [9]. screened 1000 pregnant women in first trimester. If TSH was deranged, then free T4 and T3 and thyroid peroxidase antibody were done. Their result showed that prevalence of thyroid dysfunction was high in this study, with subclinical hypothyroidism 13.5%, overt hypothyroidism 0.7%, thyrotoxicosis 0.3% and TPO Ab was positive in 6.82% of total, 18.5% of subclinical and 71% overt hypothyroid patients. Study reveals that, there was statistically very highly significance difference of mean TSH values among normal and thyroid dysfunction cases (P< 0.001). The mean TSH values of thyroid dysfunction were significantly higher as compare with mean TSH normal values. Study reveals that, there were no statistical significance difference of mean FT3 and FT4 values among normal and thyroid dysfunction cases (P value were >0.05).

The increase in thyroid hormone levels can be attributed to several mechanisms. During pregnancy, there is an increased concentration of estrogen which influences the increase in the synthesis of hepatic TBGs. It also prolongs the half-life of thyroid binding globulins from 15 mins to 3 days because of estrogen induced sialylation. Hence there is decreased hepatic clearance resulting in increase in total T3 and total T4 levels.

During pregnancy TBG levels begin to increase after 6-8 weeks of gestation10 and reaches a plateau around mid-gestation and remains high of about 2-3 times of preconception levels until term. Hence the levels of total T4 increase sharply between 6-12 wks of gestation, and progress more slowly thereafter and stabilize around mid-gestation. Moreover, the changes in albumin and free fatty acid concentration which facilitates the binding of T4 and T3 to carrier proteins and lowers the concentration of free thyroid hormones levels. This leads to further stimulation of T4 and T3 synthesis [11]. The placenta secretes hCG, a glycoprotein hormone, sharing common α subunit with TSH but having unique β subunit, which confers specificity. hCG or a molecular variant, acts as a TSH agonist, having thyrotrophic activity leads to elevated levels of thyroid hormones in first trimester which contribute to the cause of gestational transient hyperthyroxinaemia, seen in about 0.3% of pregnancies. This is commonly seen in hyperemesis gravidarum, multiple pregnancy and molar pregnancy [11]. T4 is a precursor of T3, which is major active form of thyroid hormone, T4 gets deiodinated to T3 and hence there is increased turnover of T4. This leads to relative hypothyroxemia and an increase in the production of T4 due to increased demand. About 80% of T3 produced in the body is derived extrathyroidally from T4 deiodination. T4 level is equilibrated in circulation on a manufacture and expenditure basis. Levels of thyroid hormones are determined not only by

synthesis /secretion but also by their metabolism. The variations in T3 and T4 levels seems to be need based [12].

The enzyme type III deiodinase, produced by placenta, converts T4 to rT3 and T3 to diiodotyrosine and it has extremely high activity during fetal life. During fetal life as there is an increased demand for T4 and T3 hormones by the fetus, and as it mainly depends on maternal thyroid hormones in early pregnancy until 12-14weeks, it causes an increased production of these hormones which ultimately leads to an increase in circulating concentrations of the same hormone [13].

Thyroid economy differs between the healthy pregnant women and healthy non pregnant women. Compared with preconceptional levels, TSH concentration is lower throughout the pregnancy. TSH is lowest in the first trimester of pregnancy [8].

The decrease in TSH level could be attributed to the thyrotrophic action of hCG, which is a thyroid regulator in normal pregnancy, because of hormone specific β subunits and extracellular receptor binding domains of hCG and TSH share multiple similarities [14].

In normal pregnancy, the placenta produces hCG in first week of conception and levels peak at week 10, before decreasing and reaching a plateau by week 20. Between 8 and 14 wks of gestation, the changes in hCG and TSH are mirror images of each other, with a significant negative correlation between the two 8 The structural homology between hCG and TSH, where they contain a common α subunit and the hormone specific beta subunits share 85% sequence homology in first 114 amino acid and 12 cysteine residues at highly conserved position, hence their tertiary structures are very similar [15].

Therefore, during first trimester of pregnancy the elevated hCG levels leads to transient increase in thyroid hormone levels and in turn causes partial suppression of TSH secretion, but not high enough to induce overt hyperthyroidism [15]. But according to ATA guidelines, the upper limit of TSH for first trimester of pregnancy is considered as 2.5μIU/ml. Applying the same guidelines to our study population revealed the proportion of euthyroid subjects as 81.5%, 16.3% as hypothyroid (subjects had TSH values > 2.5μIU/ml), and 2.5% (subjects had TSH values < 0.04μIU/ml), as hyperthyroid. There has been a wide geographic variation in prevalence of hypothyroidism during pregnancy. It varies from 2.5% in west to 11% in India, it seems that prevalence of hypothyroidism is more in Asian countries as compared to west [16].

The present study is in agreement with the study conducted by Dinesh DK [9] et al., where in the incidence of hypothyroidism was found to be 14.3% during first trimester of pregnancy. The observation of present study is similar to the study conducted by Nambier V et al [7]. who reported the prevalence of hypothyroidism and thyroid autoimmunity as 4.8% and 12.8% respectively.

This study is also in favour of study conducted by sahasrabuddhe A et al [17]. who reported the prevalence of hypothyroidism as > 10%A study done by Mukhopadhyay A et al [18]. reported the incidence of hypothyroidism in pregnancy about 3.69% unlike the observations found in the present study. A study by Goel P et al [19]. reported the prevalence of hypothyroidism of about 6.3% which is in favour of the findings of the present study. A study done by Shah MJ et al [20]. reported the prevalence of hypothyroid in 4.4% and overt hyperthyroidism in 0.6% in their study subjects which is quite less compared to the observations of the present study.

The subjects in hyperthyroid state could be due to gestational transient thyrotoxicosis (GTT) which occurs in 1-3% of pregnancies, due to elevated hCG levels or

due to overt hyperthyroidism which occurs in 0.4-0.7% of pregnancies. This is in support of the fact that there is a high prevalence of gestational thyrotoxicosis in Asian women during 8-11weeks of gestation than during 12-14 weeks[21].

Conclusion

A high proportion of hypothyroid was observed in first trimester of pregnancy, and hence a routine antenatal screening is suggested to diagnose the thyroid dysfunction at the earliest gestation.

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