How to Cite:
Pradeep, B. J., Baghel, M., Sharma, B., & Modala, S. (2022). Analysis of moderate subclinical hypothyroid patients with homeostatic model assessment-Insulin resistance. *International Journal of Health Sciences*, *6*(S1), 11392–11398. https://doi.org/10.53730/ijhs.v6nS1.7780

Analysis of moderate subclinical hypothyroid patients with homeostatic model assessment-Insulin resistance

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***Abstract*---**Aim: Homeostatic Model Assessment -Insulin Resistance- 2 test findings in people with mild hypothyroidism should be analyzed. Introduction: Hypothyroidism is associated with an increased risk of cardiovascular disease and alterations in blood lipidshave also been related to subclinical hypothyroidism. Treating hypothyroidism with levothyroxine (LT4) may help to improve lipid profiles and heart health, particularly in those with a wider deviation from the normal and higher blood TSH levels. Materials and Methods:There was a wide range of TSH levels among the study's participants, all of whom were between the ages of 20 and 45 and had never been diagnosed with thyroid disease. The study also included 50 people who had recently been diagnosed with moderate SCH but had not earlier been diagnosed with thyroid disease. Results: The glucose metabolism and insulin resistance are strongly influenced by thyroid hormones. Thyroid hormones. Participants in SCH were found to be more likely to be overweight or obese than those who did not participate in the research. TSH (r = 0.290; P\0.01) and LDL (r = 0.210; P\0.052) were shown to be significantly related in this study. SCH individuals had considerably higher LDL-cholesterol levels, according to this research. High blood sugar levels may be caused by insulin sensitivity, a condition that is directly associated to obesity and overweight. Without substantial changes in blood glucose or A1c levels, SCH had greater IR. Conclusion: For monitoring and avoiding hypothyroidism-related consequences associated with moderate subclinical hypothyroidism, blood glucose, insulin and serum lipids should be evaluated.

***Keywords*---**HOMA-IR 2, Mild Subclinical Hypothyroid, hypothyroid patients.

Introduction

Overt hypothyroidism is associated with an increased risk of cardiovascular disease and alterations in blood lipids. Cardiovascular disease has also been related to subclinical hypothyroidism. Experts are divided on whether or not hypothyroidism and cardiovascular disease are related.[1]Even if the TSH levels are increased, the levels of free thyroid hormones are normal in persons who have mild hypothyroidism (SH). The annual percentage risk of overt thyroid failure rises with serum TSH level in nearly half of those with this disease, which is characterized by serum TSH values of 5-10 μIU/L and thyroid autoantibodies. SH is related to the high lipid profile, an increased risk of atherosclerosis, a higher risk of cardiovascular disease, and a reduced submaximal exercise capacity. [2] When the serum TSH level rises, the divergence from normalcy increases (the "dosage effect" phenomenon). Treating hypothyroidism with levothyroxine (LT4) may help to improve lipid profiles and heart health, particularly in those with a wider deviation from the normal and higher blood TSH levels. LT4. If SH is associated with an elevated cardiovascular risk and LT4 therapy delivers long-term benefits that clearly outweigh the hazards of excessive treatment, there is still some disagreement. [3] Individual patients should be treated on an as-needed basis while simultaneously meeting the risk of thyroid disease progression and cardiovascular events as long asrandomised, controlled, prospective, and sufficiently powered trials fail to give clear solutions to these crucial challenges.[4]
All of the insulin resistance syndrome's symptoms are related to the body's inability to regulate its own insulin production. As a result of obesity and insulin resistance, as well as impaired glucose tolerance, dyslipidemia, and hypertension in the form of the metabolic syndrome (MetS). [5]The metabolic syndrome has been shown to raise cardiovascular disease risk in both diabetics and non-diabetics regardless of the usual risk factors.[6]

Materilas and Methods

TSH values ranged from 4.12–9.9 μIU/ml in 50 euthyroid control participants and 50 newly diagnosed mild SCH patients aged 20–45 years without any past thyroid disease in the current case control study. On the basis of a self-reported questionnaire, diabetics, hypertensives, alcoholics, pregnant women, those who use medication to alter the thyroid function, and those who use tobacco were excluded from the study. The IEC authorised the research after receiving informed permission from all of the participants.

Both research required participants to provide basic demographic and physical information including their height and weight. A BMI test was performed. thyroid stimulating hormone (TSH-3) is generated by the thyroid gland and has a typical range of 0.27–4.12 μIU/ml. The Bio-Rad D10 (fasting and postprandial) and the T4 (normal range: 5.1–14.1 μg/ml) were used to measure HbA1C and blood glucose (fasting and postprandial). ELISA kits were used to assess insulin levels. HOMA-IR 2 assessed fasting blood glucose and insulin levels to quantify insulin using a homeostasis model assessment (HOMA-IR).

Statistical Analysis

We utilised the SPSS package software to conduct the statistical analysis (version 25.0; Chicago, IL, USA). Mean ± SD were utilised to calculate the data set's findings. Pearson's correlation test and the students' t-test p-values of > 0.05 and above were used to determine whether or not a result was significant.

Results

The SCH group had higher BMI, LDL-C, insulin, and IR than the control group (Tables 1, 2, 3,4). Glucose metabolism and insulin resistance are greatly affected by thyroid hormones. The SCH group had a higher BMI than the general population, which may be used to determine whether or not a person is overweight or obese (Table 2). There was a strong correlation between IR2 and TSH (r = 0.298; P\0.01) and LDL (r = 0.220; P\0.052) in the current research. SCH individuals had considerably higher LDL-cholesterol levels, according to this research. High blood sugar levels may be caused by insulin sensitivity, a condition that is directly associated to obesity and overweight. IR was greater in SCH, while blood glucose and A1c levels were stable (Table 4).

