Original Article

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Thyroid profile as a marker of poor prognostic factor in patients with acute coronary syndrome: a tertiary care hospital based observational study

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Abstract

Background and aims: Serum thyroid hormonal changes can occur in acute or chronic non-thyroidal systemic illness including acute coronary syndrome in otherwise euthyroid individuals. In this study we aimed to assess thyroid hormonal profile in patients presenting with acute coronary syndromes (ACS) and compare between ST segment elevated myocardial infarction and unstable angina/Non ST segment elevated myocardial infarction.

Methods: A hospital based, retrospective, observational comparative study was designed. Data of all patients with acute coronary syndrome presenting to hospital were collected from July 2015 through June 2017 in a pre-structured proforma and analyzed.

Results: A total of 200 ACS patients between 23 years to 88 years with mean age of 61.33 ± 12.30 years were studied. One hundred and twenty seven (63.5%) were males. Among them 116 (58%) was ST segment elevated myocardial infarction (STEMI) patients while 84 (42%) were unstable angina/ non-ST elevated myocardial infarction (UA/NSTEMI) patients. Total 47 (23.5%) patients had abnormal TFT of which 28(59.5%) had Euthyroid Sick Syndrome, 12(25.5%) had subclinical hypothyroidism, 5(10.6%) had subclinical hyperthyroidism and 2(4.25%) had low fT4 with normal fT3 and normal TSH. There was significant difference in TFT in patients with STEMI and UA/NSTEMI (P=0.006).There were higher rates of heart failure (p= 0.001 & 0.003 in STEMI & UA/NSTEMI respectively), longer length of hospital stay (3+0.17 days) and high mortality (more than 4 fold) in all types of ACS patients with abnormal TFT than ACS patients with normal TFT.

Conclusion: There is higher prevalence of abnormal thyroid hormonal findings in ACS causing significant morbidity and mortality.

Keywords: Acute coronary syndrome, prognosis, thyroid hormone profile.

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Introduction

Alteration in the level of serum thyroid hormone profile has been described in several non-thyroidal systemic illnesses including acute heart diseases in otherwise euthyriod patients. This condition has been termed as "Euthyroid Sick Syndrome" and is characterized by decreased serum T3 and /or free T3, increased serum reverse T3 (rT3), plus normal serum TSH, T4, and free T4 levels[1] .Patients belonging to the STEMI group showed early elevations, in addition to higher mean reverse T3(rT3) and lower mean T3 and free T3 levels.[1] This syndrome has been reported to be found in severe chronic heart failure[2], in acute myocardial infarction[3,4] and as a rapidly emerging phenomenon during open-heart surgery.[5] Additionally hypothyroidism is emerging as a risk for coronary artery disease.[6]

Evaluation of thyroid hormone plasma levels has been done in a number of studies in patients presenting with Acute Coronary Syndrome (ACS) and findings compared between Unstable Angina/Non-ST elevation MI (UA/NSTEMI) and ST Elevation acute MI (STEMI) groups.[1, 7] Some studies have reported association of greater hormonal changes with more severe cardiac events(STEMI and Death) and patients with complications.[1, 7, 8] An association of Euthyroid sick syndrome in ACS with poorer prognosis has been suggested in few studies.[1,6] It has further been stated that the euthyroid sick syndrome has special significance in patients of ACS because low T3 levels in these patients signify severe disease and can be used as a marker for early invasive management in these patients.[6]

Till date to my knowledge there are no data regarding thyroid profile in ACS patients from this part of world. This study aims to study the thyroid hormone profile in patients of ACS and to compare it in between STEMI and UA/NSTEMI groups.

Methods:

This is a hospital based, cross-sectional, comparative, observational study done from July 2015 to June 2017 in the department of cardiology of Manipal Teaching hospital, Nepal. 200 consecutive cases of acute coronary syndromes were taken for the study. Depending on the ECG findings and result of cardiac markers, the patients of ACS were categorized into following two groups as per American Heart Association (AHA) criteria. Group 1 considered cases showing ST depression / T wave inversion with normal or elevated cardiac markers. At the time of presentation, patients with UA and NSTEMI can be indistinguishable and therefore are considered together in these guidelines.[9] UA is defined as angina pectoris or equivalent ischemic discomfort with at least one of three features: (1) it occurs at rest (or with minimal exertion), usually lasting >10 minutes; (2) it is severe and of new onset (i.e., within the prior 4–6 weeks); and/or (3) it occurs with a crescendo pattern (i.e., distinctly more severe, prolonged, or frequent than previously). The diagnosis of NSTEMI is established if a patient with the clinical features of UA develops evidence of myocardial necrosis, as reflected in elevated cardiac biomarkers[10] and Group 2

