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Comparative study of TFT and lipid profile levels in pre and postmenopausal women with thyroid disorders

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ABSTRACT: **Background:** Normal levels of thyroid hormones are essential for maintaining thermogenic and metabolic homeostasis in the adults and has effects on all the systems of the body especially cardiovascular system. Thyroid disorders are more common in women than men and onset increases with age. Thyroid dysfunction especially hypothyroidism is known to cause dyslipidemia. Hence, this study was undertaken to highlight the importance of identifying thyroid dysfunction in women and its associated dyslipidemia so that timely intervention can be instituted to prevent cardiovascular morbidity and mortality in future.

Objectives: To study and compare TFT and lipid profile levels in pre and postmenopausal women.

Methods: 150 female subjects above the age of 18 years attending General medicine OPD and IPD, at Rajarajeswari Medical College and Hospital,Bengaluru were included in the study. After informed consent, detailed history, examination, and investigations were sent as per designed proforma. The subjects were then categorized into two groups: premenopausal (age less than 45yrs) and postmenopausal (age more than or equal to 45yrs) group.

Results: Majority of patients in our study was in postmenopausal group (53%). Out of 150 patients, 32(21.3%) patients had thyroid dysfunction. Thyroid dysfunction was seen more in postmenopausal women (25.32%) compared to premenopausal women (16.9%). 11.3% of the patients had subclinical hypothyroidism followed by overt hypothyroidism (5.3%), subclinical hyperthyroidism (3.3%) and overt hyperthyroidism (1.3%). In premenopausal group, all the mean lipid profile levels were found to be higher in patients with hypothyroidism and lower in hyperthyroidism compared to euthyroid patients. In postmenopausal group, mean lipid profile levels were found to be higher in hypothyroid patients compared to euthyroid patients while mean TC,HDL,LDL levels were lower in hyperthyroidism compared to euthyroid patients.

Conclusion: Thyroid dysfunction is more common in postmenopausal women compared to premenopausal women. Hypothyroidism is more common than hyperthyroidism with subclinical cases being more in number than overt cases. Majority of the patients with thyroid dysfunction especially hypothyroidism had dyslipidemia. Since dyslipidemia coexist with other metabolic abnormalities, there is increased risk of cardiovascular diseases in these patients. Therefore, thyroid screening needs to be a part of routine investigation in postmenopausal women so that timely diagnosis of thyroid disorders and treatment can prevent future complications.

KEYWORDS: thyroid hormones, premenopausal, postmenopausal, hypothyroidism, hyperthyroidism, dyslipidemia.

I. INTRODUCTION

Thyroid hormones regulates metabolic processes essential for normal growth and development as well as regulating metabolism in the adult.[1] The incidence of thyroid disorders is increasing worldwide at an alarming rate, yet little is known of the impact it can have on the society.[2] The number of Indian people suffering from thyroid disease is estimated to be about 42 million.[3] Thyroid diseases mainly affect women; the incidence is five to 20 times higher in women than in men. In women, diseases of the thyroid gland are among the most prevalent disorders worldwide, second only to diabetes. The prevalence of thyroid diseases increases with age. Thyroid diseases are more common in middle-aged and older post-menopausal women.[4] The prevalence of hypothyroidism was found to be 8.2% in premenopausal and 12.7% in postmenopausal women.[5] In two population-based studies, the prevalence of subclinical hypothyroidism ranged between 7.5–8.5% in women and 4.4% in men.

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Subclinical hypothyroidism prevalence increases in women with increasing age and is more common in elderly females (7–18%) than males (2–15%). A substantial number of patients with subclinical hypothyroidism eventually develop overt hypothyroidism each year at the rate of 4.3–8%, with the elderly having a higher predisposition.[6] The incidence of clinical hypothyroidism is 0.3%. Thyrotoxicosis occurs in approximately 2% of women.[7] Thyroid hormones regulate cholesterol and lipoprotein metabolism, therefore thyroid disorders, including overt and subclinical, considerably alter lipid profile and promote atherosclerosis and cardiovascular disease.[8]

Keeping in mind the above said reasons we did this study highlighting various types of thyroid disorders and its effects on lipid profile so that timely intervention and preventive measures can be instituted to prevent complications in the future.

