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Association Of Thyroid Autoimmunity And Lipid Profile In Hypothyroidism: A Cross-Sectional Study

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ABSTRACT

Introduction: Hypothyroidism is a common endocrine disorder worldwide. In India, one in ten persons suffers from thyroid diseases, with hypothyroidism being the most frequent type. One of the recurring problems linked to thyroid disorders is hyperlipidemia, which may be significantly influenced by autoimmunity.Studies on the prevalence of hypothyroidism in different geographical territories of India are sparse.**Aim:** To investigate the association between Thyroid Peroxidase Antibody (anti-TPO) and serum lipid parameters among patients diagnosed with hypothyroidism.

Materials and Methods: In total, 380 individuals of both sexes attending the outpatient department (OPD) of HNB Base Teaching hospital Srinagar Garhwal Uttarakhand, with varied symptoms were screened for thyroid-function test (TFT) levels. The age of the study participants ranged from 18 to 65 years. All patients underwent estimation of thyroid function parameters such as free triiodothyronine (FT3), free thyroxine (FT4), and ThyroidStimulating Hormone (TSH), as well as anti-TPO levels and selected lipid profile parameters such as Total Cholesterol (TC), Triglycerides (TG), High-Density Lipoproteins (HDL), and Low-Density Lipoproteins (LDL). The association between anti-TPO and lipid levels was further analyzed. Statistical analysis was performed using the Chi-square test.

Results: Among the 187 hypothyroid patients, 136 (72.7%) were females, while only 51 (27.2%) were males. High serum anti TPO antibodies were found in 104 (55.6%) patients, whereas normal Anti-TPO cases accounted for 83 (44.3%). The total serum cholesterol, with a mean of 218.2± 60.2mg/dL, serum LDL, with 140.6 ± 55.9mg/dL, andserum TG with a mean of 170.7 ± 72.8mg/dL were significantly raised, whereas serum HDL, with 43.4 ± 6.7, were found to be non-significant.

Conclusion: Hypothyroid patients positive for anti-TPO antibodies are at risk of experiencing disrupted lipid levels. Positive anti-TPO status was significantly correlated with TC, TG, and LDL in the current investigation.

Keyword: Thyroid Stimulating Hormone (TSH), free triiodothyronine (FT3), free thyroxine(FT4), Autoimmune Thyroid Disorder (AITD),Total Cholesterol (TC), Triglycerides (TG), High-Density Lipoproteins (HDL), and Low-Density Lipoproteins (LDL).

Introduction

Thyroid diseases are common endocrine disorders in India. Based on estimations from multiple thyroid illness research, it is projected that approximately 42 million individuals in India are affected by thyroid problems.[1] Thyroid dysfunctions manifest either as hyper or

hypothyroidism. Dyslipidemia is a condition that exacerbates cardiovascular issues by elevating plasma cholesterol, triglycerides, or both, or by lowering HDL levels.[1]The most prevalent metabolic disease in the general population is thyroid dysfunction, specifically hypothyroidism or hyperthyroidism, which can be identified in either an overt or subclinical form.[2]Autoimmunity is one of the most frequent causes of thyroid dysfunction in women of reproductive age. Thyroid antibodies, such as anti-thyroid peroxidase antibodies, are present in 5–15% of euthyroid women, and they increase the risk of thyroid dysfunction.The presence of anti-TPO antibodies is relatively high in women of childbearing age.[3]

Thyroid hormone disorders are associated with several biochemical abnormalities due to the effect of thyroid hormones in all major metabolic pathways. These include preterm birth, spontaneous miscarriage, dyslipidemia, and metabolic disorders.[4]Infertility can also be caused by thyroid dysfunction, among many other things like hyperprolactinemia. Autoimmune thyroiditis is prevalent in women with polycystic ovary syndrome, specifying the importance of screening for anti-TPO antibodies in women, especially in their reproductive age.[5]

Thyroid hormones majorly affect all aspects of lipid metabolism and cause several qualitative and quantitative changes in lipids. One of the most prevalent metabolic disorders in people with thyroid conditions is dyslipidemia.Existing data support that thyroid dysfunctions raise the risk of cardiovascular disease by altering hemodynamics and increasing the risk of atherosclerosis. Lipid profile alterations in thyroid dysfunctions are well-established; however, alterations in thyroid autoimmunity are less understood.

