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ORIGINAL ARTICLES

The Comparative Study of T3, T4 and TSH levels among Women of Reproductive Age and Post Menopausal Women

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ABSTRACT

Background and Objectives: Thyroid hormones play one of the most vital roles in functioning of body including reproductive function. Thyroid dysfunctions are becoming more prevalent worldwide. Thyroid disorders are more common in women than men. Women after menopause are at enhanced risk of developing thyroid disorders. Aim of the study was to compare thyroid profile of postmenopausal women with those in reproductive age group.

Methods: The present study consists of total 500 women out of whom 250 women were of reproductive age group aged between 15-49 years and 250 post menopausal women aged 50-75 years. Thyroid status was assessed by estimating the serum levels of T3, T4, TSH in both the groups.

Results: Thyroid profile was compared between women of reproductive age group and postmenopausal women. Serum TSH levels were slightly high in postmenopausal women compared to reproductive women, whereas Serum levels of tri iodothyronine and thyroxine are slightly higher in reproductive age group compared to postmenopausal women. But both are statistically not significant (p-value >0.05).

Conclusion: Thyroid screening may be advisable as routine investigation for all women at least once in 3-4 months for early detection of thyroid dysfunction.

KEYWORDS

Serum TSH • SerumT3 • SerumT4 • Reproductive women • Postmenopausal women

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INTRODUCTION

Thyroid gland is an important endocrine gland involved in regulation of basal metabolic rate located superficially in front of neck on the thyroid cartilage of larynx. This gland secretes hormones triiodothyronin (T3) and thyroxin (T4) which play a major role in maintaining normal functioning of the body including reproductive function. Thyroid hormone production is controlled by auto regulatory Mechanism that is by Hypothalamo–Pituitary–Thyroidaxis (HPA). Hypothalamic neurons release thyrotropin releasing hormone (TRH) which is carried by portal vessels to Pituitary gland where it acts on Thyrotrophs to release TSH. TSH acts on thyroid follicles to release T3 and T4 which in turn cause inhibition of TSH secretion from pituitary gland by negative feedback mechanism. Therefore there is inverse relation between TSH and T3, T4 levels in the blood. Thyroid disorders are the most prevalent endocrine disorders worldwide. Thyroid disorders are more common in women than men, and especially women after menopause are at a higher risk of developing thyroid dysfunctions compared to women of reproductive age. Hyperthyroidism (both clinical and subclinical) is thought to be found in approximately 2.3% of women presenting with sub fertility.[1] Hyperthyroidism is most frequently associated with menstrual irregularity like hypomenorrhoea and polymenorrhoea.[2] The likely mechanism for these menstrual disturbances is an increased sensitivity to gonadotropin releasing hormone, resulting in a raised level of luteinising hormone and sex hormone binding globulin, causing a rise in total estrogens.[3,4] Hypothyroidism in reproductive age group is associated with menstrual disturbances particularly oligomenorrhoea, menorrhagia or amenorrhoea and in some cases anovulation leading to infertility.[5] Hypothyroidism also leads to symptoms like fatigue, mood swings, erratic periods, sleep problems, loss of sex drive and weight gain etc. These symptoms may be confused for other disorders like depression, hormonal imbalance, sleep disorders etc, if they are not evaluated for thyroid profile. The measurement of serum T3, T4 and TSH are the golden markers of thyroid function. At different stages of age these parameters vary depending on the physiological demand of an individual. Age is one of the determinant factor which regulates the set point of pituitary gland and response feedback mechanism. This phenomenon occurs across the age of an individual reaching the peak effect at the old age. This may be an adaptive response in normal aging or a pathological alteration of pituitary function with age. There are series of hormonal changes in the Women of reproductive age and in postmenopausal women. This study has been taken up to correlate the thyroid profile in these groups of women to determine whether the changes in thyroid profile with respect to age existed across the entire age spectrum, rather than only at extremes of age.

OBJECTIVE

To analyse and contrast thyroid profile of postmenopausal women and women of reproductive age group.

MATERIALS AND METHODS

The present study is a cross sectional study includes 500 women aged between 15 to 75 years of age, who are referred for the thyroid profile to the central laboratory of Biochemistry of Mysore Medical College and Research Institute, Mysuru.

Inclusion criteria: All the apparently healthy women who are not diagnosed either as hyper or hypothyroidism and not on any medications. Out of 500 females, 250 females are aged between15- 49 years (reproductive age group) and 250 females are aged 50 years and above (post menopausal age group) for comparison. Any female who had not had menstruation for a minimum duration of 2 year was considered as post menopausal.

Exclusion criteria: Any subject who is taking medication for any chronic medical disorders. Women aged above 75 years & below 15 years, who has not attained menarche and the patients who are already diagnosed as hyper or hypothyroidism and on medication. Those with history of any chronic medical disorders like hypertension, diabetes, epilepsy, history of long term medication, pregnant women, premature menopause, acute/chronic infection and any other endocrinal disorders.

Proforma in the form of questionnaire was given to all the women to collect the details of their personal, medical, family history regarding health status. Informed consent was taken after explaining about the study. The study protocol has been approved by Institutional Ethical committee. Blood samples from all the women were taken & Serum levels of T3, T4 and TSH of all the women were estimated by immulite 1000 analyser (antigen antibody reaction) in the central laboratory of Mysore Medical College and Research Institute. The Data collected was statistically analysed. Statistical analysis was done

by using SPSS 16 version. Statistical tests used are descriptive statistics, mean, standard deviation & independent t-test. p value <0.05 was considered as significant.

