A Demographic Profile of ACS Associated with Thyroid Dysfunction in North Indian Population

Abstract

Background

Thyroid disorders have an important bearing on the cardiovascular (CV) system leading to hypertension, dyslipidemia, heart rhythm disorders, obesity etc. Data regarding the influence of sub clinical hypothyroidism and CV disease and outcomes have been conflicting. Since subclinical hypothyroidism is seen often in clinical syndromes of coronary artery disease, we undertook this study to evaluate the overall prevalence and demography of patients admitted with the diagnosis of ACS in a North Indian population.

Methods

We studied consecutive 171 hospitalized patients between March 2018 to February 2020 with a diagnosis of acute coronary syndrome (ACS) to determine the features of thyroid dysfunction both clinical and sub-clinical and the associated biochemical parameters.

Results

Forty (23%) of these patients had thyroid dysfunction. Subclinical hypothyroidism was the commonest abnormality seen in 26 (23%), followed by overt hypothyroidism 12 (9%). Hyperthyroidism was uncommon (1.5%). Euthyroid sick syndrome was seen in 4% and these patients were excluded.

There was a predilection for elderly population (females 52%). STEMI (52%) followed by NSTEMI (25%) was the commonest diagnosis at presentation. Significant correlation was seen with serum lipid levels (decreased HDL C, Increased total cholesterol, triglycerides and VLDL C) and hypothyroidism. However, there was no correlation ship with LDL C.

Reduced e glomerular filtration rate (e GFR) which was seen in 50% of patients had a linear relationship with hypothyroidism. Patients with hypothyroidism had no differences in the prevalence of concomitant diabetes and hypertension. The left ventricular ejection fraction (LVEF) in the group of patients had a trend to be lower.

Conclusions

Hypothyroidism seems to be an important risk factor in patients with ACS especially STEMI. Impaired renal function also had an important relationship in these patients.

Keywords: Cardiovascular diseases; Thyroid Dysfunction; Acute Coronary Syndrome; Prevalence; Chronic Kidney Disease; Dyslipidemia

Introduction

Cardiovascular diseases (CVD) continue to remain the leading cause of death globally, including India and the United States. In 2016, there were an estimated 62.5 and 12.7 million years of life lost prematurely due to CVD in India and the United States, respectively [1]. Important risk factors include hypertension, dyslipidemia, diabetes mellitus, smoking and obesity.

Thyroid hormones have a permissive role in most metabolic actions in the body. Alterations in the functions of the hormone can lead to several derangements.

Thyroid dysfunction has an important bearing on the cardiovascular system leading to hypertension, dyslipidemia, heart rhythm disorders, obesity etc. These are especially common in hypothyroidism (both subclinical and overt) which is much more prevalent than hyperthyroidism.

The prevalence of hypothyroidism (Serum-free thyroxine (FT4) <0.89 ng/dL and thyroid stimulation hormone (TSH) >5.50 μU/mL) was reported as 10.95% in a large Indian study from 8 cities. A significantly higher proportion was in females with a preponderance of the older population. Another important finding was that 8.02% of the whole population were diagnosed as subclinical hypothyroidism [2].

Subclinical hypothyroidism (SCH) is defined as a serum thyroid-stimulating hormone (TSH) level above the upper limit of normal despite normal levels of serum free thyroxine. This condition can be associated with reduced systolic function, diastolic hypertension, increased systemic vascular resistance, an atherogenic lipid profile, and inflammatory conditions [3].

Overt hypothyroidism is associated with an increased prevalence of coronary heart disease, which is partly due to the lipid metabolism abnormalities leading to premature atherosclerosis [4].

Hyperthyroidism is a much less reported problem and in an epidemiological study from India, subclinical (normal serum FT4 and TSH <0.35 μIU/ml) and overt hyperthyroidism (hyperthyroid: Serum FT4 >1.76 ng/dL and TSH <0.35 μIU/mL) were present in 1.6% and 1.3% of subjects participating in a community survey [2].