II. MATERIALS AND METHODS

150 female subjects above the age of 18years were included in the study. Patients who were excluded from the study were those with known case of thyroid disorder and on treatment for the same, history of irradiation of thyroid gland,who have undergone thyroid surgeries,on drugs that alter thyroid function and lipid profile tests such as levothyroxine, antithyroid drugs, hypolipidemics, lithium, amiodarone, oral contraceptive pills, pregnant women, known case of chronic liver or renal disease and critically ill.

Institutional Ethical Committee approval for conducting the study was obtained. After informed consent, detailed history including past medical history, medication history was documented. They were subjected to detailed physical examination including systemic examination and investigations were sent as per designed proforma. The subjects were then categorized into two groups: premenopausal (age less than 45yrs) and postmenopausal (age more than or equal to 45yrs)group.

STUDY DESIGN: Cross sectional observational study.

STUDY DURATION: One year.

SAMPLE SIZE ESTIMATION:

Sample size was calculated by taking the average number of patients with newly diagnosed thyroid disorders visiting general medicine department. Sample size estimation was done using Yamane formula, n=N/(1+Ne2), where n=sample size, N=study population size, e=margin of error. Calculated sample size=150

Fasting blood sample was collected. Chemiluminescent immunoassay (CLIA)was used for thyroid hormone estimation. Lipid profile was estimated by spectrophotometric method.

STATISTICAL ANALYSIS:

SPSS version 20 was used to perform the statistical analysis. Descriptive statistics of the explanatory and outcome variables were calculated by mean, standard deviation for quantitative variables, frequency, and proportions for qualitative variables. Chi-square test was applied for qualitative variables. Independent sample t test was applied to compare the statistical difference of age, Thyroid profile (T3, T4, TSH) and lipid profile (TC, HDL, LDL, VLDL, TGL) between the groups. Pearson's correlation was applied to correlate T3, T4, TSH with Lipid profile (TC, HDL, LDL, VLDL, TGL). ANOVA test was employed to determine whether there are any statistically significant differences between the means of three or more independent groups. The level of significance is set at 5%.

III. RESULTS

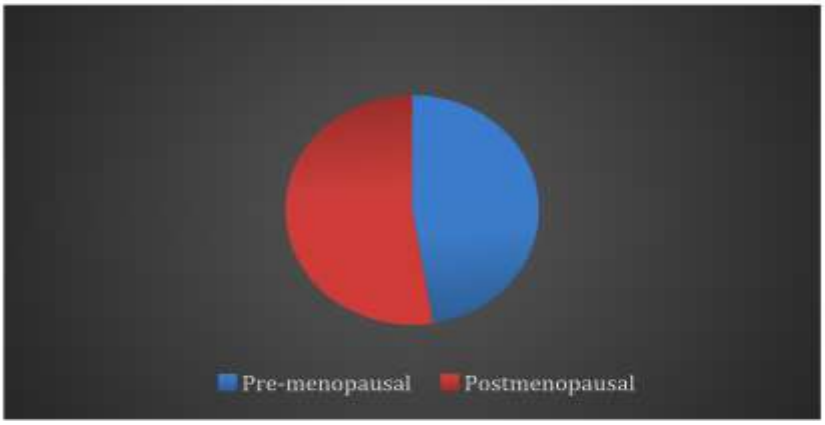

Figure 1: Case distribution in pre and postmenopausal group

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Fig 1 shows that out of 150 female patients, 79 patients were in the postmenopausal group (53%) while 71 patients were in the premenopausal group (47%). Majority of the patients in premenopausal group were in the age group of 26-35yrs with a mean age of 33yrs. Majority of the patients in postmenopausal group were in the age group of 46-55yrs with a mean age of 59.18 yrs.

Table 1: Distribution of thyroid disorders in pre and postmenopausal group

Diagnosis	No of pts	Groups		Total
		Pre-menopausal	Post-menopausal	
EUTHYROID	num	59	59	118
	%	83.10%	74.70%	78.70%
SC HYPO	num	6	11	17
	%	8.50%	13.90%	11.30%
OVERT HYPO	num	4	4	8
	%	5.60%	5.10%	5.30%
SC HYPER	num	1	4	5
	%	1.40%	5.10%	3.30%
OVERT HYPER	Count	1	1	2
	%	1.40%	1.30%	1.30%
TOTAL	num	71	79	150
	%	100.00%	100.00%	100.00%
Chi-square value-2.85 p value-0.58				

Table 1 shows that in this study, 32 patients (21.3%) had thyroid dysfunction. Thyroid disorders were more in postmenopausal group (25.32%) compared to premenopausal group (16.9%). Hypothyroidism (16.6%) was more common than hyperthyroidism (4.6%) and subclinical cases were more common than overt cases. Out of 32 patients with thyroid dysfunction, 17 patients had subclinical hypothyroidism (11.3%) followed by 8 patients with overt hypothyroidism (5.3%), 5 patients with subclinical hyperthyroidism (3.3%) and 2 patients with overt hyperthyroidism (1.3%).