included STEMI patients having symptoms of myocardial ischemia in association with electrocardiographic (ECG) ST elevation and release of biomarkers of myocardial necrosis. New ST elevation at the J point in at least 2 contiguous leads of 2 mm (0.2 mV) in men or 1.5 mm (0.15 mV) in women in leads V2–V3 and/or of 1 mm (0.1mV) in other contiguous chest leads or the limb leads.[11] The 12- lead ECG is a pivotal diagnostic tool. Level of serum cardiac biomarkers CKMB and Troponin are elevated.[12] Known patients of thyroid disorders on treatment, patients suffering from other diseases such as neoplasia, chronic renal failure, chronic obstructive lung diseases, cirrhosis of liver and active infective conditions and patients taking Amiodarone, Lithium, Steroids or those who received iodinated contrast agent within the previous 2 weeks were excluded. Data were collected in a preformed proforma and analyzed in SPSS software version 16. The significant difference between two groups was compared using ANOVA. Pearson's correlation coefficient, Chi-square test, t-tests, etc was used to find group association. Odds ratio was calculated for required appropriate values and p values were considered significant at a predetermined level of < 0.05.

Results:

Two hundred ACS patients between 23 years to 88 years with mean age of 61.33 ± 12.30 years were studied. 115 (57.5%) were more than 60 years, 70 (35%) were 40-60 years and 15 (7.5%) belonged to age group of 20-40 years. 127 (63.5%) were males. 116 (58%) were STEMI patients while 84 (42%) were UA/NSTEMI patients. 76 (39%) patients were hypertensive and on medications while only 21 (10.5%) were diabetics. 134 (67%) patients were smokers.

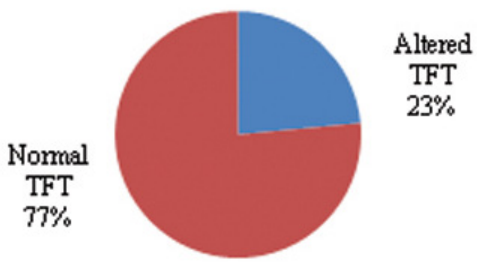

Figure 1: *Thyroid hormone in pts with ACS*

Thyroid hormone analysis was done in all the ACS patients and was found abnormal in 47 (23.5%) of the patients. Out of 127 males and 73 females with ACS, 27 (21.25%) patients had abnormal TFTs while 20 (27.39%) female patients with ACS had abnormal TFTs. There was no statistically significant difference in prevalence of abnormal thyroid hormone profile in males and females with ACS (p=0.35).

Table 1: Pattern of abnormal thyroid profile in patients with different categories.

Category	No of pts with Euthyroid sick syndrome	No of pts with subclinical hypothyroidism	No of pts with subclinical hyperthyroidism	No of pts with low fT4 but normal fT3 and TSH	Total pts with abnormal TFTs
STEMI	20	8	3	2	35
NSTEMI	8	4	2	0	12

Of the 47 patients with abnormal thyroid hormone profile, 28(59.5%) had Euthyroid Sick Syndrome, 12(25.5%) had subclinical hypothyroidism, 5(10.6%) had subclinical hyperthyroidism and 2(4.25%) had low fT4 with normal fT3 and normal TSH. Table 1 further divides the findings in sub-categories of STEMI and UA/NSTEMI.