Hyperthyroidism is associated with increased systolic blood pressure, pulmonary hypertension, atrioventricular valve regurgitation and also increased coronary atherosclerosis [5].

Subclinical hyperthyroidism is related to an increased risk of supraventricular arrhythmias, hypercoagulable state, and a mild decrease of coronary reserve [3].

Another type of dysfunction called the “low T3 syndrome” is a profile of low serum triiodothyronine(T3), normally thyroxin(T4), and normal TSH that can be seen in acute or chronic illnesses. This syndrome leads to similar changes in cardiac function (decreased maximum rate of concentration and relaxation) and gene expression (alteration in myosin

heavy chain isoform expression). This syndrome is a major cause of death in cardiac patients [3,6].

Data regarding the influence of sub clinical hypothyroidism and CV disease and outcomes have been conflicting. There is however, a single large prospective study that has assessed the relation of thyroid functions with coronary heart disease. This study included 17,311 women and 8002 men without known thyroid or cardiovascular disease or diabetes mellitus. It demonstrated that higher levels of TSH but within the normal reference range were positively and linearly associated with coronary heart disease-related mortality in women but not in men [7]. A meta-analysis of 10 studies including 1491 patients with subclinical hypothyroidism and 223 patients with subclinical hyperthyroidism has suggested that both abnormalities may be associated with a modest increased risk for coronary heart disease and mortality [8].

The association between acute coronary syndrome (ACS) and subclinical hypothyroidism has been reported in the literature, with an incidence of 2.7% to 15.7% [6]. The reports, however, suggest no significant associations between STEMI, Unstable Angina, or NSTEMI patients in terms of thyroid dysfunction and clinical implications of this are uncertain. Since subclinical hypothyroidism is seen often in clinical syndromes of coronary artery disease, we embarked upon this study to evaluate the overall prevalence and demography of patients admitted with the diagnosis of ACS. The study was carried out in the coronary care unit of large tertiary care, multi-speciality hospital in New Delhi.

Till date, there is no prospective study data regarding thyroid profile in ACS patients from India. This study aims to evaluate the overall prevalence of thyroid dysfunction in patients of ACS and to see whether there is an association between thyroid dysfunction and other important risk factors.

Aims and Objectives

The primary objective is to determine the prevalence of thyroid dysfunction in patients with Acute Coronary Syndrome, including STEMI, NSTEMI and Unstable Angina groups. The secondary objective is to see if there is an association between the thyroid dysfunction groups and the euthyroid group with the various risk factors for CAD.

Subjects and Methods

The study was conducted in the cardiology department of a large multi-speciality hospital in New Delhi. Patients with ACS above the age of 18 years, presenting within 24 hours of their symptom to the coronary care unit were enrolled in the study. ACS had three components – Unstable Angina (UA), Non ST-elevation MI (NSTEMI) and ST Elevation MI (STEMI). STEMI is defined as myocardial ischemia in association with electrocardiographic (ECG) ST elevation and release of biomarkers of myocardial necrosis along with ST elevation at the J point in at least 2 contiguous leads of 2mm (0.2mV) in men or 1.5mm (0.15mV) in women in leads V2-V3 and/or of 1mm, Non-STEMI is defined as ST depression / T wave inversion with elevated cardiac markers and Unstable Angina defined as angina pectoris or equivalent ischemic discomfort with at least one of three features: a. It occurs at rest (or with minimal

exertion), usually lasting >10 minutes. b. It is severe and of new-onset (i.e., within the prior 4-6 weeks); and/or c. It occurs with a crescendo pattern (i.e., distinctly more severe, prolonged, or frequent than previously) as per American Heart Association (AHA) criteria [9].

All patients underwent complete detailed medical history of cardiac risk factors for developing CAD. The following factors were considered to be cardiovascular risk factors: smoking status, hypertension, age, gender, diabetes mellitus, obesity and history of CAD. They also underwent full clinical examinations including heart rate and rhythm, systolic and diastolic blood pressure, including presenting symptoms (chest pain, dyspnea, fatigue, syncope, palpitations). Hypertension was defined as self-report and the use of antihypertensive medications or as a blood pressure >140/90 mmHg. Diabetes was defined as a fasting glucose >126mgs or the use of hypoglycemic medication.

