ejpmr, 2018,5(1), 335-337

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

SERUM LIPID PROFILE IN DISTINCT GRADES OF SUBCLINICAL HYPOTHYROIDISM

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Article Received on 16/11/2017 **Article Revised on 06/12/2017** **Article Accepted on 26/12/2017**

ABSTRACT

Dyslipidemia is the most common metabolic abnormality in subjects with thyroid disease, either in overt or subclinical forms of disease. Association of overt Hypothyroidism with abnormal lipid profile is the accepted clinical finding but still there is a skepticism regarding subclinical hypothyroidism (SCH) associated with lipid disorder. The purpose of the present study was to explore the association between thyroid hormones and abnormal lipid profile in SCH. 342 study subjects in the age group of 15 to 80 years were analysed. In this, 230 were Euthyroid Controls, 112 subjects were having SCH (60 persons were having Grade - I SCH, TSH < 6 µIU/ml; 40 persons - Grade II SCH, TSH <12 µIU/ml, 12 persons – Grade III SCH, TSH >12 µIU/ml). The thyroid profile namely Serum TSH, free thyroxine (FT_4) and the lipid profile namely serum TGL, Total cholesterol, HDL cholesterol and LDL cholesterol were measured. Serum TGL, LDL, Total cholesterol, Total Cholesterol/HDL ratio levels in SCH individuals were significantly higher than euthyroid subjects ($p<0.01$). No statistically significant difference between SCH individuals and euthyroid controls were found in HDL level except for an increase in HDL levels. It is also observed that the percentage of elevated serum lipids in the study subjects were more marked in Grade III SCH than the other groups. Hence, the present study supported the fact that hypothyroidism was associated with an abnormal lipid profile especially with respect to the levels of Total cholesterol, LDL and triglycerides.

KEYWORDS: Subclinical Hypothyroidism, TSH, Lipid Profile, Dyslipidemia.

INTRODUCTION

Subclinical hypothyroidism otherwise known as mild hypothyroidism is diagnosed when TSH level greater than 4 µIU/ml in presence of a normal free Thyroxine (FT_4) level (0.8-1.8 ng/dl). Subclinical hypothyroidism is much common than overt hypothyroidism and the prevalence is 1.4 - 7.8% in older population and even greater percentiles among women.[1]

Hypothyroidism ranges from minimal thyroid failure to severe overt hypothyroidism. Initially hypothyroidism may go unnoticed as the symptoms developing are insidious. Before overt hypothyroidism is established, the only marker for detection of subclinical hypothyroidism is elevated serum TSH. Biochemically, decreased concentration of T4 and T_3 lead to hypersecretion of pituitary TSH resulting in amplified increase of TSH levels. Increased TSH is the important laboratory finding, particularly in the early detection of thyroid failure. While thyroid hormones are still in the normal range, the diagnosis of subclinical hypothyroidism (SCH) is diagnosed by the increased TSH level.

In clinical state of hypothyroidism, sufficient amounts of thyroid hormones are unavailable to tissues. Clinical or overt hypothyroidism is detected based on TSH level greater than 4 µIU/ml and a decreased FT_4 level (<0.9 ng/ml). The correlation of lipid profile alteration among overt hypothyroidism patients is an established fact since half century ago. Various studies have been conducted to find whether the dyslipidemia in overt hypothyroidism may finally lead to cardiovascular diseases. But the significance of dyslipidemia in subclinical hypothyroidism remains controversial. The aim of the present study was to find out the association between the thyroid hormones and the abnormal lipid profile and also to determine the percentage of dyslipidemia in subjects with different grades of subclinical hypothyroidism.

MATERIALS AND METHODS

This study was conducted at Sri Ramachandra Medical College and Hospital, Porur Chennai. The study included 342 subjects (219 Women and 123 men) clinically diagnosed as hypothyroidism, in the age group of 15 to 80 years were analysed. In this, 230 were Euthyroid Controls, 112 subjects were having Subclinical

Hypothyroidism (SCH). SCH was further classified into 3 subgroups based on the levels of TSH as shown in Table No.1.

Table No. 1: Grades of Subclinical hypothyroidism based on TSH.

Group	Age in years	No. of subjects
Group I: Euthyroid controls (Normal TSH & Normal FT_4) (TSH- 0.35-4 µIU/ml & FT4 - 0.8-1.8 ng/dl)	15-80	n=230; M=94; F=136
Group II: Grade I – SCH (TSH < 6 µIU/ml & Normal FT_4)	15-80	n=60; M=16; F=44
Group III: Grade II – SCH (TSH<12 µIU/ml & Normal FT_4)	20-80	n=40; M=8; F=32
Group IV: Grade III – SCH (TSH>12 µIU/ml & Normal FT_4)	32-71	n=12; M=5; F=7

M = Males; F= Females, n=No. of subjects.

The persons with known Diabetes Mellitus were excluded from the study as it interferes with the lipid profile. In SCH, measurement of fT_3(tri-iodo thyronine) is not necessary, as it is always normal expect in patients with non-thyroid illness. So fT_3 measurement is excluded. The sample type used for both lipid profile and thyroid profile analysis was fasting serum. The thyroid profile namely Serum TSH, FT_4 of our study subjects were performed using kits on Advia Centuar Chemiluminiscent Immunoassay system. The lipid profile namely serum TGL, total cholesterol, HDL cholesterol and LDL cholesterol of our study subjects were estimated using kits with Dimension ® fully Automated Clinical Chemistry System. Data was subjected to standard statistical analysis such as student's unpaired t test. The results of each group were expressed as Mean ± SD. P<0.05 was considered as statistically significant.

