

A Prospective Study of Serum Thyroid Stimulating Hormone and Lipid Function in Post Menopausal Women

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Abstract

Introduction: Menopause has a direct impact on the activity of the thyroid gland. During menopause there is imbalance in the oestrogen and progesterone hormone levels that may in turn have a drastic impact on the thyroid hormone production. So, correlation between S.TSH and serum lipid profile is assessed to detect what type of alteration occurs in lipid profile.² The chance of cardiovascular disease is more in women over age 50. The risk of atherosclerosis in women increases significantly after menopause. The risk of atherosclerosis is 3.4 times greater in post-menopausal women. Three types of lipids that have been linked to cardiovascular disease and atherosclerosis are cholesterol and its carrier proteins LDL (low density lipoprotein) and HDL (high density lipoprotein). The risk for cardiovascular disease decreases by 3 % for each 1 % reduction in serum cholesterol. **Materials and Methods:** This was a cross sectional observational study done for one year from January 2019 to December 2019. Two study groups were selected; forty premenopausal women in the reproductive age group and forty post-menopausal women attending medicine outpatient department with prior informed consent. Exclusion criteria were subjects with known thyroid disease and subjects having diabetes, hypertension and heart disease. Screening of all subjects for the study was done using proforma. Samples of blood were taken by phlebotomy method after an overnight fast of twelve hours using syringes and needles which are disposable. 8 ml blood was collected from ante cubital vein under aseptic precautions and transferred to bottles. Serum TSH and all parameters of lipid profile were estimated and analysed. S.TSH measured using an automated chemiluminescence analyser. Estimation of total cholesterol was done using cholesterol reagent set. This is based on enzymatic method. Estimation of HDL cholesterol also done by enzymatic method. **Results:** Serum cholesterol / HDL ratio, LDL / HDL ratio is significantly higher in post-menopausal women. In post-menopausal women, levels of TSH and serum cholesterol were found to be positively correlated and this is found to be statistically significant. In post-menopausal women, the levels of S.TSH and serum cholesterol/ HDL ratio were found to be positively correlated and this is found to be statistically significant. In post-menopausal women, the levels of S.TSH and LDL / HDL ratio were found to be positively correlated and this is found to be statistically significant. **Conclusion:** A statistically significant positive correlation was seen between S.TSH and serum cholesterol levels in post-menopausal women. A statistically significant positive correlation was observed between S.TSH and serum cholesterol/HDL ratio levels in post-menopausal group of women. A statistically significant positive correlation was obtained between S.TSH and LDL/HDL ratio levels in post-menopausal group of women. A statistically significant correlation was not seen between S.TSH and other parameters of lipid profile in post-menopausal group. A statistically significant correlation was not seen between S.TSH and any parameters of lipid profile in the premenopausal women.

Keywords: Menopause, HDL, LDL, oestrogen, progesterone

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Introduction

Menopause has a direct impact on the activity of the thyroid gland. During menopause there is imbalance in the oestrogen and progesterone hormone levels that may in turn have a drastic impact on the thyroid hormone production. The thyroid gland might have some kind of disturbances in working and secretion of the thyroid hormone. Imbalance of the hormonal level may lead to either hypothyroidism or hyperthyroidism.[1] Thyroid hormone regulates wide array of metabolic parameters. Thyroid stimulating hormone induces 3-hydroxy-3-methyl-glutaryl-coenzyme A reductase (HMG Co A) which is the 1st step of cholesterol biosynthesis and it can alter the lipoprotein metabolism. So, correlation between S.TSH and serum lipid profile is assessed to detect what type of alteration occurs in lipid profile.[2] The chance of cardiovascular disease[3] is more in women over age 50. The risk of atherosclerosis in women increases

significantly after menopause. The risk of atherosclerosis is 3.4 times greater in post-menopausal women.[4] Three types of lipids that have been linked to cardiovascular disease and atherosclerosis are cholesterol and its carrier proteins LDL (low density lipoprotein) and HDL (high density lipoprotein).[5] The risk for cardiovascular disease decreases by 3 % for each 1 % reduction in serum cholesterol.[6] In different studies, levels of serum cholesterol is increased significantly to 1 to 2 years after menopause.[7] After menopause, the lipid levels change towards a less cardio protective pattern than before menopause. This study was done to find out any correlation between S.TSH and various lipid values

Materials and Methods

This was a cross sectional observational study done for one year from January 2019 to December 2019. Two study groups were selected; forty premenopausal women in the reproductive age group and forty post-menopausal women attending medicine outpatient department with prior informed consent. Exclusion criteria were subjects with known thyroid disease and subjects having diabetes, hypertension and heart disease. Screening of all subjects for the study was done using proforma. Samples of blood were taken by phlebotomy method after an overnight fast of twelve hours using syringes and needles which are disposable. 8 ml blood was collected from ante cubital vein under aseptic precautions and transferred to

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bottles. Serum TSH and all parameters of lipid profile were estimated and analysed.

