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Original Research Article.

Effect of Lipid Profile on Thyroid Disorder Patients: A Case Control Study

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ABSTRACT

Background: Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, these hormones regulates a wide array of metabolic activities. Dyslipidemia is a common risk factor for cardiovascular diseases. So, we have designed this study in our population for evaluation of lipid profile in hypothyroid patients that might be helpful for clinical management of hypothyroid patients with dyslipidemia.

Material & Methods: A case control study on 80 patients with thyroid disorder attending both OPD and IPD in Department of Medicine in S.P. Medical College, Bikaner. All patients divided in two groups, case group (40 patients with thyroid disorder) and control group (40 patients with euthyroid) were selected in study.

Results: In our study observed that the comparison of mean of thyroid profile (TSH, Total T3 & Total T4) were statistically significant (P<0.0001, P=0.0289 & P=0.0116) in between case and control group and correlation of lipid profile (TC, LDL, HDL, VLDL & TG) were statistically significant (P < 0.0001, P=0.0001, P=0.0485, P<0.0001 & P=0.0001 respectively) in between group also.

Conclusion: These findings suggest that thyroid disorder was associated with hyperlipidemia which enhances the risk for development of atherosclerosis and coronary artery disease. Hence, routine monitoring of lipid profile must be done in hypothyroid patients in order to improve their prognosis.

KeyWords: Thyroid Disorder, Dyslipidemia, HDL, LDL, TSH.

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INTRODUCTION

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, these hormones regulates a wide array of metabolic activities.[1] It is a common metabolic disorder in general population[2], which is more common in women and epidemiological rate of prevalence increase with age.[3] In the developed countries, the prevalence of thyroid disorders is about 4% to 5%.[4]

Hypothyroidism is related with many biochemical abnormalities. Increased levels of total cholesterol and low density lipoprotein cholesterol, when decreases thyroid function.[2] Thus hypothyroidism comprises a significant cause of secondary dyslipidemia.[5] The generally increase the serum total cholesterol level (raised serum LDL cholesterol and intermediate density lipoprotein) in hypothyroidism patients, despite the decreased activity of HMG CoA reductase.[6] Decline the thyroid hormone secretion greatly raises the plasma concentration of cholesterol because the decline rate of cholesterol secretion in the bile and consequent reduced loss in the feces due to decreased number of low density lipoprotein receptors on liver cells.[7] Reduced activity of LDL receptors resulting in decline receptor-mediated catabolism of LDL and IDL is the main cause of the hypercholesterolemia found in hypothyroidism.[8]

In newly diagnosed hypothyroid patients (value more than 40 mg/dL) reported increases concentration of high density lipoprotein cholesterol in serum, whereas euthyroid and previously reported hypothyroid cases who were on thyroid replacement therapy reported decreased level of serum HDL cholesterol.[9] Hypothyroid patients usually manifest elevated levels of high density lipoprotein cholesterol (HDL-C) mainly due to raise concentration of HDL2 particles.[10]

Nikkilia & Kekki[11] have disclosed that decreased activity of lipoprotein lipase (LPL), which results in decreased clearance of triglyceride-rich lipoproteins in hypothyroidism patients, who have hypertriglyceridemia.

Dyslipidemia is a common risk factor for cardiovascular diseases. The risk of coronary heart disease and other forms of atherosclerotic vascular disease increases with elevated level of plasma cholesterol concentration. A weak positive correlation of coronary heart disease also occur with plasma triglyceride concentration.[12] Whereas, prevalence of subclinical hyperthyroidism in the general population is between 0.7 and 12.4%. Approximately 1-5% of patients with subclinical hyperthyroidism develop overt disease annually. In India, the

prevalence has been found to vary from 0.5-3.9% for subclinical and 1.2-1.3% for overt hyperthyroidism. The incidence of hyperthyroidism has been found to be very low in patients with dyslipidemia. Tsimihodimos et al found that hyperthyroidism was present in only 1.2% of patients attending their lipid clinic.[4]

Various studies were done to evaluate the lipid profile status of hypothyroid patients. But controversies still overcome and that needs to attain consensus. So, we have designed this study in our population for evaluation of lipid profile in hypothyroid patients that might be helpful for clinical management of hypothyroid patients with dyslipidemia.

MATERIALS & METHODS

A case control study on 80 patients with thyroid disorder attending both OPD and IPD in Department of Medicine in S.P. Medical College, Bikaner. All patients divided in two groups, case group (40 patients with thyroid disorder) and control group (40 patients with euthyroid) were selected in study.

Inclusion Criteria

- All the patients with thyroid dysfunction

Exclusion Criteria

- Patients with chronic liver disease.
- Patients who had already taken treatment.
- Coagulation disorders.
- Severe systemic disease.
- Pregnancy.
- Renal failure
- Malignancy
- Underlying known cardiac disorder

Presence of thyroid dysfunction is defined as per American Thyroid Associations Guidelines.

