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Original Research Article

Study of thyroid hormones in pregnancy

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ABSTRACT

Background: Thyroid disorder is often overlooked in pregnant women this is because of nonspecific symptoms and hyper metabolic state of normal pregnancy. To evaluate the thyroid function in pregnant women in all the three trimesters and to study their impact on pregnancy outcome.

Methods: A prospective study in 200 randomly selected antenatal cases was carried out during a period of two years in a tertiary care medical college in Western Maharashtra. A detailed general and systemic examination was carried out and Thyroid stimulating hormone (TSH) was done in all cases. Any case with an abnormal TSH level was further tested for T₃ T₄ levels.

Results: The mean TSH level was 1.6 µIU/l which was less than the standard cut off of 2.5 µIU/l. 61% had decreasing level of TSH with advanced gestation. An abnormal thyroid function was seen in 8.5% cases.

Conclusions: Standardization of TSH, T₃, T₄ is still a concern as it varies significantly in different studies. Estimation of TSH with T₃ T₄ could not be correlated during pregnancy with advancing gestational age. The real impact of hypo/hyperthyroidism on fetal outcome could not be statistically established.

Keywords: Fetal outcome, Pregnancy, Thyroid hormones

INTRODUCTION

If Pituitary is the queen of endocrine glands then thyroid is a jack of all trades of the endocrine glands. Pregnancy is the phenomenon of exaggerated physiology, with many alterations in the metabolism of maternal systems due to an addition of accessory metabolic organ in the form of foetus.¹⁻³

A number of authors have stated that pregnancy is a “stress test” for the thyroid where the maintenance of adequate thyroid hormones levels for the mother and foetus requires an intact thyroid gland and an adequate supply of iodine.⁴ Most well recognized alteration in maternal thyroid physiology is increase in thyroxine binding globulin (TBG) which begins early in first

trimester plateaus during mid gestation and persists shortly after delivery.⁵ Screening studies have shown an elevated TSH in 2.5% of pregnancies.^{6,7}

Prevalence of thyroid autoimmunity among euthyroid women of childbearing age group is quite high. These women are at high risk of pregnancy related complications (spontaneous miscarriage), subclinical hypothyroidism and postpartum thyroiditis.^{8,9} The prevalence of hyperthyroidism during pregnancy ranges from 0.1-0.4% out of which Graves disease accounts for 85%.^{10,11}

The objective of the study was to evaluate the thyroid function in pregnant women in all the three trimesters. To study their impact on pregnancy outcome.

METHODS

The prospective study on 200 patients was carried out in a tertiary hospital in western Maharashtra (Bharati Hospital and Medical College Pune) over a period of 18 months (April 2009 to October 2010). Medical college Ethical committee approval was taken.

All healthy 200 pregnant women coming for ANC checkups were selected as per inclusion criteria. A detailed history and thorough general and systemic examination were carried out. The patients were subjected to essential investigations like haemogram, serology, ultrasonography and urine. TSH estimation was done in all three trimesters. Any patient with abnormal TSH levels was further subjected for free T_3 T_4 estimation.

Selection criteria

Randomised selection of 200 healthy pregnant women visiting to ANC OPD at Tertiary Care Medical College Hospital in western Maharashtra were selected for TSH evaluation.

Exclusion criteria

Any gravid under group of high-risk pregnancy (with known medical/surgical/obstetric disorder). Cases coming after 35-week pregnancy for 1st ANC check-up.

Statistical analysis

Statistical analyses were performed with SPSS 24.0.

RESULTS

The 200 antenatal cases were divided into 3 groups upto 14 weeks (group 1) there were 15 cases, between 14 to 26 weeks (group 2) 64 cases and more than 26 weeks (group 3) there were 121 cases (Table 1).

Table 1: Group wise distribution of patients.

Group	Description	Patients
Group 1	Up to 14 weeks	15
Group 2	14 to 26 weeks	64
Group 3	26 weeks onwards	121

Maximum number of patients were from the age group 20-25 (122) years irrespective of study groups. Approximately 74% of patients were gravid 1 and 2. Primigravida cases were maximum in groups 1, 2 and 3 and were 7, 23 and 56 cases respectively.

The statistically significant TSH values were found in group 2 and 3 with the highest level of TSH in both these groups being 10.94 μ IU/l. Range of TSH in 50% cases in group 1 was from 0.5-2.5, in second group 62.5%

patients the levels ranged between 0.5-2.0, while in the third group in 71.4% cases the levels ranged between 0.5-2.0 (Figure 1).