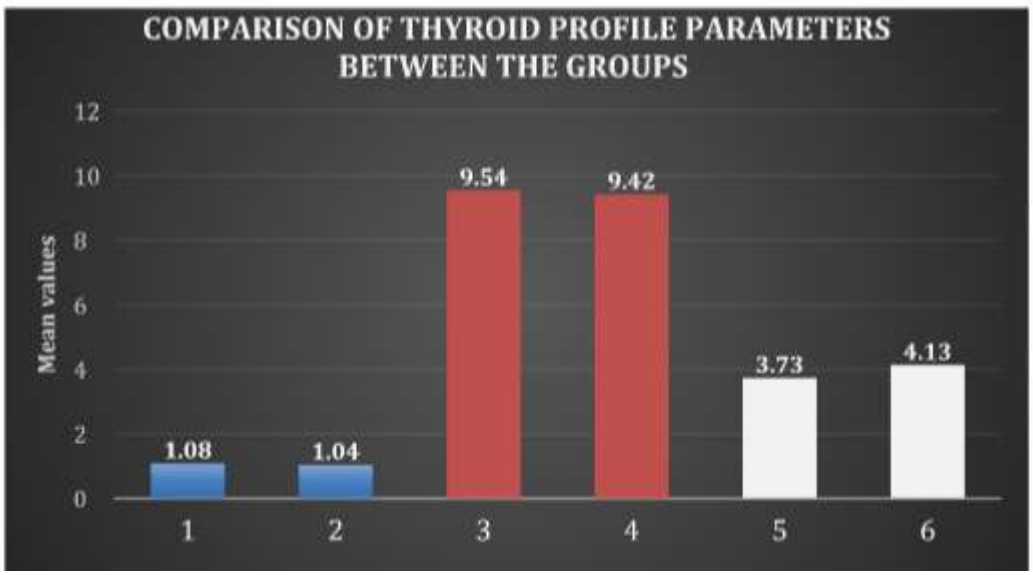

Figure 2: comparison of thyroid profile values between pre and postmenopausal groups

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Fig 2 depicts that mean T3 and T4 values were found to be similar in both the groups with no statistical significance. Mean TSH was higher in the postmenopausal group (4.13 ± 4.30) compared to premenopausal group(3.73 ±6.57) although the difference was not statistically significant(p=0.65).