Autoimmune diseases exhibit a marked incidence in the population, and among them, Autoimmune Thyroid Disorder (AITD) emerges as one of the most prevalent forms.[6]Elevated levels of serum thyroid autoantibodies, including anti-TPO-Ab, anti-TG-Ab, and TSHR-Ab, are commonly observed in patients with AITD.[7]The underlying mechanisms that drive the development of thyroid autoimmunity are most likely related to a cytotoxic immune response that is unique to TPO and TG.[8]An autoimmune condition known as Hashimoto's thyroiditis is common and significantly more common in women.[9]

MATERIALS AND METHODS

A hospital-based, cross-sectionalstudy was conducted at HNB Base Teaching Hospital, Srinagar Garhwal, Uttarakhand, India. The study subjects were individually counseled about the study, and an informed consent form was obtained from each patient. The HNB Medical Education University, Dehradun/Institutional Ethics Committee gave its approval to the current study.

Inclusion criteria: Newly diagnosed (first time) cases of thyroid disorders, age group 18-65 years, irrespective of gender, with pre-specified variables such as FT3, FT4, and TSH confirming hypothyroidism were included in the study, informed consent for participation in study, permanent resident (at least for 10 years) of Garhwal region of Uttarakhand were considered.

Exclusion criteria: Patients under the age of 18, those with hyperthyroidism, myocardial infarction, congestive heart failure, smokers, alcoholics, diabetics, post-thyroid surgery patients, those who undergo radioactive iodine therapy, those with autoimmune diseases, and pregnant women, were excluded from the study.

Sample size: A total of 380 patients, including both males and females, were analyzed for the study. Using an online statistical program called OpenEpi, a nonprobability, easy sampling procedure with a 95% confidence level was used to calculate the sample size.

Data collection: Data related to the patient's age and genders were collected from all the study participants. Following a 12-hour fasting, 5 mL venous blood sample was taken from each participant using a sterile venipuncture procedure and placed in plain (red) vials without anticoagulant. The samples were then centrifuged for 15 minutes at 2500 rpm to separate

serum. The serum samples were processed for thyroid profile,TPO antibody,and lipid profile analysis. The thyroid profile (FT3, FT4, and TSH) and TPO antibody was measured using the (LIASION Analyzer, made in DiaSorin, Italy)Immuno Assay Analyser by the Chemiluminescent Immunoassay (CLIA) method.[10]The reference ranges were provided by the kit: FT3 (2.2-4.2ng/ml), FT4 (0.8-1.7 ug/dl), TSH (0.3-3.6 uIU/ml). Hormone levels (FT3, FT4) below the normal range and elevated TSH indicated hypothyroidism.[11] Anti–TPO antibodies were analyzed by chemiluminescence technique (CLIA)(LIAISON® Anti-TPO DiaSorin Italia).Samples were then ranged from 1 - 16 IU/ ml. Reference ranges vary according to the manufacturer.[12] In our study Anti-TPO antibody values more than 16 IU/ml were considered to be TPO positive.

In a fully automated chemistry analyzer (wet chemistry) (Randox RX imola /Cobas Integra 400 plus clinical chemistry analyzer), enzymatic approaches were used to estimate the levels of TG, TC, HDL, and LDL. LDL values were determined using Friedewald's formula: LDL=Total Cholesterol–{HDL+(Triglyceride/5)}. According to the National Cholesterol Education Program Adult Treatment Panel 3 Guidelines for serum lipid, TC value ≥200 mg/dL indicated high cholesterol, LDL level ≥130 mg/dL indicated high LDL, TG value ≥150 mg/dL indicated hypertriglyceridemia and HDL value < 40 mg/dL indicated low HDL.[13]

STATISTICAL ANALYSIS

Data entry was performed using Microsoft Excel. The data were presented using frequency statistics and descriptive statistics for categorical variables. We compared the mean values between the high and normal anti-TPO groups using a two-sample independent t-test. Categorical variables were presented as Mean±SD. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) software package, version 20.0. A Chi-square test was used to evaluate the importance of categorical data. A p-value of<0.05 was considered statistically significant.

