

Original Research Article

# Study of thyroid profile during pregnancy

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## Abstract

**Background:** Thyroid disease is a disorder that affects the thyroid gland. Sometimes the body produces too much or too little thyroid hormone. Thyroid hormones regulate metabolism - the way the body uses energy and affect nearly every organ in the body. Thyroid hormone plays a critical role during pregnancy both in the development of a baby and in maintaining the health of the mother.

**Aim and objectives:** To evaluate the thyroid status in pregnancy in light of controversial data and to project our values and ideas.

**Materials and methods:** The present case control study was conducted on 100 patients (obstetric cases) attended and managed in the Department of Obstetrics and Gynecology attached to Geetanjali Medical College and Hospital, Udaipur. The results of the patients were compared with 100 age matched control females having gynecological problems (with normal thyroid values). Fasting blood sample was investigated for the following parameters: T<sub>3</sub> (Triiodothyronine), T<sub>4</sub> (Thyroxine), TSH (Thyroid Stimulating Hormone). p-value was calculated by using online student t-test calculator.

**Result:** All the cases of the control group had normal T<sub>3</sub> values. Values below normal were noted in one case each of I and III trimester and normal values were noted in 80.27 per cent in I trimester, 54.75 per cent in II and 55.28 per cent in the III trimester. Only 18.30 per cent cases of I trimester had raised values of T<sub>3</sub> while same was observed in 44.03 per cent in II and 43.51 per cent in III trimester. Variable values of T<sub>4</sub> were observed in various trimesters of pregnancy. Values of T<sub>4</sub> were below normal in 2.81 per cent in I, 1.20 per cent in II and 1.14 per cent in the III trimester. On the other hand in II and III trimester T<sub>4</sub> values were higher than normal in 6.02 per cent and 40.22 per cent respectively. TSH value below normal (0.27µIU/dl) were observed in 2 cases in I and II trimester each while normal values were noted in most of the cases i.e. 77.45 per cent in I, 71.41 per cent in II and 83.31 per cent in III trimester. Fluctuating values of TSH above 4.2 µIU/dl were observed in 19.71 per cent in I, 26.18 per cent in II and 16.66 per cent in the III trimester.

**Conclusion:** T<sub>3</sub> values increased during pregnancy significantly more so in II trimester. T<sub>4</sub> values were less during I trimester particularly at par during II trimester and increased during III trimester.

Raised TSH values were observed during pregnancy as compared to non-pregnant women. Significant increase was observed during II trimester.

## Key words

Thyroid profile, Pregnancy, Thyroxine.

## Introduction

Too much thyroid hormone is called hyperthyroidism and can cause many of the body's functions to speed up. Too little thyroid hormone is called hypothyroidism and can cause many of the body's functions to slow down [1].

Thyroid hormone plays a critical role during pregnancy both in the development of a healthy baby and in maintaining the health of the mother. Two pregnancy-related hormones - Beta human chorionic gonadotropin (Beta- hCG) and estrogen - cause increased thyroid hormone levels in the blood. Made by the placenta, Beta-hCG is similar to TSH and mildly stimulates the thyroid to produce more thyroid hormone. Increased estrogen produces higher levels of thyroid-binding globulin, also known as thyroxine-binding globulin, a protein that transports thyroid hormone in the blood [2].

These normal hormonal changes can sometimes make thyroid function tests during pregnancy difficult to interpret. Thyroid hormone is critical to normal development of the baby's brain and nervous system. During the first trimester, the fetus depends on the mother's supply of thyroid hormone, which comes through the placenta. At around 12 weeks, the baby's thyroid begins to function on its own [3].

## Material and methods

The present case control study was conducted on 100 patients (obstetric cases) attended and managed in the Department of Obstetrics and Gynecology attached to Geetanjali Medical College and Hospital, Udaipur over a period of 10 months from 25<sup>th</sup> July 2011 to 10<sup>th</sup> May 2012.

The results of the patients were compared with 100 age matched control females having gynecological problems (with normal thyroid status).

### The subjects for the study were grouped as follows:

**Group A (Study Group):-** Study group consisted of obstetric cases of various trimesters (n=100).

**Group B (Control Group):-** Females with gynecological problems, having normal thyroid values (control group) (n=100).

### Inclusion criteria:-

- Cases having no known thyroid problem were included in the study.
- Age between 18-48 years.
- Obstetric cases during I, II and III trimester irrespective of obstetric /medical complication were included.