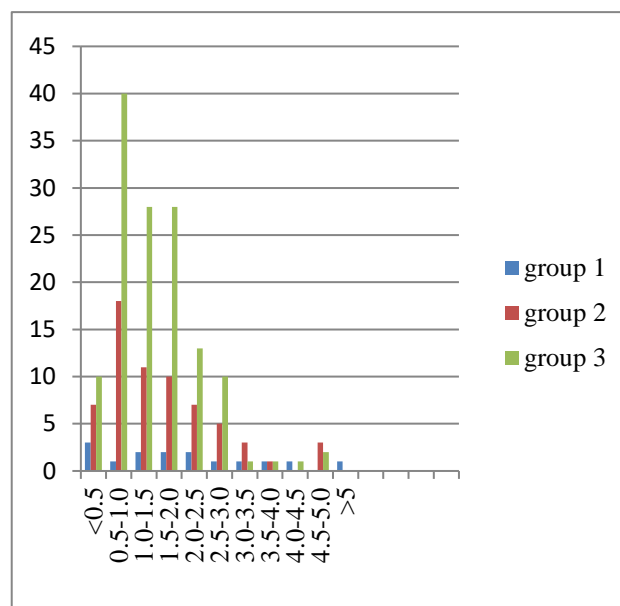


Figure 1: Range of TSH in 3 groups.

The range of T_3 value is up to 3.5 ng/ml in first group, 0.5-4 ng/ml in second group and 0.5-4 ng/ml in third group. Group one has only one patient with a T_4 level of 1 μ g/dl, in group2 the range is from 0.13 to 14.60 and in group 3 from 0.86-16.69 μ g/dl. T_4 levels had no established pattern with the gestational age while values of T_3 with advanced pregnancy were inconclusive. With advanced gestation the TSH levels decreased in 61% cases. The total number of hyperthyroid cases were 9 (4.5%). The total number of hypothyroid cases were 8 (4%) (Figure 2).

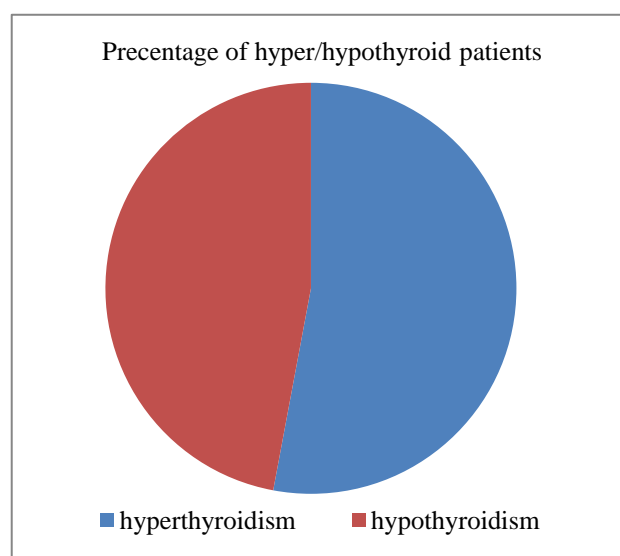


Figure 2: Incidence of hyperthyroidism and hypothyroidism.

In all the three groups the gestational age at the time of delivery in maximum cases (142) fell between 35-40 weeks. The fetal weight as assessed was 2.65 kg average in hyperthyroid cases and 2.68 kg in hypothyroid cases (Figure 3).

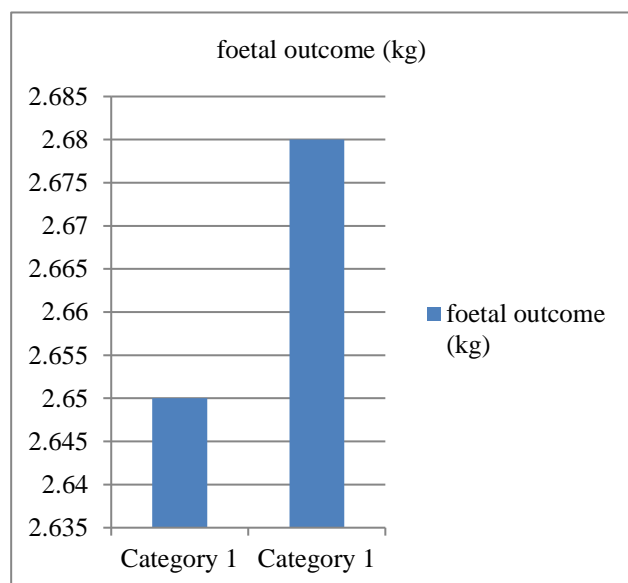


Figure 3: Foetal outcome in terms of birth weight.

DISCUSSION

The 200 antenatal cases were divided into 3 groups up to 14 weeks (group 1) there were 15 cases, between 14-26 weeks (group 2) 64 cases and more than 26 weeks (group 3) there were 121 cases.

