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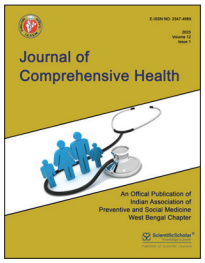

Original Article

Thyroid Dysfunction and Dyslipidemia in Patients Suffering from Coronary Artery Disease

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ABSTRACT

Background: Thyroid hormones are known to have effects on multiple systems, including the cardiovascular system. Hypothyroidism leads to hypercholesterolemia, hyperfibrinogenemia, hyperhomocysteinemia, platelet abnormalities, and systemic vasculitis, all of which can adversely affect the cardiovascular system.

Objectives: The objective of this study was to evaluate the lipid abnormalities and thyroid function in cases suffering from coronary artery disease (CAD).

Material and Methods: A case-control study was conducted involving 100 patients admitted to the Department of Cardiology in N.R.S Medical College, Kolkata, with CAD as the case and 100 age-matched healthy individuals as controls. Patients with post-percutaneous transluminal coronary angioplasty and post-coronary artery bypass graft were not included in the study. Patients taking amiodarone, lithium, or iodine-containing drugs and giving a history of thyroid disorder, renal disorder, or liver cirrhosis were excluded from the study. Blood glucose and thyroid hormones were estimated as per standard procedure.

Results: Fasting plasma glucose, hemoglobin A1C, serum total cholesterol, very-low-density lipoprotein cholesterol, low-density lipoprotein cholesterol, free triiodothyronine levels, and high-density lipoprotein cholesterol were found to be significantly higher and lower, respectively, among cases.

Conclusion: Sick euthyroid syndrome with low T3 has been reported as an important marker for the severity of CAD and has been reported to predict mortality in cardiac care unit (CCU) patients. Inclusion of thyroid profile during assessment of risk factors of CAD may be recommended.

Keywords: Sick euthyroid syndrome, Dyslipidemia, Risk factors, Coronary artery disease

INTRODUCTION WITH OBJECTIVES

Coronary artery disease (CAD) can be divided into stable angina and acute coronary syndrome; the latter includes unstable angina, ST segment-elevated myocardial infarction and non-ST segment-elevated myocardial infarction.[1] It occurs when a coronary artery is partially (more significant if more than 50% stenosed) or completely occluded due to atherosclerosis of coronary arteries, causing a reduction of their diameters, leading to insufficient oxygenated blood supply to myocardial cells, which are unable to meet their oxygen demand. The patient presents with precordial or retrosternal chest pain with radiation along with diaphoresis and usually gives a history of shortness of breath on exertion.[2]

CAD is a major cause of morbidity worldwide. Due to genetic causes, changes in lifestyle, wrong food habits, and sedentary habits as a part of modern civilization, its prevalence is increasing gradually. In India, the age-standardized death rate from cardiovascular disease (CVD) is 272/100 000 population, which is higher than the global average of 235/100,000 population. In comparison with people of European ancestry, CVD affects Indians at least a decade earlier and in their most productive midlife years.[3]

Early identification of the risk of the development of a disease and taking preventive measures thereafter is the logical approach to prevent morbidity and mortality from any disease. Dyslipidemia is an established risk factor in the development of CAD. The prevalence of dyslipidemia differs among Asians and non-Asians. However, dyslipidemia is not specific for CAD. It is present in several other conditions. Hence, there is a search for other parameters also which can be causally linked to the disease process.

Diabetes mellitus has been reported to be an important risk factor from the studies conducted in southern India;[4] The underlying cause may be attributed to the differences in dietary practices.

Thyroid hormones are known to have effects· on multiple systems, including the cardiovascular system. Hypothyroidism leads to hypercholesterolemia, hyperfibrinogenemia, hyperhomocysteinemia, platelet abnormalities, and systemic vasculitis, all of which can adversely affect the cardiovascular system.[5]

Against this backdrop, this study was carried out to evaluate lipid abnormalities and thyroid function in patients who had CAD.

Null hypothesis (H_0): Sick euthyroid is not associated with CAD.

Alternate hypothesis (H_A): Sick euthyroid is associated with CAD.

MATERIAL AND METHODS

This case-control study was conducted for one year in the Department of Biochemistry and Department of Cardiology, N.R.S Medical College, Kolkata, after obtaining ethical clearance from the Institutional Ethics Committee of Nil Ratan Sircar Medical College.

A total of 100 patients admitted to the Department of Cardiology in N.R.S Medical College, Kolkata, with CAD were taken as cases, and 100 age-matched healthy individuals were considered as controls. Patients with post-percutaneous transluminal coronary angioplasty and post-coronary artery bypass graft were not included in the study. Patients taking amiodarone, lithium, or iodine-containing drugs and giving a history of thyroid disorder, renal disorder, or liver cirrhosis were excluded from the study.

A preformed questionnaire was used for each subject to have a history of any known disease or medication. Relevant history and family history were also obtained. Approximately 5 mL blood was collected in a fasting state (2 mL in a Sugar vial, 1 mL in ethylenediaminetetraacetic acid (EDTA) vial, and rest in a vial without anticoagulant) with a standard aseptic procedure after obtaining informed consent from the patient. Plasma separated from a sugar vial was used to estimate glucose, and blood collected in an EDTA vial was used to estimate hemoglobin A1C (HbA1C). Serum was separated after centrifugation of the blood and was used for estimation of lipid profile and thyroid profile.

