

EVALUATION OF THYROID HORMONE CHANGES DURING PREGNANCYPREETI MALHOTRA¹, KAVITA TANWAR¹, DIKSHA KUMARI CHITTARA¹, SONAL SOGANI^{2*}¹Department of Obstetrics and Gynaecology, Pacific Institute of Medical Sciences, Udaipur, Rajasthan, India. ²Department of Biochemistry, Pacific Institute of Medical Sciences, Udaipur, Rajasthan, India. Email: sonal.sogani246@gmail.com

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ABSTRACT**Objective:** Knowing the ideal levels of triiodothyronine (T3), thyroxine (T4), FT3, FT4, and thyrotropin-stimulating hormone (TSH) for each pregnancy trimester are the goal.**Methods:** The Department of Obstetrics and Gynecology at the Pacific Institute of Medical Sciences in Udaipur treated 150 patients (obstetric cases) for the current longitudinal research. The following parameters were examined for in a fasting blood sample: T3, T4, FT3, FT4, and TSH.**Results:** As a result, thyroid profile readings in every group (I, II, and III trimester) were increased and were maximum in second group or second trimester followed by third. The levels above the normal range were in 39 (12+12+15) women of all the groups.**Conclusion:** The second trimester of pregnancy saw the greatest increase in thyroid hormones readings. Thyroid profile was lower during the first trimester, particularly at par during the second, and decreased in third trimester.**Keywords:** Thyroid profile, pregnant women, Triiodothyronine, Thyroxine, Thyrotropin-stimulating hormone.© 2023 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2023v16i1.46662>. Journal homepage: <https://innovareacademics.in/journals/index.php/ajpcr>**INTRODUCTION**

When compared to men, women experience thyroid issues 4–5 times more commonly than they do, especially during the childbearing years. Therefore, it is common to find thyroid function problems, while a regular laboratory assessment of pregnant women is being done [1].

The metabolic demands and hormonal changes that occur during pregnancy cause significant changes in the biochemical markers of thyroid function. Thyroid changes during pregnancy are considered as a protracted physiological situation, in which a series of things happen to change the thyroid levels. Such occurrences may have little or significant thyroidal consequences by acting singly, in concert, or even antagonistically. In addition, because these occurrences occur at various stages of gestation, complicated consequences may be seen briefly or, in contrast, may last until term [2,3].

Thyroid function tests during pregnancy can sometimes be challenging to interpret due to these natural hormonal changes. The regular growth of the baby's brain and nervous system depends on thyroid hormone [4].

The goal of the study was to identify the optimal levels of triiodothyronine (T3), thyroxine (T4), and thyrotropin-stimulating hormone (TSH) for each pregnant trimester.

METHODS

The study was conducted after the ethical clearance in the Department of Obstetrics and Gynecology at the Pacific Institute of Medical in Udaipur treated 150 patients (obstetric cases) for the purpose of the longitudinal study. The study was conducted throughout the course of 10 months. The outcomes were contrasted within each trimester.

The subjects were categorized into: Obstetric cases from different trimesters are included:

- First trimester as Group 1 (n=50)
- Second trimester as Group 2 (n=50)
- Third trimester as Group 3 (n=50)

The samples were included of patients:

1. Age must be between 20- and 50-year old
2. All obstetric cases between the first and third trimesters were included, regardless of any obstetric or medical complications
3. The study covered people with no known thyroid issues.

The following conditions were disqualified from the study due to their association with euthyroidism and hyperthyroxinemia.

1. Familial hyperthyroidism and dysalbuminemia
2. Thyroid-binding globulin (familial excess and acquired excess)
3. Transthyretin (excess and mutations).
4. Pharmaceuticals (propranolol, ipodate, popanic acid, and aminodarone)
5. Ill-defined euthyroid syndrome
6. Inhibition of thyroid hormone: In the proposed study, the case study was done as per pre laid pro forma (case record).

The information from the interviews was entered on the printed pro forma after questions were asked of all patients.

Name, age, husband's name, place of residence (urban or rural), menstruation history, obstetric history, concurrent medical conditions, and obstetric difficulties were all recorded for the patient. The fasting blood sample was collected, and analysis was done in the clinical biochemistry laboratory of PIMS, Udaipur.

The following profiles were checked in blood samples:

T3 0.6–1.81, T4 range 4.5–12.6, and TSH 0.23–5.5 FT4 and FT3.

