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Comparison of Heart Rate Variability and Lipid Profile Between Subclinical Hypothyroidism and Normothyroid in Metabolic Syndrome Cases: our Experience from Government Medical College, Nagpur

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KEYWORDS

Lipid profile, subclinical hypothyroidism, normo-thyroidism, metabolic syndrome

ABSTRACT:

Introduction: Thyroid hormone affects lipid metabolism, and numerous studies have found that lipid levels increase as TSH levels rise. Serum low-density lipoprotein-C (LDL-C) levels were observed to be higher in SCH patients in several investigations. Changes in blood high-density lipoprotein-C (HDL-C) and triglyceride (TG) levels under SCH have also yielded contradictory results. Objective: To compare lipid profile between subclinical hypothyroidism and normothyroid in metabolic syndrome cases. Methodology: The present cross- sectional study was carried out in total of 103 cases attending the outpatient department and in-patients of Government Medical College, Nagpur from March 2023 to September 2023. Results: Mean age in SCH was 48.16±13.62 years and in normal patients was 46.22±13.13 years. Mean TG in SCH was 181±57.06 and 138.71±41.89 mg/dl in normal patients ($p<0.05$). Mean TC in SCH was 185.45±37.2 and 174.25±43.52 mg/dl in normal patients($p>0.05$). Mean LDL was 119.32±30.31 mg/dl in SCH and 117.06±40.76 mg/dl in normal patients($p>0.05$). Mean HDL was 39.77±10.78 mg/dl in SCH and 42.63±10.14 mg/dl in normal patients($p>0.05$). Mean LDL/HDL ratio was 3.08±0.82 in SCH and 2.85±1.08 in normal patients($p>0.05$). Conclusion: We observed that serum triglycerides were higher in subclinical hypothyroidism patients as compared to normo-thyroidism cases. We also observed no significant difference in other lipid parameters between subclinical hypothyroidism and normo-thyroidism cases. We observed that the mean heart rate in SCH was higher as compared to normothyroid cases where as mean R-R interval in SCH patients was reduced significantly.

Introduction

The term "metabolic syndrome" refers to a group of disorders that include weight gain, hypertension, an abnormal lipid profile with high triglyceride (TG) levels and low levels of high-density lipoproteins (HDLs), and higher fasting blood sugar (FBS) levels.[1] In the years to come, diabetes and cardiovascular illnesses are more likely to occur in patients with metabolic syndrome. In individuals with metabolic syndrome, thyroid impairment is frequent. [1,2] In India, there is clear evidence of a high incidence of the metabolic syndrome, which is expanding globally. The incidence increased globally from 1.1% in 1980 to 3.85% in 2015 over the past three decades. The global rate of mortality from high body mass index (BMI) increased by 28.3% between 1990 and 2015.[2] Insulin resistance and metabolic syndrome are quite common in India. According to studies, the age-adjusted prevalence of metabolic syndrome in urban Indian populations was determined to be around 25% overall (around 31% in women and 18.5% in males). [2]

In subclinical hypothyroidism (SCH), thyroid-stimulating hormone (TSH) levels are elevated in the blood, but serum free thyroxine (FT4) levels are normal. It is rather prevalent, affecting about 10% of women over the age of 55.[3] SCH is linked to a higher risk of heart failure, coronary artery disease events, and coronary heart disease-related mortality. In addition,

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patients with SCH in their middle years may experience cognitive impairment, nonspecific symptoms such as weariness, and mood swings. [4] Other cardiovascular risk factors, such as blood pressure changes and increased atherosclerosis have been related to SCH. A change in lipid profile (LP) is another consequence of SCH. [5] Thyroid hormone affects lipid metabolism, and numerous studies have found that lipid levels increase as TSH levels rise. [5] Serum low-density lipoprotein-C (LDL-C) levels were observed to be higher in SCH patients in several investigations. Some of them discovered greater serum total cholesterol (TC) levels in SCH patients, whereas others discovered lower serum TC levels in SCH patients. [6] Changes in blood high-density lipoprotein-C (HDL-C) and triglyceride (TG) levels under SCH have also yielded contradictory results. [7,8]

Objective: To compare heart rate variability and lipid profile between subclinical hypothyroidism and normothyroid in metabolic syndrome cases

Materials and methods:

Study design: Cross- sectional study.

Study period: From March 2023 to September 2023

Sample size: A total of 103 cases attending the outpatient department and in-patients of Government Medical College, Nagpur were taken.

Inclusion criteria

- Age between 18-60 years
- Diagnosed cases of metabolic syndrome
- Those who are willing to participate in study after giving written consent

Exclusion criteria

- Past or present history of anti-thyroid drugs intake
- History of thyroid dysfunction including hypothyroidism, hyperthyroidism, goitre, thyroid malignancy
- Post thyroid surgery patients, external radiotherapy of neck
- History of chronic medical disorder including diabetes mellitus, end stage renal disease, cardiovascular disease, stroke, active liver disease and other autoimmune diseases
- Patients with acute medical illness admitted in ICU.