RESULTS

A total of 380individuals, including 260 (68%) females and 120 (32%) males, were examined to detect anti-TPO antibodies and assess serum lipid profiles. Out of 380 patients, 205(54%) patients had high anti-TPO antibody levels and 175 (46%) had normal anti-TPO antibody levels. Out of 205(54%) patients who tested positive for anti-TPO antibodies, hypothyroidism patients is 187, Out of 187 patients,104 (55.6%) had hypothyroidism and 77 were female and 27 were maleand 83(44.4%)had normal anti-TPO antibody levels.

The total serum cholesterol, with a mean of 218.2 ± 60.2mg/dL, serum LDL, with 140.6 ± 55.9mg/dL, and serum TG with a mean of 170.7 ± 72.8mg/dL were significant,whereas, serum HDL, with 43.4 ± 6.7, was found to be non-significant.**[Table 1]**

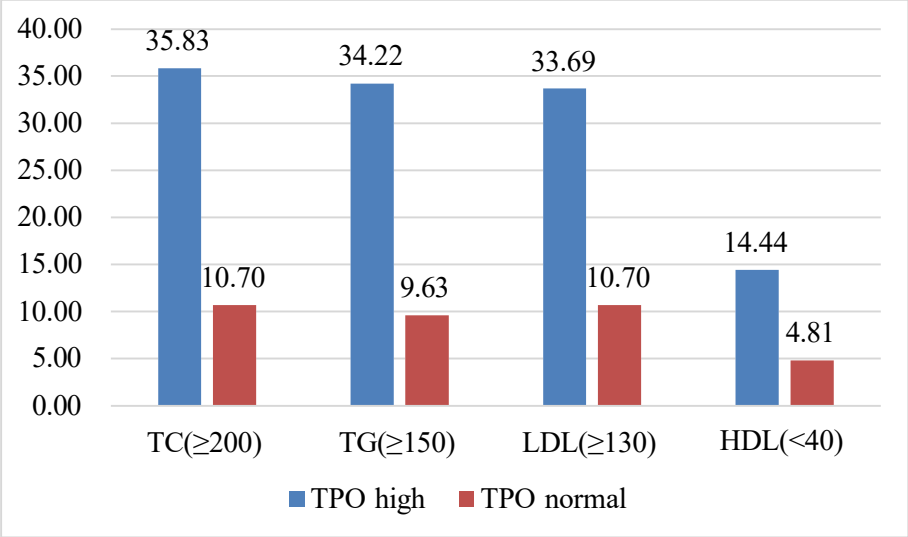
Table1:Comparing Anti-Thyroid Peroxidase Antibody and Variable in Hypothyroidism Cases

Variables	Anti-TPO High (n= 104)	Anti-TPO Normal (n= 83)	P-Value
Age (years)	44.18 ± 11.8	45.20 ± 11.4	.550
TC	218.2± 60.2	175.3 ± 56.8	<0.001
TG	170.7 ± 72.8	113.3 ± 51.3	<0.001
LDL	140.6 ± 55.9	105.8 ± 52.7	<0.001
HDL	43.4 ± 6.7	46.8 ± 7.8	.051

Among hypothyroidism patients, the high anti-TPO antibody sub-group had hypercholesterolemia in 67(35.8%) of cases, whereas in the normal anti-TPO antibody sub-group,hypercholesterolemia was present in 20(10.7%) of cases (p<0.001). Likewise, in

hypothyroidism patients, hypertriglyceridemia was found in 64 (34.2%)of cases of the high anti-TPO antibody sub-group, while in the normal anti-TPO antibody sub-group, hypertriglyceridemia was present in 18 (9.6%) of cases($p<0.001$).In the high anti-TPO antibody sub-group, 63(33.6%) of cases had raised LDL levels, while in the normal anti-TPO antibody sub-group, raised LDL levels were present in 20(10.7%) of cases ($p<0.001$). Our study showed that serum HDL was low in 09(4.8%) of cases in the normal anti-TPO antibody hypothyroidism subgroup and 27(14.4%) of cases in the high anti-TPO antibody hypothyroidism sub-group, were found to be non-significant($p=.125$).**(Figure-1)**

