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Original Research Article

A Study on Thyroid Function Abnormalities in Patients with Acute Coronary Syndrome

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Abstract:

Introduction: Thyroid dysfunction, including subclinical hypothyroidism and euthyroid sick syndrome, is common in Acute Coronary Syndrome (ACS) and may worsen outcomes like arrhythmias and mortality. This study aims to assess the prevalence and patterns of thyroid abnormalities in ACS patients and their association with clinical outcomes and in-hospital complications.

Methods: This 5-month prospective observational study at Government Medical College, included ACS patients aged >18 years. Thyroid function (TSH, free T3, free T4) was assessed within 24 hours of admission. Clinical data, complications, and outcomes were recorded. Patients with known thyroid disease or chronic illnesses were excluded. Ethical clearance was obtained.

Results: Among 115 ACS patients, 38.3% had thyroid dysfunction, predominantly subclinical hypothyroidism and euthyroid sick syndrome. ST-elevation myocardial infarction (STEMI) was the most common presentation. Thyroid dysfunction was more frequent in STEMI but not statistically significant. Patients with thyroid dysfunction had longer hospital stays, higher rates of arrhythmias, cardiogenic shock, and in-hospital mortality.

Conclusion: This study highlights a significant prevalence of thyroid dysfunction in ACS patients, particularly associated with worse in-hospital outcomes. Thyroid screening may serve as a useful prognostic tool. However, the single-center design and limited sample size warrant larger studies to validate these findings and assess long-term implications.

Keywords: Acute Coronary Syndrome, Thyroid, Subclinical Hypothyroidism.

Introduction

Thyroid hormones play a crucial role in cardiovascular homeostasis, influencing heart rate, myocardial contractility, systemic vascular resistance, and lipid metabolism. Acute coronary syndrome (ACS), encompassing unstable angina (UA), non-ST elevation myocardial infarction (NSTEMI), and ST-elevation myocardial infarction (STEMI), remains a leading cause of morbidity and mortality globally. Recent studies have highlighted the association between thyroid dysfunction (TD) and adverse cardiovascular outcomes, particularly in ACS patients. Even subtle changes in thyroid hormone levels, such as low triiodothyronine (T3) syndrome or subclinical hypothyroidism, may significantly impact prognosis in these patients [1].

Euthyroid sick syndrome (ESS), also known as non-thyroidal illness syndrome (NTIS), is frequently observed in critically ill patients, including those with ACS. This condition is characterized by low serum T3 levels, normal or low thyroxine (T4), and normal or low thyroid-stimulating hormone (TSH) levels, often without intrinsic thyroid disease [2]. The pathophysiology of NTIS in ACS is multifactorial, involving altered deiodinase activity, cytokine release, and hypothalamic-pituitary-thyroid axis suppression [3].

Furthermore, thyroid hormone abnormalities in ACS have been linked to left ventricular dysfunction, arrhythmias, and increased in-hospital and long-term mortality [4]. Identifying and understanding TDpatterns in ACS patients may aid in risk stratification and potentially guide therapeutic interventions [5]. Thus, studying thyroid function in ACS patients is vital to elucidate its clinical relevance, prognostic implications, and potential as a therapeutic target to improve

cardiovascular outcomes. This study aims to evaluate the prevalence and patterns of thyroid function abnormalities in patients presenting with ACS and to assess the association between these thyroid dysfunctions and clinical outcomes.

Methods

It was a prospective, observational study, conducted in the departments of General Medicine, Government Medical College, Bhadradri kothagudem, Telangana. Study was conducted for 5 months, from December 2024 to May 2025. Study protocol was approved by the institutional ethics committee. An informed written consent was taken from the study members.

The study included patients aged $\geq$ 18 years, diagnosed with ACS based on a combination of clinical symptoms, electrocardiographic (ECG) changes, and elevated cardiac biomarkers. Patients were excluded from the study if they had a known history of thyroid disease, were receiving thyroid hormone replacement or anti-thyroid medications, or had chronic systemic illnesses such as chronic kidney disease (CKD), chronic liver disease, malignancy, or sepsis. Pregnant women were also excluded from participation.