Method of data collection

A total of 103 cases attending the outpatient department and in-patients of Government Medical College, Nagpur were taken. Records of the cases were collected by using structured proforma. An informed consent was taken before data collection. All the details like age, gender, place of residence, comorbidity, lipid profile and heart rate variability were collected.

Instrument used for measuring the heart rate variability was ADI instrument. Baseline ECG was recorded with the help of computerized polygraph, a computerized 16 channel bio potential box. (PHYSIOPAC pp-4, Medicaid system).

Statistical analysis and methods-

Data was collected by using a structure proforma. Data thus was entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA. Qualitative data was expressed in terms of percentages and proportions. Quantitative data was expressed in terms of Mean and Standard deviation. Comparison of mean and SD between two groups will be done by using unpaired t test to assess whether the mean difference between groups is significant or not. Descriptive statistics of each variable will be presented in terms of Mean, standard deviation, standard error of mean. A p value of <0.05 was considered as statistically significant whereas a p value <0.001 was considered as highly significant.

Results

Table 1: Distribution according to age and gender

		Subclinical hypothyroidism				Total
		Yes		No		
		Frequency	Percent	Frequency	Percent	
Age group in years	20-30	3	9.7	11	15.3	14
	31-40	7	22.6	17	23.6	24
	41-50	9	29	14	19.4	23

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	51-60	5	16.1	19	26.4	24
	61-70	5	16.1	10	13.9	15
	> 70	2	6.5	1	1.4	3
	Total	31	100	72	100	103
Gender	Male	14	45.2	48	66.7	62
	Female	17	54.8	24	33.3	41
	Total	31	100	72	100	103

Out of 31 patients with SCH, majority were from 41-50 years age group i.e. 9(29%) followed by 7 i.e. 22.6% from 31-40 years age group and 5 each i.e. 16.1% from 51-60- and 61-70-years age group. Out of 31 patients with SCH, majority were females i.e. 17(54.8%) and remaining i.e. 14(45.2%) were males.

Table 2: Comparison of age between subclinical hypothyroidism and normo-thyroidism

		N	Mean	Std. Deviation	t	p	Inference
AGE	Subclinical hypothyroidism	31	48.16	13.62	0.68	0.5	Not significant
	Normal	72	46.22	13.13		(>0.05)	

Mean age in SCH was 48.16±13.62 years and in normal patients was 46.22±13.13 years. The difference in the mean age was statistically not significant (p>0.05)

Table 3: Comparison of lipid profile between subclinical hypothyroidism and normo-thyroidism

		N	**Mean**	**Std. Deviation**	**t**	**p**	**Inference**
Triglyceride (TG)	Subclinical hypothyroidism	31	181	57.06	4.2	0.0001	Highly significant
	Normal	72	138.71	41.89		(<0.001)	
Total cholesterol (TC)	Subclinical hypothyroidism	31	185.45	37.2	1.25	0.21	Not significant
	Normal	72	174.25	43.52		(>0.05)	
LDL	Subclinical hypothyroidism	31	119.32	30.31	0.28	0.78	Not significant
	Normal	72	117.06	40.76		(>0.05)	
HDL	Subclinical hypothyroidism	31	39.77	10.78	-1.28	0.2	Not significant
	Normal	72	42.63	10.14		(>0.05)	
LDL/HDL	Subclinical hypothyroidism	31	3.08	0.82	1.07	0.29	Not significant
	Normal	72	2.85	1.08		(>0.05)	

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Mean TG in SCH was 181±57.06 and 138.71±41.89 mg/dl in normal patients. The difference in the mean TG was statistically significant (p<0.001). Mean TC in SCH was 185.45±37.2 and 174.25±43.52 mg/dl in normal patients. The difference in the mean TC was not statistically significant (p>0.05). Mean LDL was 119.32±30.31 mg/dl in SCH and 117.06±40.76 mg/dl in normal patients. The difference in the mean LDL was not statistically significant (p>0.05). Mean HDL was 39.77±10.78 mg/dl in SCH and 42.63±10.14 mg/dl in normal patients. The difference in the mean HDL was not statistically significant (p>0.05). Mean LDL/HDL ratio was 3.08±0.82 in SCH and 2.85±1.08 in normal patients. The difference in the mean LDL/HDL was not statistically significant (p>0.05)

Table 3: Comparison of heart rate variability between subclinical hypothyroidism and normo-thyroidism

	Subclinical hypothyroidism	Normal	p
Mean HR	69.5±11.3	62.3±6.8	0.001
R-R interval	869.2±13.8	904±8.6	0.03

Mean heart rate in SCH patients was 69.5±11.3 as compared to 62.3±6.8 in euthyroid cases and we observed statistically significant difference between the two groups (p<0.05).