The sample was collected, subjected to a centrifugation process at 3000 rpm for 15 min at 34°C, and the resultant serum was used for the thyroid assay.

RESULTS

Age groups were separated into Groups 1, 2, and 3, with 92 cases falling into the 20–40 year age range and 58 cases falling into the 41–60 year age range. There were 97 total urban cases across all groups, compared to 53 rural instances. There were 86 tribal cases and 64 non-tribal cases (Table 1).

T3 values were raised during pregnancy maximum rise was seen during second trimester. The mean T3 values in the first, second, and third trimesters were 1.74, 8.90, and 4.50 ng/d/L, respectively. In the first trimester, the values ranged from 0.2 to 9.0 ng/d/L. The range of the mean T3 readings in the second trimester was between 0.90 and 14.1 ng/d/L. They were in the 0.84 to 2.0 ng/d/L range for third place (Table 2).

Maximum instances (47) had T4 levels between 4.5 and 12.6 µg/dL in the first, second, and third trimesters. Only four instances had a 4.5 µg/dL or lower level. One instance in the first trimester, ten cases in the second, and seventeen cases in the third trimester all had more than 12.6 µg/dL. The mean T4 values in the first trimester were 6.65 µg/dL, 8.90 µg/dL in the second, and 4.50 µg/dL in the third. In the first trimester, the range was between 1.2 and 14 µg/dL, in the second, 3.50–25 µg/dL, and in the third, 0.84–2.0 µg/dL (Table 3).

In situations, when TSH levels were above 5.5 µIU/dL, they were at their highest (20). In the second trimester, the mean TSH readings reached a maximum of 8.90 µIU/dL. The range of TSH levels was 0.2–9.0 µIU/dL in the first trimester, 0.90–14.1 µIU/dL in the second, and 0.84–2.0 µIU/dL in the third. TSH levels in 96 patients ranged from 0.23 to 5.5 µIU/dL. Six cases have values that are <0.35 µIU/dL. TSH levels in 48 instances were >5.5 µIU/dL (Table 4).

Table 5's findings indicate that in Group 2 (the second trimester), all thyroid hormone values – T3 T4, FT3, and FT4 – were lower in the first trimester or group 1 than in the second and third trimesters. Their levels reached their peak in the second trimester, and in the third, they were greater than in the first and lower than in the second (Table 5).

DISCUSSION

T3 values were raised during pregnancy. Maximum rise was seen in second trimester. Same trend was seen in T4, FT3, FT4, and TSH. Thyroid profile of pregnant women was increased than normal range. The study of Ratcliffe *et al.*, in the study, observed the increased serum levels pattern the levels that were increased in I trimester and stayed nearly stable during second and third trimester, being approximately 1.5 times the values found at the postpartum control [5].

The observation of Kumar *et al.* that the mean T3 increases during the II trimester and then drops in the III trimester compared to the I trimester was consistent with the T3 observation made in the current investigation. In the present study, the mean T4 level increased in the second trimester before declining in the third. This was in contrast to studies by Elduff [6], who noted a declining trend in T4 readings, and Kumar *et al.*, who discovered that the mean T4 level rises during the second trimester and falls during the third. The present study found that the largest spike in the mean TSH value occurred in the second

Table 1: Demographic characteristics of cases

	Age 20–40 years	Age 41–60 years	Urban	Rural	Tribal	Non-tribal
I trimester Group 1	34	16	32	18	31	19
II trimester Group 2	28	22	30	20	28	22
III trimester Group 3	30	20	35	15	27	23
Total	92	58	97	53	86	64

Table 2: T3 level in cases

	Below 0.6 ng/d/L	0.6–1.81 ng/d/L	>1.81 ng/d/L	Total	Mean	Range
I trimester Group 1	5	33	12	50	1.74	0.2–9.0
II trimester Group 2	2	36	12	50	8.90	0.90–14.1
III trimester Group 3	5	30	15	50	3.20	0.84–4.0
Total	12	99	39	150		

Table 3: T4 level in cases

	Below 4.5 µg/dL	4.5–12.6 µg/dL	>12.6 µg/dL	Total	Mean	Range
I trimester Group 1	2	47	1	50	6.65	1.2–14.0
II trimester Group 2	1	39	10	50	9.90	3.50–25.1
III trimester Group 3	1	32	17	50	6.70	3.84–12.0
Total	4	118	28	150		