Resting standard 12 leads electrocardiogram (ECG) was done for each patient to detect any findings consistent with CAD either ST elevation or ST depression or T wave inversion or pathological Q waves or new-onset LBBB.

2D echocardiography was performed for all the patients at the bedside or in the non-invasive lab using a Philips EPIQ 7C Ultrasound Machine to detect any wall motion abnormalities or ischemic complications.

Venous blood samples were collected from all the patients within 24 hours of admission in CCU for the evaluation of Thyroid function Tests - free T3, free T4 and TSH. This was done by an immunoassay method at the Nuclear Medicine of the hospital from March 2018 through January 2020.

Blood samples were also obtained for serum cardiac markers (including cardiac troponin T/I and creatine kinase MB isoenzyme (ck-mb), kidney functions (including urea, sodium, potassium, creatinine) , lipid profile (including total cholesterol (TC), high-density lipoprotein-cholesterol (HDL-C) and low-density lipoprotein-cholesterol (LDL-C), very low-density lipoprotein-cholesterol (VLDL-C) and triglycerides (TG), random blood sugar, Brain natriuretic peptide (BNP), haemoglobin and total leucocyte count (TLC). From the creatinine value, an estimated glomerular filtration rate (eGFR) was calculated by using the MDRD study equation.

All patients were treated as per the standard guideline-based treatment of HT, dyslipidemia, heart failure, and ACS.

The normal values of these tests in reference to Biochemistry and Hematology department of Batra Hospital and Medical Research Centre are as mentioned in (Table 1)

Biochemical Test	**Reference Range**
FT3	2.5-5.8 pM/L

FT4	11.5 -23 pM/L
TSH	0.2 -5.1 µU/mL
CK-MB	≤ 3.4 ng/mL
Troponin T/I	15.6 pg/mL
Total cholesterol	<200 mg/dL
High density lipoprotein	> 40 mg/dL
Low-density lipoprotein	<100 mg/dL
Very low-density lipoprotein	<40 mg/dL
Triglycerides	<150 mg/dL
Random blood sugar	<100 mg/dL
BNP	<500 pg/mL
Hb	12-15 g/dL
TLC/DLC	4-10 10^3/µL
Serum Urea	19-44 mg/dL
Serum Na	136-145 mEq/L
Serum Potassium	3.5-5.1 mEq/L
Serum Creatinine	0.72-1.25 mg/dL

Table 1: Reference range of biochemical tests

Following type of patients were excluded from the study:

Patients with known thyroid disease with or without treatment
Patients receiving any iodinated contrast agent within the previous two weeks
Advanced malignancies
Acute decompensated heart failure (LVEF<30%)
Chronic obstructive pulmonary disease
Patients with life threatening conditions with a very limited survival

Thyroid dysfunction was classified into the following groups:

- Group I: Euthyroid status was determined as a normal if serum TSH concentration is within (0.2-5.1 µU/mL) range

- Group II: Subclinical hyperthyroidism was defined by low TSH serum levels (<0.2 mU/l), with free T3 and T4 serum levels within the reference range without any clinical features of hyperthyroidism

- Group III: Subclinical hypothyroidism was defined by serum free T3 and T4 within the reference range, but serum TSH concentrations are elevated (TSH >5.1 mU/l)

- Group IV: Overt hypothyroidism was defined by high serum TSH 10 > μU/mL

- Group V: Euthyroid sick syndrome is a condition characterized by decreased levels of FT4 and normal TSH

Ethical Clearance

Written informed consent was taken from all the subjects to participate in this study. The study protocol was approval by the Institutional Ethics Committee on human research.

