

# Study of Thyroid Profile in First Trimester of Pregnancy

Shamali Jungare<sup>1\*</sup>, Sanjay Sonune<sup>2</sup>

{<sup>1</sup>Assistant Professor, <sup>2</sup>Professor} Department of Biochemistry

Government Medical College and Hospital, Akola, Maharashtra, INDIA.

\*Corresponding Address:

[shamaliajungare@rediffmail.com](mailto:shamaliajungare@rediffmail.com)

## Research Article

**Abstract:** Thyroid disorders are common in pregnancy. There is an increasing interest in identifying changes in thyroid function during pregnancy due to the role of thyroid function in maintaining a viable pregnancy and contributing to healthy offspring. Thus the present study was conducted for evaluation of thyroid function during first trimester of pregnancy. We examined total 50 pregnant women in first trimester and 50 age matched control for thyroid factor. We found there is significant elevation in serum levels of triiodothyronine (T3) and thyroxine (T4) in first trimester of pregnancy as compared to control group. Mean thyroid stimulating hormone (TSH) in this group was suppressed but their level doesn't match with elevated thyroid hormones. In first trimester of pregnancy elevated thyroid hormones according to the manufacturers reference range which suggests hyperthyroidism is actually an extra requirement of thyroid hormones by growing fetus. Also it is suggested that to avoid misdiagnosis of hyperthyroidism in pregnancy, specific trimester related reference interval should be established for particular region.

**Key Words:** First trimester of Pregnancy, thyroid hormones and Enzyme linked Immunosorbent assay (ELISA).

### Introduction

Pregnancy is a physiological state, associated with significant but reversible changes in thyroid function.<sup>(1)</sup> The role of thyroid hormone in embryogenesis and fetal development during pregnancy is well known.<sup>(1)</sup> During the first trimester of pregnancy, the fetus is reliant on transplacental passage of maternal thyroxine, as the fetal thyroid is not fully functional until about 16 weeks of gestation.<sup>(2)</sup> The production of hCG (human chorionic gonadotropin) by placenta during first trimester is known to stimulate thyroid gland because of its structural similarity to thyrotropin (TSH). This leads to reduced serum thyrotropin levels during first trimester because of negative feedback effect.<sup>(2)</sup> Maternal hypothyroidism during first trimester is known to cause impaired neuropsychomotor development, reduced IQ score in children. Apart from these, spontaneous miscarriages, gestational hypertension, placental abruption and premature delivery, IUGR are known to occur with maternal hypothyroidism.<sup>(2,3)</sup> The findings associated with hypermetabolic state of normal pregnancy can overlap with the clinical signs and symptoms of thyroid disease.<sup>(1)</sup> Hence the study was aimed to evaluate thyroid

function tests during first trimester of pregnancy, so that necessary measures can be taken to prevent both maternal or fetal adverse outcome.

### Materials and Methods

Study group consists of 50 pregnant women in first trimester without pre existing thyroid disease. The control group comprised of 50 age matched healthy non-pregnant females. All subjects were consuming iodide salt. The exclusion criteria were pregnant women with history of thyroid disease and on medication related to thyroid disorders. 2ml of fasting blood sample was collected. Serum is separated by centrifugation. Serum T3, T4, TSH were measured by enzyme immunoassay on STAT FAX 4300 CHROMATE ELISA Reader using ERBA Thyrokits by ERBA Diagnostics Mannheim GmbH, Germany.

### Results

Results are given in table 1. In the present study, in first trimester of pregnancy the mean value of T3, T4 were found to be  $1.47 \pm 0.59$ ,  $10.24 \pm 2.35$  respectively while in control group it was  $1.16 \pm 0.33$  and  $8.72 \pm 2.33$  (Table 1). The results show that mean T3 levels in first trimester were significantly higher as compared to control group with p value  $< 0.001$ . Also the mean T4 levels in first trimester were increased significantly with p value  $< 0.005$ . In control group the mean serum TSH levels were found to be  $1.88 \pm 1.07$  and in first trimester it is decreased i.e.  $1.61 \pm 1.21$  as compared to controls but there difference is not statistically significant.

**Table 1:** Levels of Serum T3, T4 and TSH in First Trimester of Pregnancy

Subjects	T3 Mean±SD	T4 Mean±SD	TSH Mean±SD
1 <sup>st</sup> trimester	$1.47 \pm 0.59$	$10.24 \pm 2.35$	$1.61 \pm 1.21$
Control	$1.16 \pm 0.33$	$8.72 \pm 2.33$	$1.88 \pm 1.07$

T3 values are expressed in ng/ml

T4 values are expressed in µg/dl.