### Exclusion criteria included those with:

The following are the conditions associated with euthyroid hyperthyroxinemia which were excluded from the present study:

- Familial dysalbuminemic hyperthyroxinemia.
- Thyroid Binding Globulin (familial excess, acquired excess).
- Transthyretin (excess, mutations).
- Medications (Propranolol, Iodate, Popanic acid, Aminodarone).
- Sick Euthyroid Syndrome.
- Resistance to thyroid hormone.

In the present study, the case study was done as per pre laid proforma (Case record). All patients were questioned and the information of the interview was recorded on the printed proforma. Details about patient's name, age, husband's

name and address, urban or rural, education status, socioeconomic status were taken. Details about obstetric history, menstrual history, associated medical problems and obstetric complication (if any) were noted.

The blood collection and sample study was done in clinical laboratory attached to the Department of Biochemistry, Geetanjali Medical College and Hospital, Udaipur. Fasting blood sample was investigated for the following parameters:

- T<sub>3</sub> (Triiodothyronine).
- T<sub>4</sub> (Thyroxine).
- TSH (Thyroid Stimulating Hormone).

The collected samples were incubated at 37<sup>0</sup>C for 15 minutes in the incubator and then centrifuged for 10 minutes at approximately 3000 rpm and serum obtained was used in thyroid assay. All the

thyroid parameters were measured by ECLIA (Electro chemiluminescence immunoassay) and were done on Elecsys 2010 using commercial available kits of Cobas.

Obtained results of case group were compared with control group for determination of difference of significance. P-value was calculated by using online student t-test calculator. p-value less than 0.05 was consider as significant.

### Results

Age and parity wise distribution of participants was done as per **Table – 1, Figure - 1** and **Table - 2**. Obtained results of case group were compared with control group for determination of difference of significance. p-value less than 0.05 was considered as significant.

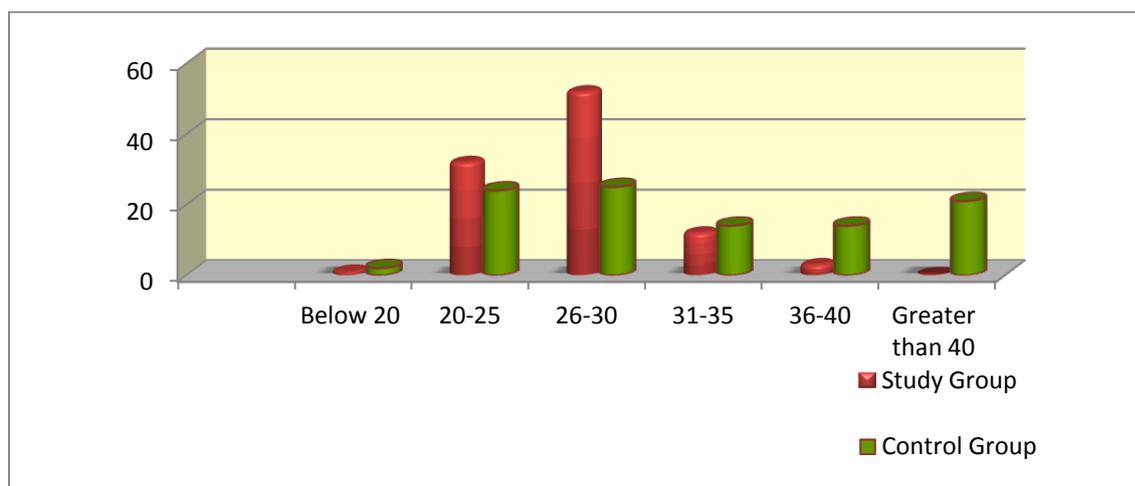
**Table - 1:** Age wise distribution of cases

| Age (Years)  | Study Group  |            | Control Group |            |
|--------------|--------------|------------|---------------|------------|
|              | No. of cases | %          | No. of cases  | %          |
| Below 20     | 1            | 1          | 2             | 2          |
| 20-25        | 32           | 32         | 24            | 24         |
| 26-30        | 52           | 52         | 25            | 25         |
| 31-35        | 12           | 12         | 14            | 14         |
| 36-40        | 3            | 3          | 14            | 14         |
| >40          | NIL          | NIL        | 21            | 21         |
| <b>Total</b> | <b>100</b>   | <b>100</b> | <b>100</b>    | <b>100</b> |
| MEAN         | 27.43        | -          | 32            | -          |
| Minimum Age  | 19           | -          | 18            | -          |
| Maximum Age  | 38           | -          | 50            | -          |