Trop *t*-test was assayed by immunochromatography as point-of-care testing. Free triiodothyronine (FT3), free thyroxine (FT4), and thyroid-stimulating hormone (TSH) were measured by chemiluminescence. HbA1C was estimated by high-performance liquid chromatography. Glucose and lipid profiles were estimated by the standard kit method.

RESULTS

Tables 1 and 2 show the distribution of the study population according to age and gender. Table 3 shows the levels of biochemical parameters among the study population.

The mean age of the patients was found to be 62 years, and most of the study population was found to be within the 55–64 years of age group [Table 1]. The occurrence of males and females was almost similar [Table 2]. So far, biochemical parameters are concerned, all parameters of lipid profile were found to be significantly altered in CAD. The level of fasting blood glucose and glycosylated hemoglobin was increased in cases with CAD compared to age-matched healthy controls, but the mean values remained within normal limits of clinical decision. TSH and FT4 levels were not found to have

Table 1: Distribution of participants according to age group.

Age group (years)	Case (n_1=100) No. (%)	Control (n_2=100) No. (%)
35–44	9 (9.00)	6 (6.00)
45–54	18 (18.00)	26 (26.00)
55–64	37 (37.00)	33 (33.00)
65–74	28 (28.00)	30 (30.00)
75–84	8 (8.00)	5 (5.00)
Total	100 (100)	100 (100)

Table 2: Distribution of participants according to their gender.

Gender	Case (n_1=100) No. (%)	Control (n_2=100) No. (%)	Total (n=200) No. (%)
Male	49 (49.00)	51 (51.00)	100 (100)
Female	51 (51.00)	49 (49.00)	100 (100)
Total	100 (50.00)	100 (50.00)	200 (100)

Table 3: Distribution of case and control as per different biochemical parameters.

Parameters	Case (n_1=100) (Mean±SD)	Control (n_2=100) (Mean±SD)	*P*-value
FBS (mg/dL)	123.32±39.02	90.30±6.90	<0.001
HbA1C (%)	5.55±1.09	4.84±0.50	<0.001
Total cholesterol (mg/dL)	208.06±15.63	184.80±8.68	<0.001
HDL (mg/dL)	37.59±5.56	39.90±4.83	<0.001
VLDL (mg/dL)	37.24±7.55	26.74±2.38	<0.001
LDL (mg/dL)	133.49±11.63	118.16±6.69	<0.001
TG (mg/dL)	179.29±40.19	133.66±11.77	<0.001
FT3 (pmol/L)	2.51±0.75	2.93±0.30	<0.001
FT4 (pmol/L)	1.33±0.18	1.34±0.15	NS
TSH (mIU/L)	2.10±1.36	2.35±0.74	NS

NS: Not significant, FBS: Fasting blood sugar, HbA1C: Hemoglobin A1C, HDL: High-density lipoprotein, VLDL: Very-low-density lipoprotein, LDL: Low-density lipoprotein, TG: Triglyceride, SD: Standard deviation, TSH: Thyroid stimulating hormone, FT3: Free tri-iodothyronine, FT4: Free tetra-iodothryronine

any significant alteration among study groups. FT3 level was found to be significantly decreased in cases with CAD but the value was within reference interval of kit literature.

The average age of cases and controls was estimated as 60.9 ± 11.0, 59.4 ± 10.4 years (Mean ± Standard deviation) with medians and ranges of 62, 60 years, 36–83, and 36–82 years.

DISCUSSION

In this hospital-based study, different risk factors for CAD were studied among 100 patients who have had. Although blood glucose levels were found to be significantly increased in CAD patients, the level was not high enough to be marked as diabetes mellitus.

Elevations in blood glucose have been reported with increased risk of CAD in non-diabetic patients.[6] Meta-analysis indicates that glucose above a threshold of 100 mg/dL poses a significant risk, which corroborates the findings of our study.[7]

Dyslipidemia has been found to be significantly present in patients who have CAD. Elevated cholesterol leads to atherogenesis, which is the main pathogenic event that results in CAD. The results of this study support this fact. High triglyceride levels and low high-density lipoprotein cholesterol levels have been found to be the most consistent features of dyslipidemia, and our study results corroborate that. A sedentary lifestyle, high physical inactivity, increased intake of junk food, and a diet deficient in polyunsaturated fatty acids[8] are mainly responsible for this finding.

So far, the thyroid profile has been considered. FT3 was found to be significantly low, but FT4 and TSH levels were found to be normal in patients with CAD. However, the level of FT3 was within the reference interval of the parameter. The report of the thyroid profile can be interpreted as sick euthyroid syndrome.

In sick euthyroid syndrome, a reduced level of free T3 hormone is the earliest biochemical change, which is followed by a reduced level of free T4 and TSH.[9] Low T3 has been reported as an important marker for the severity of illness. It has also been reported to predict mortality in CCU patients.[10] The cause of the low level of T3 is because, in this condition, the clearance rate of reverse T3 is greater than that of the marginal conversion of T4–T3, causing deleterious effects on the heart muscle, which results in decreased cardiac output leading to CAD.

This study has not followed up on the patients, so there is no data regarding their morbidity and mortality. This can be considered a limitation of the study.

CONCLUSION

This finding can be considered a strength of this study. The further implication is that the thyroid profile should be included during the assessment of risk factors for CAD. Further study from different age groups and communities is required to establish the role of the thyroid profile in CAD. If established, this can be routinely used along with the lipid profile as a determinant of risk in the development of CAD.

Ethical approval

This study was conducted with the approval of IEC, NRS Medical College, Kolkata; vide No./NMC/7497 Dated 13/11/2017.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

Dr. Dibakar Haldar is on the Editorial Board of the Journal.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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