S.TSH measured using an automated chemiluminescence analyser. Estimation of total cholesterol was done using cholesterol reagent set. This is based on enzymatic method. Estimation of HDL cholesterol also done by enzymatic method. The estimation of triglyceride was done using the ready to use liquid triglyceride reagent kit. LDL cholesterol was estimated indirectly using Friedewald formula.

Statistical Analysis: Statistical analysis has been done to determine the difference between two groups. The results are given in tables and figures. Statistical package for social sciences (SPSS) was used to analyse data. The results of the study were given as mean \pm standard deviation. Determination of significance of difference between two groups that are compared is done by applying student's t test. The level of significance was taken as P value of < 0.05 .

Results

Table 1: Age Distribution

Age	Premenopausal Women	Post-Menopausal Women
20-29	8	-
30-39	13	-
40-49	18	-
50-59	1	30
60-69	-	10

Forty-five percentage of premenopausal women selected for the study were aged between 40-49 years. Seventy-five percentage of postmenopausal women were of the age 60 to 69 years.

The mean value of S.TSH was 2.63 ± 3.05 in pre-menopausal group and 3.93 ± 3.77 in post-menopausal group. The mean value of serum cholesterol (mg/dl) in premenopausal group was 177.27 ± 27.63 and that of post-menopausal women was 244.9 ± 55.42 .

Table 2: Comparison of Total Cholesterol / HDL Ratio in Pre-and Post-Menopausal Women

	Premenopausal Women	Post-Menopausal Women
Mean	3.77	5.97
SD	0.98	0.98

There is significant difference between TC /HDL ratios of premenopausal and post-menopausal women.

Table 3: Comparison of LDL / HDL Ratio in Pre-and Post-Menopausal Women

	Premenopausal Women	Post-Menopausal Women
Mean	3.77	5.97
SD	0.98	0.98

There is significant difference between LDL/ HDL ratios of premenopausal and post-menopausal women.

Correlation: In order to find out whether there is a significant association present or absent between the continuous variables, coefficient of correlation (r) was calculated. Correlation coefficient tends to lie between +1.0 and -1.0. If r is nearing +1, indicating strong positive association. If r is nearing -1, indicating strong negative association. The level of significance was taken as P value of < 0.05 .

Post Menopausal Women:

1) The levels of S.TSH & serum cholesterol found to be positively correlated in post-menopausal women and this is found to be statistically significant, i.e., when one parameter increases other also increases.

2) In post-menopausal women the levels of S.TSH and serum cholesterol/HDL ratio found to be positively correlated and this is found to be statistically significant.

3) The levels of S.TSH and LDL /HDL ratio found to be positively correlated in post-menopausal women and this is found to be statistically significant.

4) In post-menopausal women correlation between TSH & HDL, TSH & triglycerides, TSH & VLDL and TSH & LDL were found to be statistically insignificant.

Premenopausal women: In premenopausal women correlation between TSH & serum cholesterol, TSH & HDL, TSH & triglycerides, TSH & VLDL, TSH & LDL, TSH & TC/HDL ratio, TSH & LDL/HDL ratio were found to be statistically insignificant.

Discussion

Menopause is permanent cessation of menstruation caused by ovarian failure. Usually occurs at an average age of 52 years, within a range of 40 to 58 years. Even though life expectancy of women has increased, the age of menopause has not changed. This means a

woman has to spend greater than one third of her life after menopause. Age of menopause also has a genetic determination.[8]

During menopause, there will be changes in the hypothalamic and pituitary hormones indicating ovarian failure. Ovarian follicles will be depleted in the ovary secondary to apoptosis. Response of ovary to pituitary follicle-stimulating hormone (FSH) and luteinizing hormone (LH) will be poor and the production of oestrogen and progesterone from ovary will cease.[9]

In my study, LDL / HDL ratio is 2.22 ± 0.84 in premenopausal women and 4.37 ± 0.94 in post-menopausal women. There is considerable difference between LDL / HDL ratio levels of premenopausal and post-menopausal women. Here also ratio is more in post-menopausal group hinting towards risk for cardiovascular disease.