**Table - 2:** Parity wise distribution of cases

| Parity        | Study Group  |            |
|---------------|--------------|------------|
|               | No. of cases | %          |
| Primi         | 48           | 48         |
| II            | 28           | 28         |
| III           | 16           | 16         |
| More than III | 8            | 8          |
| <b>Total</b>  | <b>100</b>   | <b>100</b> |

**Figure - 1:** Graphical presentation of Age wise distribution of cases



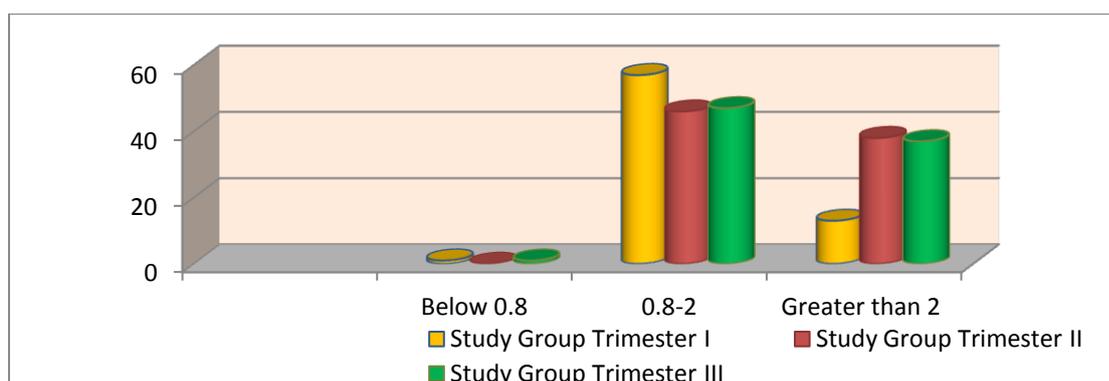
All the cases of control group had normal  $T_3$  values. Values below normal were noted in one case each of I and III trimester and normal values were noted in 80.27 per cent in I trimester, 54.75 per cent in the II and 55.28 per cent in the III trimester.

Only 18.30 per cent cases of I trimester had raised values of  $T_3$  while same was observed in 44.03 per cent in II trimester and 43.51 per cent in III trimester (**Table - 3, Figure - 2**)

**Table - 3:** Values of  $T_3$  (ng/ml)

| $T_3$ (ng/ml) | Study Group (Trimester) |              |              |              |              |              | Control group |            |
|---------------|-------------------------|--------------|--------------|--------------|--------------|--------------|---------------|------------|
|               | I                       |              | II           |              | III          |              | No. of cases  | %          |
|               | No. of cases            | %            | No. of cases | %            | No. of cases | %            | No. of cases  | %          |
| Below 0.8     | 1                       | 1.40         | NIL          | NIL          | 1            | 1.17         | NIL           | NIL        |
| 0.8-2         | 57                      | 80.27        | 46           | 54.75        | 47           | 55.28        | 100           | 100        |
| >2            | 13                      | 18.30        | 38           | 44.03        | 37           | 43.51        | NIL           | NIL        |
| <b>Total</b>  | <b>71</b>               | <b>99.97</b> | <b>84</b>    | <b>98.78</b> | <b>85</b>    | <b>99.96</b> | <b>100</b>    | <b>100</b> |
| Mean          | 1.77                    | -            | 9.09         | -            | 4.43         | -            | 1.35          | -          |
| Minimum value | 0.23                    | -            | 0.89         | -            | 0.68         | -            | 0.86          | -          |
| Maximum value | 8.90                    | -            | 141          | -            | 38           | -            | 2             | -          |