Data Analysis

Chi- Square/ Fisher Exact Test was used for the categorical variables to test the association between different variables like Gender, Alcohol Status, Smoking etc. and Thyroid status.

Furthermore, all continuous variables were summarized using Mean and Standard Deviation and Categorical Variables using count and percentages. Also, p values were computed to test the association between Lipid Abnormalities and Thyroid status using Chi- Square/ Fisher Exact Test and t test for continuous variable.

All the analysis was performed using R/SPSS Software.

A total of 171 ACS consecutive patients admitted with ACS were analyzed. Out of 171, 94 (72%) were males with a mean age of 59 years. 65% of patients were known case of hypertension, 50% of patients were known case of diabetes, 65% were known case of CAD, 24% had dyslipidemia, and 12% were smokers. No statistical significance was seen in the prevalence of the risk factors for CAD in between the groups. (Table 2)

Variable	**Euthyroid (n=131)**	**Thyroid dysfunction (n=40)**	**Subclinical Hypothyroidism (n=26)**	**Overt Hypothyroidism (n=12)**
Age (years)	59.0 (± 12.38)	58.9 (±12.59)	58.5 (±12.65)	61.2 (±13.20)
Gender (Male/Female)	94/37	19/21	9/17	8/4

Smoking	15 (11.5)	3 (7.5)	1 (3.8)	2 (16.7)
Diabetes Mellitus	65 (49.6)	17 (42.5)	12 (46.2)	4 (33.3)
Hypertension	85 (64.9)	28 (70.0)	18 (69.2)	8 (66.7)
History of CAD	85 (64.9)	25 (62.5)	17 (65.4)	7 (58.3)
Dyslipidemia	31 (23.7)	6 (15.0)	5 (19.2)	1 (8.3)
Pulse Rate	85.6 (21.07)	85.3 (16.31)	86.4 (18.53)	80.3 (7.56)
Chest pain	100 (76.3)	34 (85.0)	24 (92.3)	8 (66.7)
Dyspnea	44 (33.6)	10 (25.0)	4 (15.4)	5 (41.7)
Fatigue	7 (5.3)	4 (10.0)	3 (11.5)	1 (8.3)
Syncope	7 (5.3)	1 (2.5)	1 (3.8)	0 (0.0)
Palpitations	7 (5.3)	2 (5.0)	1 (3.8)	0 (0.0)
Diastolic BP	80.0 (15.16)	80.7 (14.48)	82.5 (17.00)	77.5 (7.54)
Systolic BP	130.8 (25.29)	132.8 (22.42)	133.1 (24.78)	133.3 (18.26)

Table 2. Baseline characteristics of the patients according to thyroid status (values are mean/SD and percentages).

All the patients had presented with chest pain. Similarly, some of them also presented with complaints like dyspnea, syncope, fatigue and palpitations.

The average mean blood pressure in all the groups was 130/80, with a mean pulse rate of 86/min.

66 (50%) belonged to age group >60 years, 54 (41%) belonged to age group 41-59 years and 11(8%) belonged to the age group less than 40 years. Prevalence of thyroid dysfunction was 48% in patients who are sixty or above. Between the age group of 41-59 years, it was 45%, and in the small group of younger patients, it was 7%. There was a statistical difference in the prevalence of thyroid dysfunction vs Euthyroid status in all age categories. According to gender, the prevalence of thyroid dysfunction was 19 (47%) in males vs 21 (53%) in females, the difference being statistically different (p=0.04). Women were more likely to have subclinical thyroid dysfunction. This difference was seen in the subclinical hypothyroid individual but not in the overt hypothyroid individuals (Table 3).