RESULTS

In the present study the concentrations of T3, T4 & TSH in serum were measured in 500 healthy women of which 250 women were of reproductive age & 250 women were of menopausalage. The mean age of women of reproductive age group was found to be 31.6 years with standard deviation 9.1.The mean age of women of menopausal age group was found to be 57.3 years with standard deviation 6.6 . (Table 1)

TABLE:1 Mean+SD of Age in Women of Reproductive age group, Women of menopausal age group

Mean±SD	Women of Reproductive age group	Women of menopausal age group
Age in years	31.6 ± 9.1	57.3 ± 6.6

The Mean+SD of T3 for women of reproductive age and menopausal age was recorded as 111.40 + 50.06ng /dl and 109.07 + 42.92 ng/dl respectively with normal range 81 to 178ng /dl. The Mean ± SD of T4 for reproductive women and menopausal women were found to be 7.88 ± 2.64 µg/dl and 8.06 ± 2.75 µg/dl respectively with normal range 4.5 to 12.5 µg/dl. The Mean ± SD of TSH for reproductive women and menopausal women were found to be 3.64 ± 7.13 µIU/ml and 3.73 ± 7.93 µIU/ml respectively with normal range 0.4 to 4.2 µIU/ml. The mean & standard deviation of thyroid profile of both groups, t-value, P value is mentioned in Table:2

Table: 2 Mean ± SD of T3, T4 & TSH in Women of Reproductive age group, Women of menopausal age group & p value

Mean ± SD	Women of Reproductive age group	Women of menopausal age group	P value
T3 → ng/dl	111.44 ± 50.33	109.07 ± 42.92	0.571
T4 → µg/dl	7.88+2.64	8.06+ 2.75	0.453
TSH → µIU/ml	3.64+7.13	3.73+7.93	0.905

In the current study, the mean value of T3 was found to be within the normal range in both age groups with slightly low in menopausal age group compared to reproductive age group. But the p-value is more than 0.05 suggesting no statistical significance between the two groups. The mean value of T4 is also found to be within the normal range in both age groups with slightly low in menopausal age group compared to reproductive age group. But the p-value is more than 0.05 suggesting no statistical significance between the two groups. Whereas the mean TSH value is in normal range in both groups menopausal women. But slightly lower in reproductive age group compared to menopausal age group, this is statistically insignificant as the p value is above 0.05.

DISCUSSION

In the current study, serum TSH levels in postmenopausal women were found to be higher in comparison to the women of reproductive age group. However the difference was not statistically significant. Numerous causes proposed for raised TSH activities in the elderly, including nutritional iodine deficiency, sleep disturbances, altered sleep patterns and others. Aging is linked with changes in the pituitary-thyroid-axis and there was a progressive shift in serum TSH activities with raising age. Age related fall in T4 levels and decreased responsiveness of thyroid gland to TSH could lead to increased TSH secretion. Other causes of raised TSH activities may be due to occult thyroid diseases in older people.[9] Rojas LV etal. Found higher TSH levels in postmenopausal women (2.80 microunits /mL) in comparison to premenopausal (2.52microunits/mL).[10] They recorded average increase in TSH levels with age, although the change between groups was not significant, which was similar to that observed from the present study. Elizabeth N Pearce etal. (2007) study in USA points towards increased TSH levels in post menopausal women.[11] Some studies have shown completely contrasting results, where the serum TSH levels among the postmenopausal and older women were lower when compared to the premenopausal women who had increased levels of TSH.[12,13] This maybe due to reduced TSH secretion by Pituitary gland with increase in age.

In a study by Jacobson MH, the relationship between thyroid hormone activities and menstrual function outcomes among the euthyroid women was evaluated. This study had noted that the menstrual function out comes and sex steroid hormone activities were influenced by the thyroid hormone levels, suggesting it's potential relation to fertility.[14]

A study had suggested that although euthyroid, there is a possibility of developing cardiovascular disease with increased activity of TSH.[15] Earlier studies have marked the potential role of estrogen

in the development of thyroid dysfunction. Studies have found that estrogen receptors, along with there is forms, on thyroidcells could modulate thyroid function.[16,17] The most accepted and probable mechanism by which estrogen causes thyroid dysfunction, especially among premenopausal women, is it's binding to thyroglobulin. This restricts entry of thyroxine in to cells, hence raising the concentration of bound thyroxine and reducing availability of free thyroid hormones.[18] From a recent study from Japan, thyroid disease may also be attributed to reactivation of Ebstein–Barrvirus (EBV). This study noted that during EBV reactivation, Thyrotropin receptor antibodies (TRAbs) are formed, which stimulated TSH receptors and caused thyroid dysfunction.[19] Previous studies suggested that, aging was associated with reduced TSH secretion. However, more recent data (National Health and Nutrition Examinations Survey–NHANESIII), showed that, in conditions of iodine sufficiency, serum TSH concentration is raised in people with no clinical or biochemical evidence of thyroid disease.[20]

CONCLUSIONS

The baseline thyroid function should be assessed by measuring thyroid hormone activities in euthyroid women at different phases of life, including pre- puberty, puberty, before and after pregnancy, menopause etc. to detect subclinical thyroid disease/thyroid dysfunction. All women should be subjected to periodical thyroid screening which helps in early detection of thyroid dysfunctions.

Conflict of interest: NIL

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