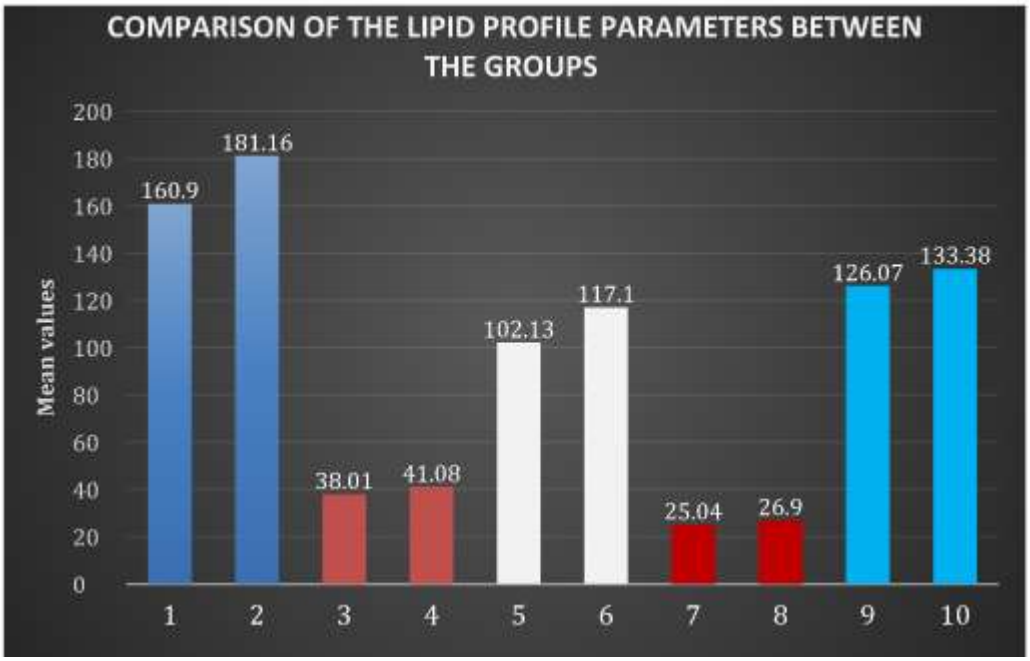

Figure 3: Comparison of mean lipid profile values between the groups

Fig 3 shows that all the mean lipid profile values were found to be higher in postmenopausal group with TC, LDL values being statistically significant(p<0.05).

Table 2: Pearson's correlation between lipid profile and thyroid function test

Thyroid profile	Groups		LIPID PROFILE				
			TC	HDL	LDL	VLDL	TGL
TSH	Pre menopausal	r value	0.124	-0.055	0.027	0.384	0.148
		p value	0.301	0.65	0.82	0.001*	0.219
	Post menopausal	r value	0.039	-0.082	0.008	0.086	0.112
		p value	0.736	0.471	0.944	0.452	0.325
T3	Pre menopausal	r value	-.282	-.251	-.229	-.178	-.147
		p value	.017*	.035*	.05*	.136	.223
	Post menopausal	r value	-.126	-.167	-.134	.030	.046
		p value	.268	.141	.240	.796	.688
T4	Pre menopausal	r value	-.231	-.151	-.179	-.232	-.127
		p value	.05*	.208	.135	.05*	.293
	Post	r value	-.207	-.091	-.143	-.056	-.049

	menopausal	p value	.067	.426	.210	.622	.668

Table 2 shows that TSH was significantly associated with VLDL(p=0.001) in the premenopausal group. T3 was negatively associated with TC, HDL and LDL levels in the premenopausal group while T4 was negatively associated with TC and VLDL levels in the premenopausal group(P=.05). No statistically significant associations were found between TFT and lipid profile in the postmenopausal group.

Table 3: Comparison of lipid profile parameters with various thyroid disorders in premenopausal group

LIPID PARAMETER		**EUTHYROID**	**SC HYPO**	**OVERT HYPO**	**SC HYPER**	**OVERT HYPER**	**p value**
TC	mean	156.085	193.833	212.25	102	101	0.00024*
	SD	50.89	39.061	41.414	0	0	
	Num	59	6	4	1	1	
HDL	mean	37.22	45.667	42.75	38	20	0.00241*
	SD	10.674	15.705	16.6	0	0	
	Num	59	6	4	1	1	
LDL	mean	100.695	114	124.75	64	63	0.01278*
	SD	38.433	28.092	31.637	0	0	
	Num	59	6	4	1	1	
VLDL	mean	23.373	32.833	42.25	16	17	0.00002*
	SD	8.82	12.4	18.007	0	0	
	Num	59	6	4	1	1	
TG	mean	119.322	164.833	188.75	82	85	0.01369*
	SD	57.266	61.882	142.601	0	0	
	Num	59	6	4	1	1	

Table 4: Comparison of lipid profile parameters with various thyroid disorders in postmenopausal group

LIPID PARAMETER		**EUTHYROID**	**SC HYPO**	**OVERT HYPO**	**SC HYPER**	**OVERT HYPER**	**p value**
TC	mean	182.559	199.182	182	151.75	115	0.06287
	SD	57.263	51.717	47.588	13.124	0	
	Num	59	11	4	4	1	
HDL	mean	40.779	43.454	45.75	36.5	32	0.25497
	SD	11.429	12.331	16.82	6.191	0	
	Num	59	11	4	4	1	
LDL	mean	120.339	147.63	131.5	91.5	35	0.00225*
	SD	47.699	22.312	35.95	17.019	0	
	Num	59	11	4	4	1	

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VLDL	mean	25.644	29.272	27.25	33.5	47	0.00025*
	SD	9.341	10.84	10.468	18.448	0	
	Num	59	11	4	4	1	
TG	mean	126.068	163.182	139	167.5	230	0.0001*
	SD	42.771	42.205	52.643	92.24	0	
	Num	59	11	4	4	1	

In premenopausal group, mean TC, HDL,LDL,VLDL,TG levels were found to be higher in patients with overt and subclinical hypothyroidism and lower in overt and subclinical hyperthyroidism compared to euthyroid patients. This was statistically significant ($p < 0.01$)[table 3]. In postmenopausal group, all mean lipid profile values were found to be higher in hypothyroid patients compared to euthyroid patients while mean TC,HDL,LDL levels were lower in hyperthyroidism compared to euthyroid patients[table 4].LDL,VLDL,TG levels were statistically significant($p<0.00$)

IV. DISCUSSION

In this study, out of 150 female patients 79(53%) were in the postmenopausal group while 71(47%) patients were in the premenopausal group. This was similar to a recent Indian study done in Assam by Bordoloi G et al[9] where postmenopausal group constituted 52% of the study and premenopausal 48%.