TSH values are expressed in µIU/ml.

## Discussion

In our study we found elevated T3, T4 in first trimester as compared to control group which was statistically significant. Somewhat similar results were obtained by Mujawar et al. He found significantly higher elevation of hCG, T3, T4. But he also found elevated TSH in these subjects.<sup>(4)</sup> In a study by Kumar et al, they also found rise in T3, T4 in both first and second trimester of pregnancy.<sup>(5)</sup> Our results are in agreement with WohllkN et al who also found significant elevation T3, T4 and suppression of TSH in 6-14 weeks of pregnancy.<sup>(8)</sup> In our study we also found TSH levels to be suppressed in first trimester as compared to controls but are not statistically significant. In another study by Zarghami et al TSH levels are suppressed in First trimester and also their difference is not statistically significant.<sup>(1)</sup> The etiology of increase in total thyroid hormones involves, primarily, increased concentration of plasma thyroxine binding globulin (TBG) during pregnancy.<sup>(1,6)</sup> Another proposed mechanism for this increase in total thyroid hormone concentration is production of type III deiodinase from placenta. This enzyme which converts T4 to reverse T3 and T3 to diiodotyrosine (T2), has extremely high activity during fetal life. Increased demand for T4 and T3 has been suggested to increase production of these hormones with, ultimately increased concentration in circulation.<sup>(1,6)</sup> Increased sialylation, mediated by oestrogens, reduces the clearance of TBG, resulting to increase levels of T4 and T3 as well.<sup>(7)</sup> It means, not every pregnant women which demonstrate elevated T4, is really in a state of hyperthyroidism but it is the new physiological condition and the metabolic regulation of pregnant women which realized and on that base, extra thyroxine requirement is requested, T4 is elevated, not for the sake of hyperthyroidism, but for the sake growing fetus demand and the maternal new physiological condition, therefore the establishment of reference interval and the methodology of thyroid hormone measurements in each region is great importance.<sup>(9)</sup> In a study by Marwaha et al, they had established trimester related reference interval in Indian population. The reference range for fT3, fT4 and TSH in first trimester was 1.92-5.86 pM/l, 12- 19.45 pM/l, and 0.6 – 5.0iu/ml respectively.<sup>(10)</sup> Another study was done in 2159 pregnant women in Western Australia, who were evaluated for TSH, fT3 and fT4 during their first trimester (9-13weeks) to establish first trimester specific reference intervals for thyroid function tests. The derived reference interval for thyroid function tests during first trimester of pregnancy were: TSH,0.02-2.15Mu/L; fT4,10.4-17.8pmol/L; and fT3, 3.3-5.7pmol/L.<sup>(2)</sup> Mansourion et al had found that if reference intervals for pregnant females not established there would be negative adverse effects on pregnant female and fetus as well.<sup>(11)</sup>

Thyroid function test values change in gestation, especially within the first trimester, largely because of estrogen-induced increases in serum thyroxine-binding globulin (TBG) levels and human chorionic gonadotropin (hCG)–induced increases in thyroid hormone synthesis and release. The results of thyroid function tests during the first trimester of pregnancy often are outside non-pregnant reference ranges for commercial laboratories. Few US studies have provided first trimester specific thyroid function values.<sup>(12-14)</sup> The American Thyroid Association has recently identified the determination of reference ranges for thyroxine (T<sub>4</sub>) and thyroid-stimulating hormone (TSH) in pregnant women, especially in the first trimester, as a research priority.<sup>(15)</sup> In our study we found elevated serum T3, T4 but on the other hand TSH was not suppressed to the levels that match T3, T4. Thus TSH level during first trimester should be assessed carefully. Although, there are many reports advising for the proper evaluation of thyroid function tests during early stages of pregnancy to avoid the risk involved, but one should remember that the extra requirement of T4 during pregnancy and elevated T4 according to the reference range of manufacturer kit, for non-pregnant women may cause some irreversible damage to the growing fetus if treatment for hyperthyroidism started which is in fact are the extra requirement of the thyroid hormone for the pregnant women and fetus. Thus trimester specific intervals in each particular region also should have been taken into consideration when thyroid function tests in pregnant women were evaluated.<sup>(11)</sup>

## Conclusion

There is significant elevation of T3 and T4 in first trimester of pregnancy, but since suppression in TSH is not significant, this increase in thyroid hormones is considered to be extra requirement of thyroid hormone for fetal development. Also it is suggested that region wise specific trimester related reference interval should be established to avoid misdiagnosis of hyperthyroidism.

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