RESULTS

The results of our study are shown below

The study included 342 individuals, 123(36%) were males, 219 (64%) were females, with male to female ratio of 1:2.

Serum TGL, LDL, Total cholesterol, Total Cholesterol/HDL ratio levels in SCH individuals were significantly higher than euthyroid subjects (p<0.01). No statistically significant difference between SCH individuals and euthyroid controls were found in HDL level except for an increase in HDL levels which is shown in Table No.2.

Table No. 2: Serum lipid and thyroid profile in normal and subclinical hypothyroid patients.

Parameters	Normal (n=230)	Grade I SCH (n=60)	Grade II SCH (n=40)	Grade III SCH (n=12)
TSH (µIU/ml)	2.02 ± 0.93	4.95 ± 0.59***	7.92 ± 1.32***	17.18 ± 4.81***
FT_4 (ng/dl)	1.14 ± 0.21	1.07 ± 0.17***	1.27 ± 1.23^{NS}	0.96 ± 0.18*
TGL (mg/dl)	107.33 ± 40.91	151.93 ± 70.95***	179.8 ± 113.27***	152.75 ± 52.96*
LDL (mg/dl)	86.35 ± 23.58	111.95 ± 26.82***	115.7 ± 33.42***	137.17 ± 53.44***
HDL (mg/dl)	38.55 ± 11.87	37.6 ± 10.77^{NS}	41.35 ± 12.07^{NS}	39.5 ± 14.93^{NS}
Total Cholesterol (mg/dl)	159.79 ± 37.08	188.55 ± 35.02***	195.65 ± 41.75***	213.92 ± 57.59***
Total Cholesterol/HDL ratio	4.56 ± 2.41	5.40 ± 1.53**	5 ± 1.20^{NS}	6.75 ± 5.37^{NS}

*** p<0.001, **p<0.01, *p<0.05 statistically significant; NS – Not significant.

The percentage of elevated serum lipids especially Total cholesterol and LDL cholesterol in the study subjects were more marked in Grade III SCH than the other groups which is shown in Fig No.1.

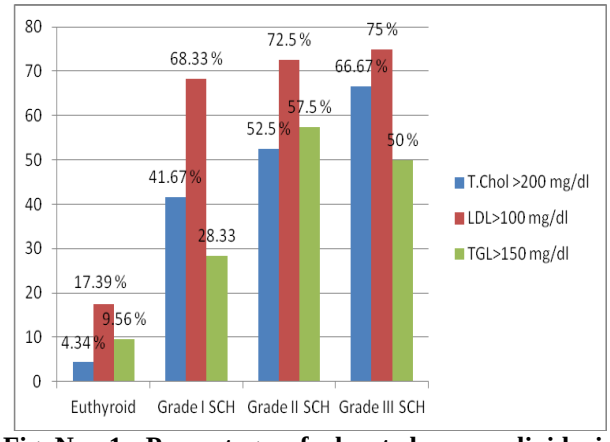

Fig No. 1: Percentage of elevated serum lipids in study subjects.

DISCUSSION

This is evident from our study that hypothyroidism was more common in female patients and the male to female ratio is 1:2 which is in consonance with the study of Baldwin et al in 1978.[2]

Regmi et al in 2010 did a study to find out the relation between thyroid dysfunction and serum lipid levels and their study revealed significant increase in serum lipid levels even with slight increase in serum TSH between 6.2 – 10 µ IU/ml. There was a progressive increase in total cholesterol and LDL with increase in TSH values.[3] Like that, in our study, total cholesterol, LDL cholesterol are significantly increased, thus displaying a more atherogenic lipid profile when compared with healthy individuals. Increase in circulating concentrations of Total cholesterol and LDL in SCH is responsible for decreased LDL receptor activity, resulting in decreased catabolism of LDL.[4]

The numerous studies have shown that HDL levels did not exhibit any difference between patients with subclinical hypothyroidism and controls (A. Iqbal et al in 2006, M. Adrees et al in 2009).[5][6] In contrast to our study, HDL levels are slightly increased in subclinical hypothyroid patients when compared to euthyroid controls but the increase is not statistically significant which is shown in Table no.2. This alteration in HDL cholesterol could be due to the altered activity of Cholesterol Ester Transfer Protein and hepatic lipase.[7]

Studies on triglyceride level (TGL) are far few and they have either higher or similar level to euthyroid subject levels. Present study has shown that the serum triglycerides are also higher in the subjects with subclinical hypothyroidism than in the euthyroid subjects which concurred with the reports of previous study of Lam KSL et al in 1986.[8] Decreased clearance of triglyceride-rich lipoproteins and decreased activity of lipoprotein lipase (LPL) must have contributed to the alteration in the triglyceride level in SCH.[9]

The other finding of our study is the relatively high incidence of dyslipidaemia which is more marked in Grade III SCH when compared to other groups; 66.67% had hypercholesterolemia 75% had raised LDL. This finding is concurrent with result of Cabral et al.[10]

CONCLUSION

Our study supports the fact that Subclinical hypothyroidism is associated with abnormal lipid profile which can lead to cardiovascular diseases. Therefore, this study indicates that monitoring of lipid level in patients with subclinical hypothyroidism would be helpful in preventing cardiovascular diseases.

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