

RESEARCH

Correlation between carotid intima media thickness and TSH in diabetic patients - an analytical cross-sectional study in a tertiary-care hospital

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Background: Atherosclerotic cardiovascular disease is one of the major complications in diabetic patients leading to illness and death. Carotid Intima media thickness (CIMT), being simple and non-invasive, is widely used as an indicator of atherosclerosis to identify early atherosclerotic changes. Insulin sensitivity, development of chronic complications in diabetes, as well as alteration in glucose metabolism could be attributed to abnormal thyroid function, and likewise, diabetes itself can alter thyroid function by impairing peripheral conversion of thyroxine and altering thyroid stimulating hormone (TSH) level. This study was conducted to find the correlation between CIMT and TSH in diabetic patients.

Methods: In this hospital-based analytical cross-sectional study we enrolled 29 patients with type 2 Diabetes Mellitus. TSH and CIMT were measured. To find the correlation between TSH and CIMT, Pearson correlation analysis was used.

Results: Of the 29 patients 34.5% were female and 65.5% were male. A statistically significant correlation was found between HbA1C, FBS with CIMT ($p < 0.001$); however, whether TSH was an independent factor causing early atherosclerosis in diabetic patients measured using CIMT could not be established. We found a negative correlation between CIMT and TSH Pearson correlation $r = -0.213$ with a p -value 0.267.

Conclusion: Diabetes was associated with early atherosclerotic changes measured using CIMT, and hence, it can be used as a marker for screening early atherosclerosis in diabetic patients. Since no association was found between CIMT and TSH in our study, the role of TSH in predicting atherosclerosis in diabetic patients could not be established. Studies with larger sample size need to be conducted to establish the relationship.

Keywords: diabetes, carotid intima media thickness, TSH, atherosclerosis, HbA1c

Introduction

Diabetes is a chronic complex metabolic disorder leading to impaired glucose tolerance and hyperglycemia, which in turn lead to end organ failure. As per the WHO report, every year about 422 million people have diabetes and 1.5 million deaths are directly due to diabetes (1). Both diabetes and cardiovascular diseases are characterized by subacute inflammation and resistance to insulin. Under the stimulus

of various risk factors, it is evident that in the natural pathway of diabetes, inflammatory mediators play a major role (2).

Atherosclerosis is an inflammatory disease of the arteries, occurring as a result of arterial wall lesions, due to lipid retention in the intima and hence classically associated with altered lipid metabolism and hypercholesterolemia (3). Atherosclerotic cardiovascular events are among the major cause of illness, complications, and death among diabetic individuals.

Carotid Intima media thickness, being simple and non-invasive, is widely used as a marker of atherosclerosis as it can identify early atherosclerotic vascular changes (4). The thickness of intima and media can signal the presence of atherosclerosis (plaque buildup) even in its earliest stages even before any symptoms develop. As atherosclerosis advances, risk of cardiovascular disease increases. Thus, CIMT helps in early identification and in planning preventive measures (5).

TSH aggravates atherosclerosis by promoting macrophage inflammation within plaques (6). Insulin sensitivity, development of chronic complications in diabetes, as well as alteration in glucose metabolism could be attributed to abnormal thyroid function, and likewise, diabetes itself can alter thyroid function by impairing peripheral conversion of thyroxine and altering thyroid stimulating hormone (TSH) (7, 8). Hence, diabetes and its complications could be associated with abnormal thyroid function test. So this study was conducted to find the relationship between TSH and CIMT in diabetic patients. Early identification of the risk factors will help us in preventing disease progression and reducing mortality.

Objective

To study the correlation between CIMT and TSH in diabetic individuals.

Materials and methods

In this hospital-based analytical cross-sectional study, 29 diabetic patients attending General Medicine OPD of Sree Gokulam Medical College and Research Foundation, Trivandrum, for a period of 2 weeks from February 17/2/2024 to 29/2/2024 were selected using Consecutive sampling and after getting informed written consent. We excluded patients with recent hospitalization for the last 2 weeks, history of thyroid surgery, use of thyroxine preparation and other drugs affecting thyroid function, and also patients with underlying liver or kidney disease and history of coronary artery disease. A detailed *pro forma* was filled out for each patient, which included age, sex, CIMT, and laboratory parameters, including FBS, HbA1c, and TSH. CIMT was measured using B mode ultrasound at common carotid artery. According to the European Society of Cardiology (ESC), CIMT values greater than 0.90 mm are considered to be indicative of organ damage (9). Blood samples were taken and TSH value was determined by the chemiluminescence method, and normal TSH was taken as 0.5–5 MIU/L (10). The collected data were entered into the SPSS statistical data package and the correlation between TSH and CIMT was done using Pearson correlation analysis.

TABLE 1 | Distribution of cases according to gender.

