



## STUDIES ON SERUM THYROID PROFILE IN PREMENOPAUSAL AND POSTMENOPAUSAL WOMEN FROM TERTIARY CARE HOSPITALS OF PUNJAB

### Biochemistry

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### ABSTRACT

**Background:** The human life especially of women relies in a delicate balance of hormones like estrogen, progesterone, and testosterone. Women has to go through many physiological changes such as pregnancy, menopause etc for which the female hormones are one of the main responsible factors. The thyroid hormones influence the heart, brain, kidney, along with reproductive system development. Worldwide diseases of the thyroid gland disorders are among the most prevalent endocrine disorders especially in women, second on to diabetes in world wide. Menopausal age is more prone to get overt hypothyroidism. Symptoms of hypothyroidism are similar to postmenopausal complaints so can be difficult to differentiate. Thyroid stimulating hormone (TSH) is recommended as a single best screening test for vast clinical outpatients. With this perspective, present comparative cross sectional study in premenopausal and postmenopausal women on thyroid profile was undertaken. **Aim:** To evaluate and compare serum thyroid profile like  $T_3$ ,  $T_4$  and TSH levels in premenopausal and postmenopausal women to observe the effect of postmenopausal hormonal changes on serum  $T_3$ ,  $T_4$  and TSH levels in women.

**Material & Method:** 40 premenopausal women of age group 15-25 years and 40 postmenopausal women of age group 50-60 years were evaluated for serum  $T_3$ ,  $T_4$  and TSH level.

**Results:** A significant increase by 34.45% ( $p < 0.01$ ) and 16.64% ( $p < 0.05$ ) was observed in TSH and  $T_3$  levels in postmenopausal women in comparison to pre menopausal women while a nominal increase by 5.78% was recorded in  $T_4$  levels in the serum of postmenopausal women in comparison to pre menopausal women.

**Conclusion:** Aforementioned observations in  $T_3$ ,  $T_4$  and TSH level in postmenopausal women suggested that postmenopausal women in Punjab should be monitored for serum thyroid profile for reducing the risk of thyroid dysfunction, could be responsible for the pathophysiology of various diseases. Further large scale clinical study is needed to elucidate the relationship between thyroid dysfunction and postmenopausal women

### KEYWORDS

Premenopausal women, postmenopausal women, Triiodothyronine ( $T_3$ ), Thyroxine ( $T_4$ ) and Thyroid Stimulating Hormone (TSH), Thyroid dysfunction.

### INTRODUCTION

Thyroid gland plays a vital role in regulating overall body metabolism including sexual development and reproductive function. Worldwide diseases of the thyroid gland disorders are among the most prevalent endocrine disorders especially in women, second only to diabetes. In India approximately 42 million people are being affected by thyroid disorder. It is well reported in literature that even mild thyroid failure can have a number of clinical effects such as depression, memory loss, cognitive impairment and a variety of neuromuscular complaints. Myocardial function has been found to be subtly impaired. [1-2]

Hypothyroidism is associated with a broad spectrum of reproductive disorders ranging from abnormal sexual development through menstrual irregularities to infertility. The impact of hypothyroidism on the menstrual cycle leads to changes in cycle length and blood flow (3). In 1993, Joshi *et al.* [4] reported 68% of menstrual abnormalities in 22 women with hypothyroidism compared to only 12% in 49 controls. The most common abnormalities observed by hypothyroid women are changes in character of the uterine bleeding and length of the intermenstrual interval, prolonged and heavy flow is commonly noted. Krassas *et al.* 1999 [5] found 23.4% hypothyroid female patients had irregular cycles. In adult women, hypothyroidism results in changes in cycle length and amount of bleeding and has been reported in association with the ovarian hyper-stimulation syndrome. In an Indian study, 68.2% of hypothyroid women had menstrual abnormalities, compared to 12.2% of healthy controls [6,7] (Higham, 1992 and (Shruti *et al.* 2008).

Menstrual flow diminishes or ceases in hyperthyroidism despite persistent ovulatory cyclic ovarian function. The mechanism of changes is unknown (Topper, 1994). Krassas *et al.* 1994 reported irregular cycles in 21.5% of the thyrotoxic patients and liked hyperthyroidism in women with reduced fertility. Sowers *et al.* 2003 [10] reported menopausal symptoms, menstrual cycle bleeding characteristics and reproductive hormones and their association with TSH with irregularities of menstrual cycle. Menopausal age is more

prone to get overt hypothyroidism. Symptoms of hypothyroidism are similar to postmenopausal complaints.

So, present study was designed to evaluate thyroid hormones like Triiodothyronine ( $T_3$ ), Thyroxine (T) and Thyroid Stimulating Hormone (TSH) in pre-menopausal women and postmenopausal women of North -West Indians.

### MATERIAL AND METHODS

The present case-control study was carried out in the Department of Biochemistry, Government Medical College - Patiala in collaboration with Department of Obstetrics and Gynaecology, Rajindra Hospital Patiala on 80 subjects in the age range of 25 - 70 years. These subjects were taken from general population attending the outdoor patients of Department of Obstetrics and Gynaecology Rajindra Hospital Patiala and were divided into following two groups based on their menopausal status.

**Group- 1:** 40 premenopausal women with age range of 25 - 45 years

**Group-2:** 40 postmenopausal women in the age range of 50 - 70 years. These subjects were recruited from rural and as well as from urban areas of Patiala District of Punjab state.