Age & Sex	**Euthyroid**	**Thyroid dysfunction**	**Subclinical Hypothyroidism**	**Overt Hypothyroidism**	**P-value**	**P-value**	**P-value**
<40	11 (8.4)	3 (7.5)	2 (7.7)	1 (8.3)			
41-59	54 (41.2)	18 (45.0)*	12 (46.2)	4 (33.3)			

>=60	66 (50.4)	19 (47.5)	12 (46.2)	7 (58.3)	0.0486	0.0873	0.0357
Male	94 (71.8)	19 (47.5)	9 (34.6)	8 (66.7)	0.0046	0.0003	0.8233
Female	37 (28.2)	21 (52.5)	17 (65.4)	4 (33.3)			

Table 3: Correlation of age and gender with thyroid status

The total number of cases included was 178, 7 patients had euthyroid sick syndrome. These patients were not subjected to detailed evaluation.

Out of 171 cases, 131 (77 %) had Euthyroid, and 40 (23%) had thyroid dysfunction. Out of 40 patients with abnormal thyroid dysfunction, 26(20%) patients had subclinical hypothyroidism, and 12(9%) patients had overt hypothyroidism. Only 2(1.5%) patients had subclinical hyperthyroidism

Correlation with subgroups of ACS

Out of 171 patients, 64 (49%) patients belonged to STEMI group, and 38 (29%) patients to NSTEMI and 29 (22%) belonged to UA group. STEMI group had the highest frequency of thyroid dysfunction both sub clinical and clinically overt (Table 4)

ACS	**Euthyroid**	**Thyroid dysfunction**	**Subclinical Hypothyroidism**	**Overt Hypothyroidism**
UA	29 (22.1)	9 (22.5)	6 (23.1)	3 (25.0)
NSTEMI	38 (29.0)	10 (25.0)	5 (19.2)	5 (41.7)
STEMI	64 (48.9)	21 (52.5)	15 (57.7)	4 (33.3)

Table 4: ACS categories and Thyroid Function (Euthyroid and Thyroid Dysfunction)

A higher prevalence of abnormal thyroid hormone profile was seen in patients of STEMI group 21(52%) as compared to NSTEMI 10 (25%) (p=0.0116) and between STEMI and UA 9(22%) (p=0.0056). This difference was statistically significant. The results are shown in (Table 5).

ACS	**Thyroid dysfunction 40 (%)**	**P-value**
UA	9 (22.5%)	0.0056 *
NSTEMI	10 (25.0%)	
STEMI	21(52.5%)	0.0116**

***Between UA and STEMI **Between NSTEMI and STEMI , P Between UA and NSTEMI is not significant**

Table 5. Thyroid dysfunction association between UA, NSTEMI and STEMI

A higher prevalence of abnormal thyroid hormone profile was seen in patients of STEMI group 21(52%) as compared to NSTEMI 10 (25%) (p=0.0116) and between STEMI and UA 9(22%) (p=0.0056). This difference was statistically significant. The results are shown in (Table 6).

Variable	Euthyroid	Thyroid dysfunction	Subclinical Hypothyroidism	Overt Hypothyroidism	P-value
Increased LDL C	56 (42.7)	13 (32.5)	8 (30.8)	5 (41.7)	0.5171
Increased Total cholesterol	14 (10.7)	2 (5.0)	2 (7.7)	0 (0.0)	0.0135
Decreased HDL-C	92 (70.2)	27 (67.5)	19 (73.1)	8 (66.7)	0.0064
Increased Triglycerides	37 (28.2)	12 (30.0)	7 (26.9)	5 (41.7)	0.0044
Increased VLDL C	12 (9.2)	2 (5.0)	1 (3.8)	1 (8.3)	0.0215

Table 6: Association between thyroid status and lipid abnormalities among the whole study population**.**

Troponin was raised in all the groups indicating the presence of STEMI or NSTEMI. BNP was seen significant with the overt hypothyroidism vs Euthyroid group as per (Table 7).