Mean R-R interval in SCH patients was 869.2±13.8 as compared to 904±8.6 in euthyroid cases and we observed statistically significant difference between the two groups (p<0.05).

Discussion:

Metabolic Syndrome (MS) is diagnosed when three out of five cardiometabolic risk factors are present namely hyperglycaemia, low HDL-Cholesterol, high 1 triglycerides, systolic hypertension and obesity.[1] Presence of metabolic syndrome increases the risk of cardiovascular diseases and type 2 diabetes mellitus 2 (T2DM).[2]

Hypothyroidism can be overt or subclinical. Subclinical-hypothyroidism (SCH) is defined when TSH values are more than 4.0 mIU/L but less than 10 mIU/L with normal thyroid hormones (fT4 and fT3).[3,4] The etiological factors for SCH and overt disease are the same with a difference of severity of the disease, so SCH is also called 'Mild Hypothyroidism' as by definition SCH is only a biochemical diagnosis and has nothing to do with the presence or absence of clinical features of thyroid disease.[5]

Lipid profile comparison between subclinical hypothyroidism and normo-thyroidism

Mean TG in SCH was 181±57.06 and 138.71±41.89 mg/dl in normal patients. The difference in the mean TG was statistically significant (p<0.001). Mean TC in SCH was 185.45±37.2 and 174.25±43.52 mg/dl in normal patients. The difference in the mean TC was not statistically significant (p>0.05). Mean LDL was 119.32±30.31 mg/dl in SCH and 117.06±40.76 mg/dl in normal patients. The difference in the mean LDL was not statistically significant (p>0.05). Mean HDL was 39.77±10.78 mg/dl in SCH and 42.63±10.14 mg/dl in normal patients. The difference in the mean HDL was not statistically significant (p>0.05). Mean LDL/HDL ratio was 3.08±0.82 in SCH and 2.85±1.08 in normal patients. The difference in the mean LDL/HDL was not statistically significant (p>0.05) (Table 3)

Abha P et al[9] reported that in case of lipid profile, TGs in those with metabolic syndrome (262.8±112.3 mg/dL) were significantly higher (p<0.001) than those without metabolic syndrome (137.9±19.01 mg/dL), while the serum levels of HDL were significantly higher (p<0.001) in patients without metabolic syndrome (50.5±3.9 mg/dL) as compared to patients with metabolic syndrome (43.4±5.2 mg/dL).

Tumbanatham A et al[10] compared the lipid profile between subclinical and clinical hypothyroidism and concluded that total Cholesterol values in subclinical and clinical hypothyroidism were 195.4±31.9 and 230.8 ±43.9 with p<0.05, tri- glycerides in subclinical and clinical hypothyroidism 193.6± 58.2 and 150.7± 81.6 with p<0.05, HDL 47.5±7.9 and 42.3± 9.8 with p<0.05, LDL in subclinical and clinical hypothyroidism were 107.1±29.5 and 155.7±31.2 with p<0.05 and VLDL in subclinical and clinical hypothyroidism 38.7± 11.4 and 25.7±9.7 with p<0.05.

Rastgooye Haghi A et al[11] in their study reported that regardless of age groups and gender, there were no significant correlations between SCH and increased

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levels of TG and TCHOL (P-value <0.05). The prevalence of dyslipidemia and SCH was significant in females (P-value =0.009), but not in males (P-value =0.02). Totally, there was a significant correlation between the prevalence of dyslipidemia and SCH regardless of gender (P-value =0.04).

Ejaz M. et al[12] observed the prevalence of SCH as 19.8%. SCH was more common in females and participants with higher body mass index (BMI). TSH was significantly higher in patients with SCH compared to participants without SCH (6.58 ± 1.15 mIU/L vs. 3.12 ± 0.56 mIU/L; p-value: 0.0001). TC and LDL were significantly higher in participants with SCH compared to participants without SCH (228.41 ± 35.21 mg/dL vs. 171.21 ± 30.21 mg/dL; p-value: <0.00001) and (131.65 ± 28.22 mg/dL vs. 89.26 ± 18.52 mg/dL; p-value: <0.0001), respectively.

Conclusion:

- Mean TG in SCH was 181±57.06 and 138.71±41.89 mg/dl in normal patients. The difference in the mean TG was statistically significant (p<0.001). We observed that serum triglycerides were higher in subclinical hypothyroidism patients as compared to normo-thyroidism cases.
- We also observed no significant difference in other lipid parameters between subclinical hypothyroidism and normo-thyroidism cases.
- We observed that the mean heart rate in SCH was higher as compared to normothyroid cases where as mean R-R interval in SCH patients was reduced significantly.

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