A detailed medical history was recorded, including information about presenting symptoms, past medical history, comorbid conditions, medication use, lifestyle factors, and family history of cardiovascular or thyroid disorders. This was followed by a comprehensive physical examination and routine investigations such as complete blood count, renal and liver function tests, lipid profile, blood glucose levels, and cardiac biomarkers as per the institutional protocol.

To assess thyroid function, blood samples were collected within the first 24 hours of hospital admission. Serum levels of TSH, free T3, and free T4 were measured using a standardized chemiluminescence immunoassay method in the hospital's central laboratory. These tests were used to categorize patients into different thyroid function groups: euthyroid, subclinical hypothyroidism, subclinical hyperthyroidism, overt hypothyroidism, overt hyperthyroidism, and ESS. ACS was classified as STEMI, NSTEMI, or UA according to standard clinical, electrocardiographic, and biochemical diagnostic criteria. Echocardiography was performed to determine left ventricular ejection fraction (LVEF) and assess any structural or functional abnormalities. The Killip classification was used to grade the severity of heart failure [6], and the GRACE score was calculated to estimate the patient's risk of adverse cardiovascular outcomes [7].

Clinical parameters, including the presence of complications such as arrhythmias, cardiogenic shock, and congestive heart failure, were closely monitored throughout the hospital stay. In-hospital outcomes were documented in detail, including the total duration of hospitalization, treatment received, need for intensive care, recovery status at discharge, and any mortality events. All collected data were systematically recorded using a pre-designed case report form and subsequently entered into a secure digital database for further statistical analysis.

Statistical Analysis: Data were analyzed using SPSS software version 21. Descriptive statistics were employed to summarize baseline characteristics of the study population. Categorical variables were analyzed using the Chi-square test, while continuous variables were assessed using the t-test or ANOVA; $P < 0.05$ was considered statistically significant.

Results

Total 115 members were included, mean age was 586 $\pm$ 10.2. Gender wise, 62.6% (72) were male. Hypertension was reported by 64 (55.7%), smoking history by 42.6% (49). STEMI was the most common presentation (54; 47%), followed by NSTEMI (36; 31.3%) and UA (25; 21.7%). Majority (71; 61.7%)) were euthyroid. TD was noted in 44 patients (38.3%), with subclinical hypothyroidism and ESS each in 14 (12.2%), overt hypothyroidism in 7 (6.1%), subclinical hyperthyroidism in 6 (5.2%), and overt hyperthyroidism in 3 (2.6%).

Among STEMI patients (n=54), 53.7% were euthyroid and 46.3% had thyroid dysfunction. In NSTEMI cases (n=36), 69.4% were euthyroid and 30.6% had thyroid dysfunction. Among patients with UA (n=25), 68% were euthyroid and 32% had thyroid dysfunction. Although TD was more frequent in STEMI patients, the association was not statistically significant ($P = 0.172$) (Table 1). The mean hospital stay was significantly longer in the TD group (6.3 ± 1.8 days) compared to the euthyroid group (5.2 ± 1.4 days, $P = 0.003$). Arrhythmias occurred in 27.3% of TD patients versus 12.7% in euthyroid patients ($P = 0.041$). Cardiogenic shock and in-hospital mortality were also higher in the TD group (15.9% and 11.4%, respectively), statistically significant (Table 2).

Table 1: Association between thyroid function and ACS; n (%)

Thyroid Status	STEMI	NSTEMI	UA
Euthyroid	29 (53.7)	25 (69.4)	17 (68)
TD	25 (46.3)	11 (30.6)	8 (32)
Total	54 (100)	36 (100)	25 (100)

Table 2: In-Hospital outcomes, thyroid status among the study members

Outcome	Euthyroid	TD	P value
Mean Hospital Stay (days)	5.2 ± 1.4	6.3 ± 1.8	0.003
Arrhythmias	9 (12.7%)	12 (27.3%)	0.041
Cardiogenic Shock	3 (4.2%)	7 (15.9%)	0.028
In-hospital Mortality	2 (2.8%)	5 (11.4%)	0.046

Discussion

TD was observed in 38.3%, reflecting a considerable prevalence among this cardiac cohort. The mean age of the study population was 58.6 ± 10.2 years, with a male predominance (62.6%). Hypertension (55.7%) and smoking (42.6%) were common comorbidities, aligning with known risk profiles for coronary artery disease.