Trop T/I	Euthyroid	Thyroid dysfunction	Subclinical Hypothyroidism	Overt Hypothyroidism	P-value	P-value	P-value
<15.6	18 (13.7)	5 (12.5)	5 (19.2)	0 (0.0)	0.9273	0.1821	0.2897
>15.6	89 (67.9)	26 (65.0)	17 (65.4)	7 (58.3)			
BNP							
<100	34 (26.0)	12 (30.0)	8 (30.8)	4 (33.3)			
100-500	49 (37.4)	14 (35.0)	11 (42.3)	2 (16.7)	0.5357	0.5219	0.0458
>500	40 (30.5)	8 (20.0)	5 (19.2)	3 (27.0)			

Table 7. Relationship between Bio-Markers (Troponin and BNP) and Thyroid Function**.**

There is a statistical significant difference in the association between thyroid dysfunction and Euthyroid group in terms of Creatinine (Table 8).

Variable	Euthyroid	Thyroid dysfunction	Subclinical Hypothyroidism	Overt Hypothyroidism	P-value	P-value	P-value
Urea							
15- 40	92 (70.2)	34 (85.0)	23 (88.5)	10 (83.3)	0.0633	0.0551	0.3367
> 40	39 (29.8)	6 (15.0)	3 (11.5)	2 (16.7)			
Na							
<136	56 (42.7)	11 (27.5)	7 (26.9)	4 (33.3)	0.2186	0.2386	0.7233
136-145	73 (55.7)	28 (70.0)	19 (73.1)	8 (66.7)			
> 146	2 (1.5)	1 (2.5)	0 (0.0)	0 (0.0)			
Potassium							
<3.5	8 (6.1)	5 (12.5)	4 (15.4)	1 (8.3)	0.3891	0.2651	0.7605
3.5-5.	118 (90.1)	34 (85.0)	21 (80.8)	11 (91.7)			
5.1-6	5 (3.8)	1 (2.5)	1 (3.8)	0 (0.0)			
Creatinine							
0.57-1.1	58 (44.3)	26 (65.0)	17 (65.4)	8 (66.7)	0.0217	0.0490	0.1364
≥1.1	73 (55.7)	14 (35.0)	9 (34.6)	4 (33.3)			

Table 8: Relationship Between Clinical Biochemistry and Thyroid Function.

The e GFR in patients with various grades of hypothyroidism was lower as compared to euthyroid group. There is a significant correlation between eGFR and various categories of thyroid dysfunction. (Table 9).

eGFR	Euthyroid	Thyroid dysfunction	Subclinical Hypothyroidism	Overt Hypothyroidism	P-value	P-value	P-value
>90 (Garde I)	9 (6.9)	2 (5.0)	2 (7.7)	0 (0.0)	0.0012	0.0052	0.0216
60-89 (Garde II)	58 (44.3)	18 (45.0)	11 (42.3)	6 (50.0)			
30-59 (Garde III)	47 (35.9)	19 (47.5)	12 (46.2)	6 (50.0)			
15-29 (Garde	10 (7.6)	1 (2.5)	1 (3.8)	0 (0.0)			

IV)							
<15 (Garde V)	5 (3.8)	0 (0.0)	0 (0.0)	0 (0.0)			

Table 9: Correlation with e GFR (Calculated glomerular Functional Rate) and Thyroid Function.

The prevalence of low LVEF (<55%) was seen numerically more frequently in all the groups with thyroid dysfunction when compared with normal LVEF (>55%). This was however not statistically significant (Table 10)

LVEF	**Euthyroid**	**Thyroid dysfunction**	**Subclinical Hypothyroidism**	**Overt Hypothyroidism**	**P-value**	**P-value**	**P-value**
<55%	94 (71.8)	35 (87.5)	24 (92.3)	10 (83.3)			
>55%.	30 (22.9)	5 (12.5)	2 (7.7)	2 (16.7)	0.1165	0.0618	0.5572

Table 10: Correlation between Left Ventricular Ejection Fractio and Thyroid Function.

Discussion:

The alteration in thyroid function mechanistically can cause several derangements on the cardiovascular system leading to hypertension, dyslipidemia, heart rhythm disorders, obesity etc. in ACS patients as seen in many studies.