Sex	Frequency (n)	Percent (%)
Female	10	34.5
Male	19	65.5
Total	29	100.0

TABLE 2 | Descriptive statistics.

Statistics	Age	FBS	HBA1C	CIMT	TSH	
N	29	29	29	29	29	
Mean	66.31	144.59	7.6552	1.0345	1.3169	
Median	68	134	7.7000	0.9000	1.2300	
Std. deviation	10.981	52.290	1.76768	0.44823	0.72824	
Minimum	39	76	5.50	0.40	0.12	
Maximum	86	272	12.40	2.10	3.51	
Percentiles	25	57	97.0	6.1000	0.7000	0.7485
	50	68	134	7.7000	0.9000	1.2300
	75	74	185	8.8500	1.2500	1.7350

FBS, fasting blood sugar; CIMT, carotid intima media thickness; TSH, thyroid stimulating hormone.

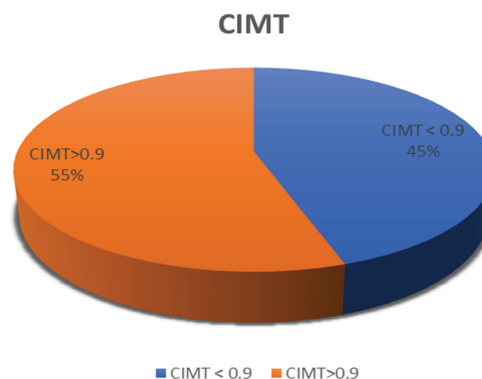


FIGURE 1 | Distribution of cases according to CIMT.

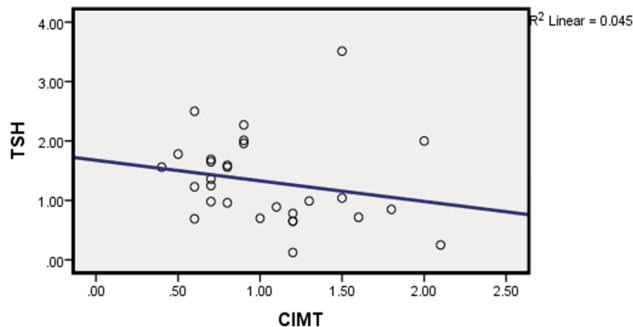
Results

34.5% of study population were female while 65.5% were male (Table 1). The various patient characteristics are mentioned in Table 2. The mean age was 66.32 + 10.981. The maximum HbA1c was 12 with a mean 7.65. 55% had CIMT more than 0.9 mm (Figure 1), the mean CIMT was 1.0345, with maximum value of 2.10. Table 3 shows the correlation between CIMT and various parameters. A positive correlation was found between CIMT with FBS and HbA1C with $p < 0.001$, with r -value 0.812 and 0.709, respectively. We found a negative correlation between CIMT and TSH $r = -0.213$ with a p -value 0.267 (Figure 2). All patients were euthyroid and mean TSH was 1.316.

TABLE 3 | Correlation between CIMT and age, FBS, HbA1C, and CIMT.

	Variable	n	Pearson correlation (r)	p-value
CIMT	Age	29	0.308	0.104
	FBS	29	0.812	<0.001
	HbA1C	29	0.709	<0.001
	TSH	29	-0.213	0.267

FBS, fasting blood sugar; CIMT, carotid intima media thickness; TSH, thyroid stimulating hormone.

**FIGURE 2** | Correlation between CIMT and TSH.

Discussion

Carotid Intima media thickness was greater in patients with high FBS and uncontrolled diabetes. All subjects were euthyroid. We found a negative correlation between CIMT and TSH $r = -0.213$ with a p -value 0.267. In a study done by Jie Lin et al. (6), Zhou et al. (11) it was shown that CIMT was inversely associated with thyroid function test, P -values ≤ 0.002 . Even though in patients with normal thyroid function many studies have found a positive correlation between TSH and CIMT (12), we couldn't establish such a relationship. In a study conducted by Monzani et al., it was found that patients with subclinical hypothyroidism had significantly higher mean CIMT than euthyroidism controls ($r = 0.71$, $P < 0.0001$) (13). No interaction between diabetes and subclinical hypothyroidism was detected using CIMT in the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil) ($p = 0.29$) (13).

Carotid Intima media thickness can be used as marker for detecting early atherosclerosis in diabetic patients. Since no correlation was found between CIMT and TSH in our study, the role of TSH in predicting atherosclerosis in diabetic patients could not be established. Studies with a larger sample size need to be carried out to establish the relationship.

Conclusion

Diabetes was found to be associated with early atherosclerotic changes measured using CIMT. However, no association was found between TSH and development of atherosclerosis in diabetic patients measured using CIMT. This cross-sectional study does not establish any relationship between CIMT and serum TSH.

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