A positive correlation was obtained between S.TSH and serum cholesterol levels in post-menopausal women, which was statistically significant. This was consistent with the following studies; thyroid hormones and lipid metabolism in a group of patients over seventy, thyroid stimulating hormone and its correlation with lipid profile in the obese Nepalese population, thyroid function and perimenopausal lipid and weight changes, thyroid functions and serum lipids in older women. Here they found that increasing levels of TSH was associated with linear increase in lipid concentrations. "Thyroid function tests, serum lipids and gender interrelations in a middle-aged population", found out that there is a correlation between TSH and lipids mainly in the females. Thyroid function and lipid sub particle sizes in patients with short-term hypothyroidism in a population-based cohort was done to determine whether lipoprotein sub particle concentrations are associated with thyroid status in hypothyroid women, there is a shift toward less atherogenic large LDL, small VLDL, and large HDL sub particle sizes.

Effect of LDL/HDL ratio was also explained in various studies. In my study a positive correlation was obtained between S.TSH and

LDL/HDL levels in group of women after menopause and that is statistically significant also. There was no statistically significant correlation between S.TSH and other parameters of lipid profile in group of women after menopause. In premenopausal women correlation between S.TSH and serum lipid profile was not statistically significant. [10] This study showed a hypothyroid tendency for the post-menopausal women. So routine screening of post-menopausal women for thyroid status is advisable, since this can decrease the possible incidence of hypothyroidism in these women. Screening for S.TSH and serum lipid profile may be advised for every woman in the premenopausal age groups so that the related problems during menopausal transition can be reduced. TSH and lipids are correlated positively, so treatment for hypothyroidism may help in decreasing cardiovascular risk.

Conclusion

This study showed a hypothyroid tendency for post - menopausal women. Screening for Serum TSH and Serum Lipid profile may be advised for every woman in the peri menopausal age group so that the related problems during menopausal transition can be reduced. A statistically significant positive correlation was seen between Serum TSH and serum cholesterol levels in post menopausal women. A statistically significant positive correlation was observed between Serum TSH and Serum cholesterol/HDL ratio levels in post menopausal women. A statistically significant positive correlation was obtained between Serum TSH and LDL/HDL ratio levels in post- menopausal group of women. A statistically significant correlation was not seen between Serum TSH and other parameters of lipid profile in the post- menopausal group. A statistically significant correlation was not seen between Serum TSH and any parameters of lipid profile in the premenopausal women.

References

1. Lindquist O. Intra individual changes of blood pressure, serum lipids and body weight in relation to menstrual status: results from a prospective Population study of women in Goteberg Sweden. *Prev Med.* 1982;11(2):162-72.
2. Millán Jet al. Lipoprotein ratios: physiological significance and clinical usefulness in cardiovascular prevention. *Vasc Health Risk Manage.* 2009;5: 757-65.
3. Maugeri D, Santangelo A, Barbagallo P, et al. Thyroid hormones and lipid metabolism in a group of patients over seventy. *Eur Rev Med Pharmacol Sci.* 1999;3(5):211-6.
4. Nagila A, Bhatt M, Poudel B et al. Thyroid Stimulating Hormone and its Correlation with Lipid Profile in the Obese Nepalese Population. 2008;2(4):932-7.
5. Massoudi MS, Meilahn EN, Orchard TJ et al. Thyroid function and perimenopausal lipid and weight changes: The Thyroid Study in Healthy Women (TSH-W). *J Womens Health.* 1997;6(5):553-8.
6. Bauer DC, Ettinger B, Browner WS. Thyroid functions and serum lipids in older women: a population-based study. *Am J Med.* 1998;104(6):546-51.
7. Petersson U, Kjellstrom T. Thyroid function tests, serum lipids and gender interrelations in a middle-aged population. *Scand J Prim Health Care.* 2001;19(3):183-5.
8. Pearce EN, Yang Q et al. Thyroid function and lipid subparticle sizes in patients with short-term hypothyroidism and a population-based cohort. *J Clin Endocrinol Metab.* 2008; 93 (3): 888-94.
9. Nanda N, Bobby Z, Hamide A. Association of thyroid stimulating hormone and coronary lipid risk factors with lipid peroxidation in hypothyroidism. *Clin Chem Lab Med.* 2008;46(5):674-9.
10. Monica C, Costa A, Santos M et al. Lipid Profile Alterations in Subclinical Hypothyroidism. *The Endocrinologist.* 2004;14 (3): 121-5.

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