A study was carried out by Marwaha in 2008 to establish reference range for thyroid hormones in normal pregnant Indian women. The composition of reference population comprised of 107 women in first trimester, 137 in second trimester, and 87 in third trimester unlike our study they had more cases in the second trimester.¹²

In our study maximum number of patients were from the age group 20-30 years (170 cases) while the study done by Jidnyasa et al where the mean age of the mothers was 25.38 ± 5.36 in completed years.¹³

The statistically significant TSH values were found in group 2 and 3 with the highest level of TSH in both these groups being 10.94 $\mu\text{IU/L}$. Range of TSH in 50 % cases in group 1 was from 0.5-2.5, in second group 62.5% patients the levels ranged between 0.5-2.0, while in the third group in 71.4% cases the levels ranged between 0.5-2.0. The range of T_3 value is upto 3.5 ng/ml in first group, 0.5-4 ng/ml in second group and 0.5-4 ng/ml in third group. Group one has only one patient with a T_4 level of 1 $\mu\text{g/dl}$, in group 2 the range is from 0.13 to 14.60 and in group 3 from 0.86-16-69 $\mu\text{g/dl}$. T_4 levels had no established pattern with the gestational age while values of T_3 with advanced pregnancy were inconclusive. With

advanced gestation the TSH levels decreased in 61% cases. In our study it was found that average TSH is 2.3 $\mu\text{IU/l}$ that is higher than the other two groups (1.66 $\mu\text{IU/l}$) unlike the study by Soldin et al. In his study the trimester-specific T_3 , FT_4 , TSH, were significantly different between the first and third trimesters (all $p \leq 0.05$); second and third trimester values were not significantly different for FT_4 , TSH, and (all $p > 0.25$), although T_3 was significantly higher in the third, relative to the second trimester. T_4 was not significantly different at any trimester (all $p > 0.8$). During a normal pregnancy the stimulatory effect of hCG on the thyroid induces a partial TSH suppression below the non-pregnant range at the end of the first trimester (mean 0.89 mIU/l compared to 1.06 mIU/l postpartum).¹⁴⁻¹⁶

Dashe et al estimated a normal reference range for TSH during gestation in singleton and twin pregnancies.¹⁷ TSH decreased significantly during the first trimester for singleton first-trimester pregnancies, the approximate upper limit of normal TSH was 4.0 multiples of the median. Thereafter, the approximate upper limit was 2.5 multiples of the median for singleton pregnancies.

There was relatively close agreement between TSH limits which tended to be lowest in early pregnancy. The mean first trimester 97.5th percentile was 3.00 mIU/l (range 2.15-3.78 mIU/l). The changes in thyroid function tests with gestational age were shown in a study of 13,599 singleton pregnancies assessed at one week intervals from week 6 to term where serum TSH fell to a trough at week 10 followed by a progressive increase to term.¹⁸

TSH levels more than 2.5 mU/l in first trimester of pregnancy predispose women to pregnancy loss even without thyroid autoimmunity.¹⁹

Deshwal et al in their study reported that FT_3 , FT_4 decreased, and TSH increased with the progression of the gestational period as is observed in this study.²⁰ Another study carried out by Kumar et al from India evaluated 124 pregnant women using radioimmunoassay showed an increase in TSH progressively with each trimester while serum triiodothyronine (T_3) and thyroxine (T_4) values increased from first to second trimester and declined from second to third trimester.²¹

A cross-sectional study by Marwaha et al on 541 pregnant Indian women revealed significant decrease in FT_4 with advancing pregnancy, while no significant difference was seen in values of FT_3 or TSH between the trimesters.

Similar observation were made by Maji et al in their study of 402 healthy pregnant women.²² The reference intervals for TSH were 0.25-3.35 IU/ml for the first trimester; 0.78-4.96 IU/ml for the second trimester, and 0.89-4.6 IU/ml for the third trimester. For Free T_4 , the trimester specific reference range was 0.8-1.53, 0.7-1.20 and 0.7-1.20 ng/dl for each trimester, respectively. The

reference range for total T₄ for the first, second and third trimester was 7.31-15.00, 8.92-17.38, and 7.98-17.70 µg/dl, respectively. Furthermore, last trimester specific reference range for total T₃ was 0.90-2.51, 1.99-2.87 and 1.20-2.70 ng/ml, respectively.

The prevalence of hyperthyroidism is approximately 0.4%, subclinical hyperthyroidism about 3.3%, hypothyroidism about 0.3%, and subclinical hypothyroidism may reach 2.5% or more.²³

CONCLUSION

Only TSH estimation is not the indicator of abnormal thyroid function in pregnancy. Standardisation of the TSH, T₃, T₄ values is still a concern as it varies significantly in different studies. Estimation of TSH cannot be correlated with T₃, T₄ during pregnancy with advancing gestational age. The real impact of hypo/hyperthyroidism on fetal outcome could not be statistically established in the present study because of study population sample size.

The study limitations for the detail evaluation of thyroid function test during pregnancy in the form of estimation of free T₃, T₄, TBG and autoimmune antibodies is because of economical constraints.

The goal TSH value of our study (1.6 µIU/L) does match with the current trend of changes of goal TSH globally.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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