**Figure - 2:** Graphical presentation of values of  $T_3$  (ng/ml) during various trimesters of pregnancy.



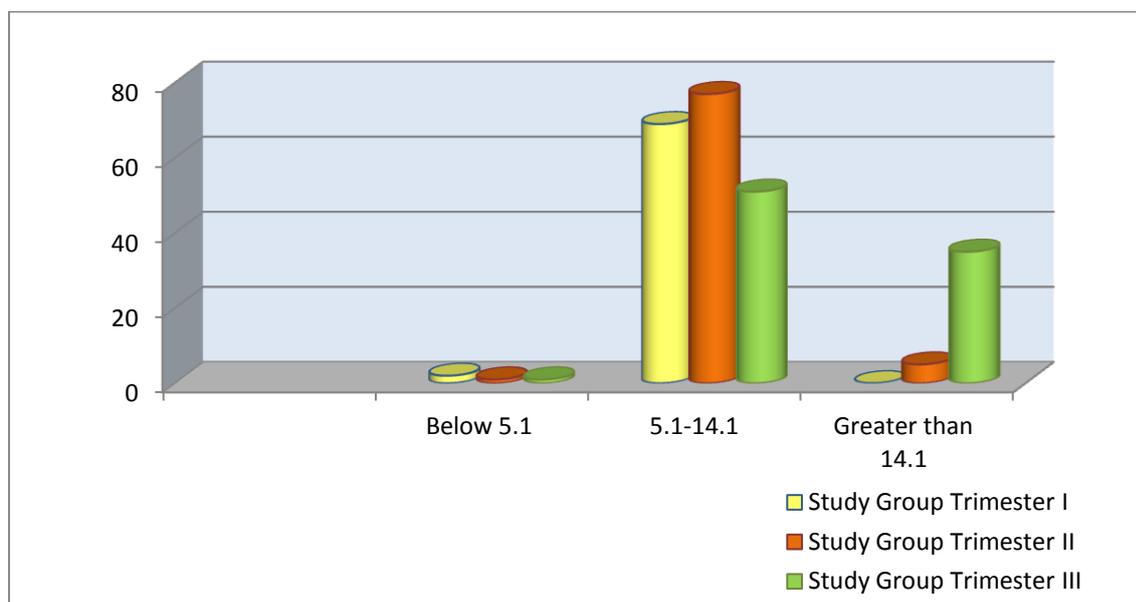
Variable values of T<sub>4</sub> were there in various trimesters of pregnancy while all the cases of control group had valuation within normal range. Values of T<sub>4</sub> were below normal in 2.81 per cent

in I trimester, 1.20 per cent in II and 1.14 per cent in III trimester. On the other hand in II and III trimester T<sub>4</sub> values were higher than normal in 6.02 per cent and 40.22 per cent respectively (Table – 4, Figure – 3).

**Table - 4:** Values of T4 (µg/dl)

| T <sub>4</sub> (µg/dl) | Study Group (Trimester) |              |              |              |              |              | Control group |            |
|------------------------|-------------------------|--------------|--------------|--------------|--------------|--------------|---------------|------------|
|                        | I                       |              | II           |              | III          |              | No. of cases  | %          |
|                        | No. of cases            | %            | No. of cases | %            | No. of cases | %            |               |            |
| Below 5.1              | 2                       | 2.81         | 1            | 1.20         | 1            | 1.14         | NIL           | NIL        |
| 5.1-14.1               | 69                      | 97.17        | 77           | 87.95        | 51           | 58.61        | 100           | 100        |
| >14.1                  | NIL                     | NIL          | 5            | 6.02         | 35           | 40.22        | NIL           | NIL        |
| <b>TOTAL</b>           | <b>71</b>               | <b>99.35</b> | <b>83</b>    | <b>95.17</b> | <b>87</b>    | <b>99.97</b> | <b>100</b>    | <b>100</b> |
| MEAN                   | 6.65                    | -            | 9.47         | -            | 13.45        | -            | 9.26          | -          |
| Minimum value          | 1.00                    | -            | 3.40         | -            | 1.22         | -            | 5.20          | -          |
| Maximum value          | 13.08                   | -            | 24.86        | -            | 20.80        | -            | 14.10         | -          |

**Figure - 3:** Graphical presentation of values of T4 (µg/dl) during various trimesters of pregnancy



Clinically TSH values are a reflection of thyroid profile as considered mostly in clinical practice. All the cases of the control group had normal TSH values. TSH value below normal (0.27µIU/dl) was observed in 2 cases in I and II trimester each while normal values were noted in most of the cases (Table – 5, Figure – 4).