Dyslipidemia as per NCEP ATP II and IDF Guidelines:

- Total cholesterol>200mg/dl
- Triglyceride>150mg/dl
- HDL<40 mg/dl
- LDL>100 mg/dl

Procedure

Fasting blood samples were taken in a plain gel vaccutainer tube with an aseptic blood collection technique. The samples were centrifuged within 1 h at 3000 rpm for 5 min. These were processed to obtain serum for the estimation of serum lipid profile and thyroid hormone level. Estimation of fasting lipid profile (TG, cholesterol, and HDL) was carried out on a fully automated Cobas Integra 400 plus clinical chemistry analyzer. LDL value was derived by Friedwald's formula: {LDL = Total Cholesterol – [HDL + (Triglyceride/5)]}. And thyroid function test was estimated with electrochemiluminescence method on Elecsys 2010. T3, T4, and FT4 levels were estimated by competitive principle and TSH by sandwich principle.

Data Analysis

Statistical analysis of the data's was done by SPSS (version 2016) where the values ≤ 0.05 was considered as significant.

Table 1: Sex wise distribution of case and control group

Sex	Cases		Control		P- value
	Number	Percentage	Number	Percentage	
Male	7	17.5%	9	22.5%	0.786
Female	33	82.5%	31	77.5%	
Total	40	100%	40	100%	

Table 2: Age wise distribution of case and control group

Age (yrs)	Cases		Control		Chi-square test	P- value
	Number	Percentage	Number	Percentage		
<30 yrs	11	27.5%	10	25%	4.182	0.2424
30-45	20	50%	13	32.5%		
46-60	5	12.5%	11	27.5%		
>60 yrs	4	10%	6	15%		
Total	40	100%	40	100%		

Table 3: Mean Thyroid Level of case and control group

Parameters	Cases	Control	T	Df	P- value
TSH (µIU/ml)	9.523±3.954	2.57±0.8589	10.86	78	<0.0001***
TotalT3 (ng/dl)	124.7±36.22	139.6±22.09	2.226	78	0.0289*
TotalT4 (µg/dl)	7.206±4.236	9.049±1.547	2.584	78	0.0116*

Table 4: Mean Lipid Parameters (mg/dl) of case and control group

Parameters	Cases	Control	T	df	P- value
Serum Cholesterol	184.0±39.72	132.5±18.63	7.431	-	<0.0001
LDL	101.6±12.66	120.7±27.36	4.002	-	0.0001
HDL	38.53±6.421	36.10±4.162	2.004	-	0.0485
VLDL	25.68±7.043	20.35±3.009	4.397	-	<0.0001
TG	143.8±40.62	116.3±14.81	4.019	-	0.0001

RESULTS

The present study shows the 80% were females and 20% males in both groups but not statistically significant (p = 0.786) (table 1). Majority of cases (50%) were 30-45 years of age in case group but 50% cases occurred in 30-60 years of age in control group (table 2).

In our study observed that the comparison of mean of thyroid profile (TSH, Total T3 & Total T4) were statistically significant (P < 0.0001, P = 0.0289 & P = 0.0116) in between case (table 3) and control group and correlation of lipid profile (TC, LDL, HDL, VLDL & TG) were statistically significant (P < 0.0001, P = 0.0001, P = 0.0485, P < 0.0001 & P = 0.0001 respectively) in between group also (table 4).

DISCUSSION

The present study showed female predominance with 89% versus male 11% of total cases. This is again similar to that shown in a study by Bhandopadhyay et al.,[13] who observed that females constituted 78% of study population. Many major studies have been done only on women. Thyroid disease is much more prevalent in women than men; women are 5–8 times more likely to develop hypothyroidism.

In the present study it was found that parameters [total cholesterol (184.0±39.72mg/dl), triglycerides (143.8±40.62mg/dl), HDL cholesterol (38.53±6.421mg/dl) and VLDL cholesterol (25.68±7.043mg/dl)] of lipid profile were significantly increased whereas LDL cholesterol (101.6±12.66mg/dl) showed comparable values in hypothyroid patients and controls. These results suggest that the effect of hypothyroidism in the lipid metabolism is more marked in patients with higher serum TSH levels. Even mild elevations of TSH are associated with changes in lipid profile significant enough to raise the cardiovascular risk. Hypothyroidism has also emerged as an independent risk factor for aortic atherosclerosis and myocardial infarction.

Studies done by Michalopoulou G et al[14], Diekman T et al[15], Tsmihodimoset V et al[5] and Olukoga AO et al[16] had shown that average serum concentration of HDL higher in subclinical or clinical hypothyroidism.

CONCLUSION

These findings suggest that thyroid disorder was associated with hyperlipidemia which enhances the risk for development of atherosclerosis and coronary artery disease. Hence, routine monitoring of lipid profile must be done in hypothyroid patients in order to improve their prognosis.

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