In this study, total 21.3% of the patients was found to have thyroid dysfunction. 16.9% of the premenopausal group and 25.3% of the postmenopausal women had thyroid dysfunction. Hypothyroidism (16.6%) was more common than hyperthyroidism (4.6%) among which subclinical cases were more compared to overt cases. Out of 32 patients with thyroid dysfunction, 17 patients (11.3%) had subclinical hypothyroidism followed by 8 patients (5.3%) with overt hypothyroidism,5 patients(3.33%) with subclinical hyperthyroidism and 2 patients(1.33%) with overt hyperthyroidism. This was similar to Indian studies done on postmenopausal women by Mohammad Zahid Labrez et al in 2020[10] and Shigil Mathew Varghese et al in 2017[11] which proved that incidence of hypothyroidism is more common than hyperthyroidism and subclinical hypothyroidism more common than overt hypothyroidism.

According to the 6-year duration NHANES III Study published in 2002, the prevalence of hypothyroidism was 4.6% (0.3% clinical and 4.3% subclinical) and of hyperthyroidism 1.3% (0.5% clinical and 0.7% subclinical), in population above the age of 12 years.

Bordoloi G et al[9] in his study found that the total prevalence of hypothyroidism in women was 10.526%. In the premenopausal group,the prevalence was 8.219% while in the postmenopausal group,the prevalence was 12.658% although the difference of prevalence of hypothyroidism between the two groups were not significant. The prevalence of subclinical hypothyroidism was found to be 5.5% in the premenopausal group and 8.2% in the postmenopausal group. The numbers are roughly twice of the clinical hypothyroid cases: 2.7% and 4.4% in the two groups respectively. Similar results were seen in an Indian study by Dr Lalitha R[13]. In our study mean TSH value was higher in postmenopausal group compared to premenopausal group. Similarly higher TSH values in postmenopausal group was observed in many other Indian and international studies.[9,13,14,15,16] In our study, mean T3 and T4 values were found to be similar in both the groups with no statistical difference. Similar results were observed in studies by Kolanu BR et al[15] and Nilay A et al[16].All the mean lipid profile values were found to be higher in postmenopausal group with differences in TC, LDL values being statistically significant.In our study, dyslipidemia was seen predominantly in hypothyroid patients which was similar to a study done by Dr Alpesh R Vora et al[17] and Khan MAH et al[18] . In our study dyslipidemia was similar in subclinical and overt hypothyroidism while in few other studies dyslipidemia was found more in subclinical cases compared to overt cases[19] . In a study by Anju Sharma et al the mean TC & LDL levels were decreased in patients with overt hyperthyroidism as compared to controls and the difference between the levels was statistically insignificant. Mean serum TG remain unchanged in patients. In cases of subclinical hyperthyroidism, the mean serum levels of TC, LDL & TG were decreased in patients as compared to controls & the difference was statistically insignificant. Mean serum HDL levels was significantly decreased in cases as compared to controls[20]. These results were

similar to our study. Pearson correlation between lipid profile and thyroid function test showed that in our study TSH was significantly associated with VLDL in the premenopausal group while T3 was negatively associated with TC, HDL and LDL levels and T4 negatively associated with TC,VLDL levels in the premenopausal group. A similar study done by Sudhina PS[14] found positive association of TSH with TC in the postmenopausal group.

V. CONCLUSION

Thyroid dysfunction is more common in postmenopausal women. Hypothyroidism is more common than hyperthyroidism with subclinical cases being more common than the overt cases. Since hypothyroidism is invariably associated with dyslipidemia, there is increased risk of cardiovascular diseases in these patients. Hence thyroid screening should be done in postmenopausal women so that timely diagnosis of thyroid disorders and treatment of the same can be instituted to prevent future cardiovascular complications. Also, female patients with dyslipidemia should be evaluated for thyroid dysfunction.

Conflict of interest: none

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