Comparison of thyroid function tests in pregnant and non-pregnant women was as per Table – 6.

### Discussion

T<sub>3</sub> values were raised during pregnancy. Maximum rise was seen during II trimester. Rising trend was noted in T<sub>4</sub> values in various

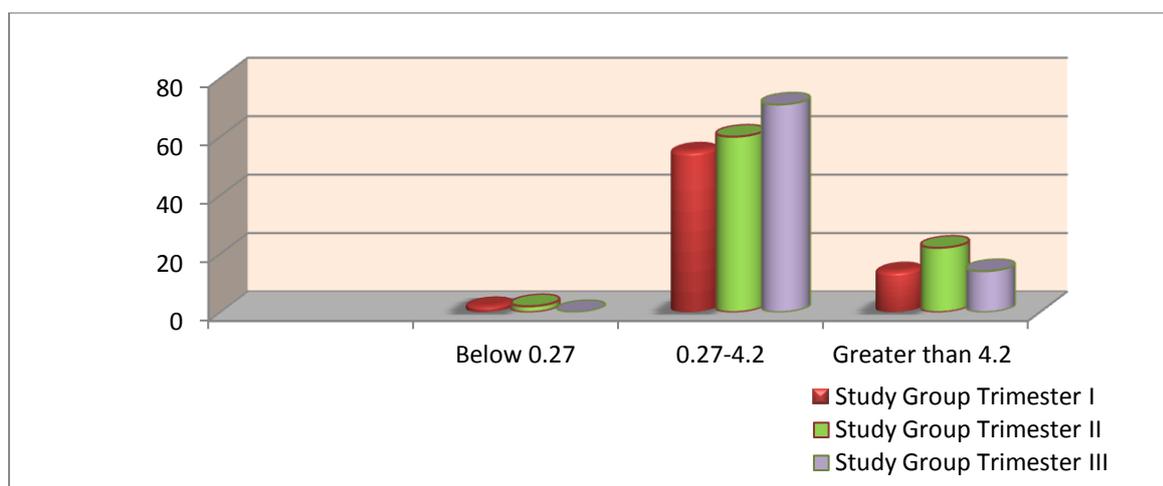
trimesters of pregnancy except for I trimester. Raised mean values of TSH were observed during II and III trimester of pregnancy. Peak

value was recorded in II trimester. The III trimester fall may be a reflection of appropriate clinical management by the clinician.

**Table - 5:** Values of TSH ( $\mu\text{IU}/\text{dl}$ )

| TSH ( $\mu\text{IU}/\text{dl}$ ) | Study Group (Trimester) |              |              |              |              |              | Control group |            |
|----------------------------------|-------------------------|--------------|--------------|--------------|--------------|--------------|---------------|------------|
|                                  | I                       |              | II           |              | III          |              | No. of cases  | %          |
|                                  | No. of cases            | %            | No. of cases | %            | No. of cases | %            |               |            |
| Below 0.27                       | 2                       | 2.81         | 2            | 2.38         | NIL          | NIL          | NIL           | NIL        |
| 0.27-4.2                         | 55                      | 77.45        | 60           | 71.41        | 71           | 83.31        | 100           | 100        |
| >4.2                             | 14                      | 19.71        | 22           | 26.18        | 14           | 16.66        | NIL           | NIL        |
| <b>TOTAL</b>                     | <b>71</b>               | <b>99.97</b> | <b>84</b>    | <b>99.97</b> | <b>85</b>    | <b>99.97</b> | <b>100</b>    | <b>100</b> |
| MEAN                             | 4.04                    | -            | 4.35         | -            | 3.84         | -            | 2.59          | -          |
| Minimum value                    | 0.15                    | -            | 0.02         | -            | 0.56         | -            | 0.49          | -          |
| Maximum value                    | 19.50                   | -            | 25.70        | -            | 47.00        | -            | 4.20          | -          |

**Figure - 4:** Graphical presentation of values of TSH ( $\mu\text{IU}/\text{dl}$ ) during various trimesters of pregnancy.