Table 2: Comparision of abnormal TFT reports in patients with STEMI and UA/NSTEMI

Catagory	Number of pts with normal TFT reports	Number of pts with abnormal TFT reports	Odds ratio	P-value(Fisher exact probability test)
STEMI	81	35	2.59	0.006
UA/NSTEMI	72	12		

Table 2 shows the comparison of abnormal TFT reports in patients with STEMI and UA/NSTEMI patients. It shows a statistical significant difference in TFT profile in these two groups

Table 3: Analysis of ACS patients with heart failure and abnormal thyroid

Catagory	TFT reports	Number of patients with heart failure	Number of patients without heart failure	P-value(Fisher exact probability test)
STEMI	Normal	7	73	0.001
	Abnormal	12	23	
UA/NSTEMI	Normal	2	70	0.003
	Abnormal	4	8	

The above table (table 3) shows that there was significant difference in patients woth abnormal TFT reports presenting or habing heart failure both in STEMI or UA/STEMI groups

Table 4 : Analysis of ACS patients of different thyroid status with average length of hospital stay

Category	TFT reports	Mean average hospital stay (in days)	Mean difference (95% CI)	P-value
STEMI	Normal(n=80)	6+0.7	-3.0(-3.56 to 2.45	<0.001
	Abnormal(n=35)	9+2.3		
UA/NSTEMI	Normal(n=72)	5+1.1	-2.0(-2.79to -1.22)	<0.001
	Abnormal(n=12)	7+2.01		

Further analysis in mean average hospital stay and mortality with abnormal thyroid hormone profiles in these patients was analyzed. The mean hospital stay was significantly higher (p=<0.001) in both the groups (Table 4). Mortality was slightly higher in patients having abnormal TFT reports but not significant in both the groups (p= 0.164 and 0.1429 respectively) (table 5).

Table 4: Analysis of ACS patients of different thyroid status with average length of hospital day

Category	TFT Report	Number of patients died	Number of patients survived	OR(95% CI)	P value*
STEMI	Normal	2	78	3.65(0.583 to 22.928)	0.164
	Abnormal	3	32		
UA/NSTEMI	Normal	0	72	NA	0.1429
	Abnormal	1	11		

*p value obtained from Fischer exact test (2 tailed)

Discussion:

Alteration in the level of serum thyroid hormone profile has been described in various several non-thyroidal systemic illnesses including acute heart diseases in otherwise euthyriod patients which is called as "euthyroid sick syndrome".[1-4] Present study assesses thyroid profile in ACS and compare between the ACS sub-groups. Our study showed abnormal thyroid hormonal findings in 47(23.5%) of patients with ACS. This result was comparable to various other studies in other part of the world too. For example a study of 400 patients of ACS by Qari FA, thyroid dysfunction was reported in 23.3% of patients.[13] Similarly Khalil OA et al in their study of 196 patients of ACS, reported changes in thyroid hormone profile in 23% of their patients.[14] Mathur P et al in their study of 85 patients and Bayrak A et al in their study of 110 patients of ACS reported changes in thyroid hormone profile in 31.7% and 23.6% of patients respectively. [6, 15]

This study is done to see the status of thyroid profile in patients with ACS in our part of world. Our study showed a higher prevalence of abnormal thyroid hormone profile was seen in patients of STEMI group as compared to NSTEMI/UA group being 35 out of 47 (74.46%) in STEMI group and 12 out of 47 (25.56%) in NSTEMI/UA group. The difference is statistically significant (p=0.006). Similarly there was high prevalence of different thyroid patterns like euthyroid sick syndrome, subclinical hypothyroidism or hyperthyroidism and low fT4 but normal TSH and fT3 in STEMI group than UA/NSTEMI. These results are comparable to studies done before.[6, 13-15]

Thyroid dysfunction in acute coronary syndrome increases the relative risk of death by 5.49 fold than euthyroid patients.[13,14] Takada K et al in year 1994 in their study of relationship of thyroid function and left ventricular function in Acute Myocardial Infarction in 52 patients admitted to Coronary Care Unit within 24 hours after the onset observed that non-survivors showed significantly lower levels of fT3 and fT4 48 hours after onset, and concluded that measurement of thyroid hormone in AMI is important in evaluating the severity of the condition and waking a prognosis.[16] Our study also showed higher rates of heart failure (p= 0.001 & 0.003 in STEMI & UA/NSTEMI respectively), longer length of hospital stay and high mortality in all types of ACS patients with abnormal thyroid profiles (refer table 3 and 4).

Limitation:

Cardiac enzymatic levels of troponins (quantitative) were not available in the laboratory of study area. Had it been there we could further compare the relationship with altered thyroid profile and level of troponins.

Conclusion:

There is higher prevalence of abnormal thyroid hormonal findings in ACS causing significant morbidity and mortality. As a future direction, thyroid hormone profile done at the time of admission in patients with ACS may be used as a marker of prognosis along with other established scores or biochemical markers.

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