Table 1
Gender and Age

S.no	Gender	Euthyroid (N=50)	SCH (N=50)	P value
1	Male	16(32%)	10(20%)	
2	Female	34(68%)	40(80%)	
3	Age(Years)	41.5±5	39.1±6	0.109

Table 2
Baseline parameter of the patients

S.NO	Parameters	Euthyroid (N=50)	SCH (N=50)	P value
1	T3 (ng/ml)	1.2 ±0.3	1.3±0.1	0.287
2	T4 (Ig/dl)	8.5±1.1	7.9±1.2	0.001
3	TSH (IIU/ml)	2.1±0.9	5.7±1.3	0.001
4	BMI (kg/m2)	24.5±4	25.6±2	0.48

T3 free triidothyronine, T4 thyroxine, TSH thyrotropin, BMI body mass index

Table 3
Comparison of biochemical parameters between SCH and Controls

S.no	Lipid Parameters	Euthyroid (N=50)	SCH (N=50)	P value
1	Total Cholesterol (mg/dl)	179 ± 29	188 ± 33	0.127
2	Triglycerides (mg/dl)	110 ±58	120 ±49	0.335
3	HDL cholesterol (mg/dl)	49 ±9	46 ±7	0.116

4	LDL cholesterol (mg/dl)	121 ±25	132 ±30	0.038

Table 4
Comparison of Glycemic indices between the groups

S.no	parameters	Euthyroid (N=50)	SCH (N=50)	P value
1	FBS(mg/dl)	97±10	98±10	0.070
2	PPBS (mg/dl)	97±13	100±20	0.153
3	HbA1C(%)	5.8±0.3	5.6±0.3	0.677
4	Insulin (IU/ml)	15.4±4.0	19.0±4.0	0.001
5	IR-2	1.98±0.52	2.44±0.58	0.001

FBS Fasting Blood sugar, PPBS Post prandial blood Sugar, HbA1C Glycated Hemoglobin, IR Insulin Resistance

Dicussion

The SCH group had higher BMIs, LDL-Cs, insulin levels, and IRs (Tables 1-4). Sugar metabolism and insulin resistance are both influenced by thyroid hormones. Insulin resistance in the peripheral tissues is related to hypothyroidism.[7] Glucose absorption by muscles and adipose tissue is thought to be reduced as a consequence of decreased insulin binding and impaired GLUT4 translocation due to a reduction in T3. In moderate hypothyroidism, 7Gen et al.[8] found early insulin resistance and hyperinsulinemia, but IR in overt hypothyroidism was also seen. Only fasting hyperinsulinemia, not IR, was found by Al Sayed et al.[9] in SCH. An early indicator of poor glucose metabolism is evident in the SCH stage, which may explain the latter finding. High blood sugar levels may be caused by insulin sensitivity, a condition that is directly associated to obesity and overweight. IR was higher in SCH, while blood glucose and A1c levels were stable (Table 4). Different studies [10,11] specify a wide range of cutoff values ranging from 1.8 to 2. Due to a lack of established cutoff values for our study's participants, we relied on the HOMA 2 IR value C2.The SCH group had a higher BMI than the general population, which may be used to determine whether or not a person is overweight or obese (Table 2). It's not clear if TSH levels are connected to BMI, which implies that TSH may play a part in obesity's progression.[12,13,14] The idea that obesity causes alterations in circulating thyroid function parameters has been validated by research, on the other hand. [15]

Women over the age of 50 are more likely than younger women to have SCH, which is characterised by normal blood free thyroxine levels and increased serum TSH levels[16].[17]Recent research shows that women over the age of 65 who have moderate thyroid dysfunction have a higher risk of atherosclerosis [18]and myocardial infarction, and that SCH is a powerful predictor of atherosclerosis and myocardial infarction. [19]Dyslipidemia is common in people with hypothyroidism that is obvious to the sight.[20]If TSH levels are normal, serum lipids may still be dramatically affected, according to several recent research. [21]In the majority of studies, SCH has been linked to a rise in total and LDL cholesterol, as well as a decrease in HDL cholesterol.[22,23] SCH individuals had considerably higher LDL-cholesterol levels, according to this research.LDL cholesterol clearance and

hepatic and peripheral HDL production are both enhanced by thyroid hormone-stimulated synthesis and activation of LDL receptors.[24] [25] Subclinical hypothyroidism (SCH) has been linked to decreased clearance of LDL-C and elevated levels of LDL-C concentrations in the bloodstream.Metabolic syndrome affects 30–40% of people, according to previous research. The insulin, IR, BMI, and LDL-C values of the [26,27] SCH patients in this study were equal to those of MS, although there were no changes in glycemic or other lipid indicators. Thyroid dysfunction is linked to insulin resistance, according to research.There was a significant correlation between TSH (r = 0.290; p\0.01) and LDL (r = 0.20; p\0.052) in this research. Results from studies [10,11,12] comparing HOMA-IR to BMI levels have been mixed. Insulin resistance has been linked to an increase in visceral adipose tissue. It's not clear whether the problem is with the thyroid or with visceral fat, but the fact that this cycle exists calls for further research.The subject's thyroid condition would have been better understood if free thyroxine had been measured. insulin and lipid metabolism must also be evaluated in the context of obesity or thyroid autoimmunity.In spite of these drawbacks, the findings were consistent with earlier investigations.

Conclusion

For monitoring and avoiding hypothyroidism-related consequences associated with moderate subclinical hypothyroidism, blood glucose, insulin and serum lipids should be evaluated.

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