Table 4: TSH level in cases

	Below 0.35 µIU/dL	0.23–5.5 µIU/dL	>5.5 µIU/dL	Total	Mean	Range
I trimester Group 1	3	35	12	50	1.74	0.2–9.0
II trimester Group 2	2	32	16	50	5.99	0.90–14.1
III trimester Group 3	1	29	20	50	4.50	0.84–2.0
Total	6	96	48	150		

Table 5: Thyroid profile in pregnant women

	T3 (ng/d/L) Mean±SD	T4 (µg/dL) Mean±SD	TSH (µIU/dL) Mean±SD	FT3 (Pg/mL) Mean±SD	FT4 (ng/mL) Mean±SD
I trimester Group 1 (N=50)	1.74±1.87	6.65±1.88	1.74±2.54	3.0±1.75	1.32±0.97
II trimester Group 2 (N=50)	9.90±6.45	9.90±2.06	5.99±1.97	3.45±1.03	1.12±0.45
III trimester Group 3 (N=50)	3.20±5.44	6.70±4.98	4.50±1.01	3.05±0.96	0.96±0.23

trimester. In the present study, like in Zarghami *et al.*'s observation, mean FT3 and FT4 levels decreased during pregnancy [6-9].

TSH and T3 levels were not significantly different between pregnant and non-pregnant cases according to Zarghami *et al.*; however, T4 levels in the third trimester were significantly different from non-pregnant women. In the present study, a considerable rise in T4 levels in the third trimester and a significant rise in mean TSH values compared to non-pregnant women were both noted. TSH and T3 levels significantly increased across all three trimesters compared to non-pregnant women, according to Khandakar *et al.* When compared to non-pregnant counterparts, the mean T1 value in the current inquiry significantly increased in the second trimester. The TSH results were consistent with the present study [8,10].

CONCLUSION

Pregnancy increased the levels of serum T3, T4, FT3, FT4, and TSH, with highest values occurring in the second trimester and minimal in the first.

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COMPETING INTERESTS

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REFERENCES

1. Abraham R, Murugan VS, Pukazhvanthen P, Sen SK. Thyroid disorders in women of Puducherry. *Indian J Clin Biochem* 2009;24:52-9. doi: 10.1007/s12291-009-0009-y, PMID 23105807
2. Hershman JM. The role of human chorionic gonadotropin as a thyroid stimulator in normal pregnancy. *J Clin Endocrinol Metab* 2008;93:3305-6. doi: 10.1210/jc.2008-1461, PMID 18772462
3. Moleti M, Trimarchi F, Vermiglio F. Thyroid physiology in pregnancy. *Endocr Pract* 2014;20:589-96. doi: 10.4158/EP13341.RA, PMID 24449667
4. Allan WC, Haddow JE, Palomaki GE, Williams JR, Mitchell ML, Hermos RJ, *et al.* Maternal thyroid deficiency and pregnancy complications: Implications for population screening. *J Med Screen* 2000;7:127-30. doi: 10.1136/jms.7.3.127, PMID 11126160
5. Ratcliffe WA, Marshall J, Ratcliffe JG. The radioimmunoassay of 3,3',5'-triiodothyronine (reverse T3) in unextracted human serum. *Clin Endocrinol (Oxf)* 1976;5:631-41. doi: 10.1111/j.1365-2265.1976.tb03866.x, PMID 1009675
6. McElduff A, McElduff P, Wiley V, Wilcken B. Neonatal thyrotropin as measured in a congenital hypothyroidism screening program: Influence of the mode of delivery. *J Clin Endocrinol Metab* 2005;90:6361-3.
7. Kumar A, Ghosh BK, Murthy NS. Maternal thyroid hormonal status in preeclampsia. *Indian J Med Sci* 2005;59:57-63. doi: 10.4103/0019-5359.13904, PMID 15738611
8. Ekins R. Measurement of free hormones in blood. *Endocr Rev* 1990;11:5-46. doi: 10.1210/edrv-11-1-5, PMID 2180687
9. Zarghami N, Rohbani-Noubar M, Khosrowbeygi A. Thyroid status during pregnancy in normal Iranian women. *Indian J Clin Biochem* 2005;20:182-5.
10. Khandakar MA, Ali MS, Kahtun M. Thyroid status of normal pregnant women in Dhaka city. *Mymensingh Med J* 2002;11:1-5. PMID 12148388