**Table - 6:** Comparison of thyroid function tests in pregnant and non-pregnant women (mean values).

| Subjects                  | T3( $\text{ng}/\text{ml}$ )<br>Mean $\pm$ SD | T4( $\mu\text{g}/\text{dl}$ )<br>Mean $\pm$ SD | TSH( $\mu\text{IU}/\text{dl}$ )<br>Mean $\pm$ SD |
|---------------------------|--|--|--|
| <b>Non-Pregnant women</b> | 1.35 $\pm$ 0.33                              | 9.26 $\pm$ 2.05                                | 2.52 $\pm$ 1.02                                  |
| <b>Pregnant women</b>     |  |  |  |
| <b>I Trimester</b>        | 1.77 $\pm$ 1.73 <sup>a</sup>                 | 6.65 $\pm$ 1.55 <sup>b</sup>                   | 4.04 $\pm$ 3.53 <sup>a</sup>                     |
| <b>II Trimester</b>       | 9.09 $\pm$ 24.25 <sup>a</sup>                | 9.47 $\pm$ 3.08                                | 4.35 $\pm$ 4.55 <sup>a</sup>                     |
| <b>III Trimester</b>      | 4.43 $\pm$ 6.55 <sup>a</sup>                 | 13.45 $\pm$ 3.41 <sup>a</sup>                  | 3.84 $\pm$ 5.07 <sup>a</sup>                     |

**a=** Significant increase compared to non-pregnant;  $P < 0.05$ .  
**b=** Significant decrease compared to non-pregnant;  $P < 0.05$ .

Thyroid profile of pregnant versus non pregnant cases was compared by using two-sample *t*-test and it was observed that  $T_3$  values increased during pregnancy significantly more so in II trimester.  $T_4$  values were less during I trimester particularly at par during II trimester and increased during III trimester. Raised TSH values were observed during pregnancy as compared to non-pregnant women. Significant increase was observed during II trimester.

Ratcliffe WA, et al. (1976) [4] Stated that during pregnancy the well-known pattern of high serum  $T_4$  and  $T_3$  was observed. The levels were increasing during the I trimester and stayed nearly stable during the II and III trimester, being approximately 1.5 times the values found at the post-partum control. Serum  $rT_3$  was relatively high already when, the first samples were obtained and remained elevated throughout pregnancy.

The observation regarding  $T_3$  in the present study was at par with the observation of Kumar, et al. (2003) [5] that the mean  $T_3$  increases during the II trimester and then declines in III trimester compared to I trimester. Regarding mean  $T_4$  value, in the present study the mean  $T_4$  level rose in the II and then decreased in the III trimester. This was in contradiction to the study of Elduff A (1999) [6] where he observed the decreasing trend of  $T_4$  values and Kumar, et al. (2003) where the author found that mean  $T_4$  level rises in the II and decreases during the III trimester. According to Kumar, et al. (2003) mean TSH level rises progressively throughout all the trimester of pregnancy but in the present study peak rise in the mean TSH value was noted in the II trimester.

Zarghami Nosratollah, et al. (2005) [7] has not found significant difference in TSH and  $T_3$  in pregnant as compared with non-pregnant cases on the other hand  $T_4$  level in the III trimester was significant highly as compared to non-pregnant women. In the present study a significant increase in mean TSH values compared to non-pregnant women was observed and the increase

in  $T_4$  was significant increase in III trimester. Khandakar M.A., et al. (2002) [8] noted a significant increase in TSH and  $T_3$  in all the three trimesters as compared to non-pregnant. In the present investigation there was significant increase in mean  $T_3$  value in II trimester as compared to non-pregnant counterparts. TSH results were par with the present study.

## Conclusion

The maximum number of cases studied was in the age group of 26-30 years in both the groups. Incidence of primi para was 48 per cent while 24 per cent of the cases were para III or more.  $T_3$  values increased during pregnancy significantly more so in II trimester.  $T_4$  values were less during I trimester particularly at par during II trimester and increased during III trimester. Raised TSH values were observed during pregnancy as compared to non-pregnant women. Significant increase was observed during II trimester.

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