**Ethical Issues:** The study protocol was approved by the institutional ethic committee. Study details & potential risks and benefits were explained to individuals taking part in the study and at least one attendant. A written informed consent was obtained voluntarily from the subjects before entering into the study.

### Inclusion Criteria

- Premenopausal women in the age group of 25-45 years
- Postmenopausal women in the age group of 50-70 years with natural menopause

All subjects recruited for the study were vegetarian and there was no

positive family history of CVD, thyroid dysfunction, Diabetes, Kidney disease etc, in these subjects. These subjects were interviewed by questionnaire regarding the detailed information on their lifestyle, medical history, diet etc.

#### Exclusion Criteria

- i. Age less than 25 years and more than 70 years
- ii. Pregnancy
- iii. Abnormal uterine bleeding
- iv. Surgical menopause
- v. Hypertension, Diabetes Mellitus, Thyroid disorders
- vi. Hepatic disease
- vii. Acute illness
- viii. Patients on lipid lowering medication, patients on HRT.

#### Measurements of Anthropometric Parameters

The examination of body weight was done by taking weight in kilogram (kg) and height was measured in centimeters. The BMI was calculated from the formula: BMI = weight in kg/(height in meters squared). A complete lipid profile, fasting and postprandial glucose levels, and Blood pressure (systolic and diastolic) were carried out in adolescents, who entered the study as per a predesigned performa for assessing the signs of chronic heart failure, diabetes and also the presence of any exclusion criteria.

#### Collection and processing of blood sample

Fasting (12 hours fasting) blood sample (approximately 5 ml) were collected in plain vacutainer from both the groups (Premenopausal and Postmenopausal women subjects) and this vacutainer was kept at 37 °C for 20 min and then centrifuged at 3000rpm for 15 minutes. A clear supernatant (serum) was used for the estimation of thyroid profile various biochemical assays.

#### Biochemical Assays

##### 1. Estimation of serum Triiodothyronine (T<sub>3</sub>), Thyroxine (T<sub>4</sub>) and Thyroid Stimulating Hormone (TSH):-

TSH, T<sub>3</sub>, and T<sub>4</sub> levels in blood was analyzed by using ELISA techniques. The kits were purchased from Transasia Biomedical Private Limited, Mumbai (India). The concentrations are expressed in  $\mu$ IU/ml.

#### Statistical Analysis

The data was expressed as Mean  $\pm$  SD and analyzed with the SPSS 16.0.7 statistical software package. Differences between the premenopausal and post menopausal women were evaluated using the Student's independent samples "t" test. Differences were considered statistically significant at  $p < 0.05$ .

#### RESULTS AND DISCUSSION

In the present study, we observed a significant ( $P \leq 0.01$ ) increase by 34.45% in TSH levels in postmenopausal women in comparison to premenopausal women (from 2.212  $\pm$  0.772  $\mu$ IU/ml to 2.974  $\pm$  0.931  $\mu$ IU/ml) while no significant change was recorded in T<sub>3</sub> and T<sub>4</sub> levels in postmenopausal women with respect to premenopausal women (Table-2). A significant increase in TSH in postmenopausal women might be due to anti-thyroid antibodies, nutritional iodine supply, hidden thyroid autonomy, problems regarding sleep disturbances and altered sleep patterns. Aging is associated with changes in pituitary-thyroid axis. There was a progressive shift in the serum TSH distribution curve towards higher TSH values with increasing age<sup>[10-13]</sup>.

In 2008, Legier *et al.*<sup>[14]</sup> reported that higher TSH level in postmenopausal women w. r. t. premenopausal. They found average TSH values increased with age, although the changes between groups were not significant. They suggest evaluation of TSH levels within groups and within locations to establish appropriate baseline levels.

Elizabeth *et al.*, 2007<sup>[15]</sup> observed increased TSH levels in post menopausal women and In 2002, Hollowell *et al.*<sup>[16]</sup> observed higher TSH levels in women in the older age group.

Our observations of significant increase in TSH levels with non significant changes in T<sub>3</sub> and T<sub>4</sub> are agreement with the literature reports that postmenopausal women are more prone to subclinical hypothyroidism if remains untreated might lead to overt hypothyroidism, a well known risk factor for the pathophysiology of various cardiovascular diseases.

#### CONCLUSION

A significant increase in TSH levels in postmenopausal women from the tertiary care hospitals of Punjab suggested that postmenopausal women are more prone to subclinical hypothyroidism if remains untreated might lead to overt hypothyroidism could be responsible for the initiation of various cardiovascular diseases like atherosclerosis. Large number of studies with large sample size needed to elucidate the more relationship between serum thyroid profile and postmenopausal women.

**TABLE 1 Changes in serum T3, T4 and TSH levels of premenopausal and Postmenopausal women**

| Biochemical Assays | Reference Value | Premenopausal Women (n=40) | Postmenopausal Women (n=40) |
|--------------------|-----------------|----------------------------|-----------------------------|
| T3 (ng/ml)         | 0.49- 02        | 1.172 0.452                | 1.367 1.004 (+16.64)*       |
| T4 ( $\mu$ g/dl)   | 4.7- 12.8       | 8.427 1.725                | 8.907 3.153 (+5.78)NS       |
| TSH ( $\mu$ IU/ml) | 0.44- 3.45      | 2.212 0.772                | 2.974 0.931 (+34.45)**      |

\*Values are expressed as Mean  $\pm$  S.D of 40 observations

\*\*Values in parentheses represent percentage changes compared to normal healthy non smokers

NS = Not Significant, \*  $P \leq 0.05$ , \*\*  $P \leq 0.01$ .

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