Among the ACS subtypes, STEMI was the most frequent presentation (47%), followed by NSTEMI and UA. This distribution is consistent with findings from previous studies highlighting the high burden of STEMI in acute cardiac admissions [8].

Thyroid function analysis revealed that 61.7% of the patients were euthyroid. Among the 44 patients (38.3%) with thyroid dysfunction, subclinical hypothyroidism and ESS were the most common abnormalities (12.2% each), followed by overt hypothyroidism (6.1%), subclinical hyperthyroidism (5.2%), and overt hyperthyroidism (2.6%). These results are in concordance with previous literature, where ESS has been frequently reported in critically ill cardiac patients, reflecting an adaptive metabolic response to acute illness [9, 10].

Subclinical hypothyroidism has been associated with increased systemic vascular resistance and diastolic dysfunction, possibly worsening ischemic outcomes in ACS [11]. Furthermore, studies suggest that even mild thyroid dysfunctions, particularly low T3 levels, are linked with poor cardiac contractility and increased mortality post-myocardial infarction [12]. Therefore, the significant proportion of TD in this cohort underlines the importance of early thyroid screening in ACS for better prognostication and individualized management strategies.

The distribution of TD among different subtypes of ACS was also analyzed. Among STEMI patients (n=54), 46.3% exhibited TD, while 53.7% were euthyroid. In comparison, TD was observed in 30.6% of NSTEMI patients and 32% of those with UA. Although the highest proportion of thyroid dysfunction was noted in the STEMI subgroup, the association between ACS type and thyroid status did not reach statistical significance (P = 0.172). This trend suggests that thyroid abnormalities, particularly ESS and subclinical hypothyroidism, may be more prevalent in patients with more severe myocardial damage, as typically seen in STEMI. Previous studies have reported similar findings where altered thyroid function, especially low T3 syndrome, correlated with the severity of myocardial infarction and poor outcomes [13, 14]. The non-significant p-value may be attributed to sample size limitations or overlapping clinical characteristics among ACS subtypes. Nevertheless, these observations underscore the potential role of thyroid dysfunction as a secondary pathophysiological factor in ACS, particularly in STEMI cases, and warrant further investigation through larger prospective studies [9].

This study revealed that TD in patients with ACS was associated with significantly worse in-hospital outcomes. Patients with TD had a notably longer mean hospital stay (6.3 ± 1.8 days) compared to euthyroid individuals (5.2 ± 1.4 days, P = 0.003). Furthermore, adverse cardiovascular events such as arrhythmias were more common in the TD group (27.3%) than in euthyroid patients (12.7%, P = 0.041). Similarly, cardiogenic shock and in-hospital mortality were significantly elevated in the TD group (15.9% and 11.4%, respectively), indicating the impact of altered thyroid function on cardiac stability and prognosis.

These findings align with prior research highlighting the detrimental role of thyroid dysfunction, particularly low T3 syndrome and subclinical hypothyroidism, in cardiovascular morbidity and mortality [11, 13]. Thyroid hormones are essential for myocardial contractility, vascular tone, and electrophysiological balance, and their deficiency may exacerbate ischemic injury and arrhythmogenic potential [15]. Additionally, euthyroid sick syndrome reflects the severity of systemic illness and has been correlated with prolonged hospitalization and increased mortality in ACS patients [9]. Routine assessment of thyroid function in ACS could serve as a valuable prognostic tool and guide tailored therapeutic strategies.

Conclusion: This study demonstrated a high prevalence of thyroid dysfunction (38.3%) among patients with ACS, with subclinical hypothyroidism and euthyroid sick syndrome being the most common. Thyroid dysfunction was associated with prolonged hospital stay, increased incidence of arrhythmias, cardiogenic shock, and higher in-hospital mortality, underscoring its prognostic significance in ACS. Routine thyroid function screening may aid in risk stratification and management. However, limitations include the single-center design, relatively small sample size,

and lack of long-term follow-up, which may affect generalizability. Larger multicentric studies are warranted to confirm these findings and explore therapeutic implications.

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