The present study has demonstrated changes in thyroid hormone profile in 23 % of the patients who were admitted with a diagnosis of ACS (STEMI, NSTEMI and UA). Twenty percent of them had subclinical hypothyroidism, 1.5% had subclinical hyperthyroidism, and 9% had overt hypothyroidism. 73% of the patients admitted with ACS were euthyroid.

In a study done by Qari FA et al thyroid dysfunction was reported in 23%, 0.5% had subclinical hyperthyroidism, 8% had overt hypothyroidism. They also had included euthyroid sick syndrome, which consisted of 10%. Khalil OA et al. in their study reported changes in thyroid profile in 23 % of their patient population. Mukherjee et al. in a larger cohort reported it in 15% of patients. A prevalence of 23% reported in our study is, therefore, as per the literature of India and other neighbouring countries.

Thyroid function is more common in elderly population with female preponderance as seen in our study has been the observation of other studies too [3]. The mean age in our population was 59 years, and thyroid dysfunction was seen in 48% of patients above the age of 60 years. ACS occurs at a younger age in Indians, which is a well-documented observation [1]. In the Rotterdam study, elderly females with subclinical hypothyroidism had a higher frequency of atherosclerosis of aorta and myocardial infarctions [10].

The observation in our study of higher prevalence of thyroid dysfunction was seen in STEMI (52%) as compared to NSTEMI (25%), and UA (22%) is also consistent with the literature

[11]. The difference between the thyroid dysfunction in STEMI vs NSTEMI (p=0.0116) or UA (p=0.0056) was statistically significant.

The association of dyslipidemias in ACS patients with thyroid dysfunction particularly with hypertriglyceridemic, low HDL C, high VLDL C and higher total cholesterol levels are consistent with studies of Helmy et al. despite intake of statin drugs as compared to euthyroid patients [4]. This observation has also been seen in the Colorado Health Fair study [12]. Lipid anomalies associated with hypothyroidism are at least partially responsible for the increase in coronary heart disease.

All the thyroid dysfunction groups showed significant association with abnormal levels of e GFR, indicating an associated renal impairment and electrolytes imbalance. In CKD patients, hypothyroidism may directly worsen kidney function, an independent risk factor for cardiovascular disease and death, through alterations in hemodynamics and structure [13,14,15]. Hypothyroidism by lowering the cardiac output and peripheral actions on blood vessels and renal vessels may contribute to kidney injury [16,17]. The renin angiotensin aldosterone system activation may further augment it indirectly. Changes in auto regulation can also contribute in worsening it [18, 19].

The LV ejection fractions in the group of patients with thyroid dysfunction had numerically lower values of <55% but missed the statistical significance point, possibly because of a small number of patients in the study.

Left ventricular function abnormalities as assessed by several non-invasive methods of studying ejection phase indices have been reported in the literature. These studies coupled with findings of lower cardiac output, negative inotropy and chronotropy, end diastolic pressures, increase in after load, peripheral resistance, and systemic vascular stiffness are the hall mark of the cardiac involvement of hypothyroidism. Associated diabetes mellitus which is a common association additionally can worsen such patients [20,21]. Our country has a large diabetic population and hence along with hypothyroidism it and can additionally predispose patients to ACS [22]).

Conclusion:

Our prospective study conducted on patients admitted with ACS in a tertiary care hospital had 23% of patients having abnormalities of thyroid function. Subclinical hypothyroidism was the commonest abnormality (23%), followed by overt hypothyroidism (9%). Sub-clinical hyperthyroidism was uncommon (1.5%). Euthyroid sick syndrome was seen only in 4% of patients. STEMI followed by NSTEMI were the diagnosis in patients with thyroid dysfunction. There was a predilection for elderly females with a high prevalence of dyslipidemias as compared to the euthyroid group. Patients with hypothyroidism had a pre dilection for renal dysfunction. The LVEF in the group with hypothyroidism had a trend to be lower. Hypothyroidism seems to be an important risk factor in patients with ACS especially STEMI.

Limitation and Strengths:

Being a single center study, the number of cases is small but the strength being that it is a prospective hospital-based study with complete data capture.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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