Figure-1 Association between lipid profile and Anti-Thyroid Peroxidase Antibody in Hypothyroidism cases



DISCUSSION

The purpose of the current study is to assess the relationship between lipid profiles and anti-thyroid antibodies, potentially identifying dyslipidemia as a contributing factor. The importance of thyroid hormone, or TSH, in lipid metabolism has been highlighted in earlier research. Elevated blood TSH, TC, TG, and LDL values are frequently associated with hypothyroidism.[14,15] The current study looked at the relationship between lipid profiles and anti-TPO antibodies and discovered that positive anti-TPO antibodies were strongly linked to higher levels of TC, TG, and LDL (p-value <0.05), and that this relationship was even more significant in the case of females. These findings are supported by another study by Topaloglu O et al., which reported a positive correlation between TPO antibody levels and TC and LDL cholesterol levels.[16]In astudy on women with thyroid dysfunction, Jaseem T et al., discovered that anti-TPO antibodies were significantly associated with hyperlipidaemia.[17]Surendranath SP et al., A comparison of lipid levels with anti-TPO levels in anti-TPO positive group shows a statistically significant correlation between antibody levels and total cholesterol and triglyceride levels (P = 0.07* and P < 0.01*). LDL-C and HDL-C did not show any significant correlation between the two parameters in this group.[18]

Variations in thyroid hormone affect the functioning of the cardiovascular system and, thus, patients with thyroid dysfunctions and high levels of anti-TPO antibodies also have an increased risk of developing coronary artery disease (CAD).[19] Risk of CAD and all-cause mortality was higher in patients with thyroid disorders.[20]

The symptoms of thyroid dysfunction can have an impact on a woman's quality of life. Thyroid disorders are associated with dyslipidemia and this is known to confer risk of cardiovascular

diseases.[21, 22]Mustaq et al. reported an increase in serum TC, LDL-C, HDL-C, or TG in patients with thyroid dysfunction.[23] Similarly, dyslipidemia was significantly associated with anti-TPO positivity in other studies, especially in women with thyroid dysfunction.[24] A recent retrospective study investigating the association of serum lipids and anti-thyroid antibody positivity in 7688 participants with normal TSH levels shows a positive association between thyroid antibodies and increasing LDL-C and decreasing HDL-C ($P < 0.05$).[25]This large study indicates that serum lipids may be predictors of thyroid autoimmunity even in women with normal TSH levels. In present study design to find out the association of serum lipids and anti-thyroid antibody positivity in 104 participants with thyroid disorder shows a positive association between thyroid antibodies and increasing LDL-C and decreasing HDL-C ($P < 0.05$).

In the present study, TPO antibodies were found to be a prominent indicator of autoimmune thyroid disease in hypothyroidism, with a prevalence of 50.7%.Out of 205(54%) patients who tested positive for anti-TPO antibodies, hypothyroidism patients is 187, Out of 187 patients,104 (55.6%) had hypothyroidism and 77 were female and 27 were male and 83(44.4%) had normal anti-TPO antibody levels.Our study showed an increase in total cholesterol, LDL and TG whereas a decrease in HDL. These findings are supported by another study by Khatri Pet al., increase in total cholesterol, LDL and TG whereas a decrease in HDL.[26]

CONCLUSION

For all patients with dyslipidemia, a thyroid function test is crucial for the detection of thyroid dysfunction. It is also crucial for any individuals whose lipid profile unexpectedly improves or deteriorates. Therefore, patients with dyslipidemia should have any underlying thyroid abnormalities identified and treated, particularly if the results are unexpected.

It is also important to address the association of thyroid abnormalities with an increased risk for CAD and whether therapy for these disorders could influence cardiovascular mortality. The current study indicates that patients with hypothyroidism who test positive for anti-TPO antibodies may have abnormal lipid levels. Significant correlations were found in this study between higher serum cholesterol (TC), triglycerides (TG), and low-density lipoprotein (LDL) levels and positive anti-TPO status.

LIMITATIONS

In the present study, only tests for TPO antibodies were conducted and did not utilize any other antibodies for the association. The main limitation of this study was the small sample size. Additionally, patient groups with Primary and overt were not compared.

CONFLICTS OF INTEREST

No, it was a self-funded project.

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