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STUDY OF THE RISK FACTORS FOR CORONARY ARTERY DISEASE AND THEIR CORRELATION WITH THYROID HORMONE PROFILE AMONGST WOMEN WITH ST SEGMENT ELEVATION IN ACUTE MYOCARDIAL INFARCTION

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Abstract

Background: To assess risk factors for coronary artery disease and their correlation with thyroid hormone profile amongst women with ST segment elevation in acute myocardial infarction.

Method: A total number of 78 females having ST elevation myocardial infarction diagnosed through detailed clinical history and ECG evaluations were included after they satisfy the eligibility criteria. Patients were subsequently evaluated for presence of risk factors of ischemic heart disease such age, marital status, parity, and menopause, use of oral contraceptives, family history, obesity, diabetes mellitus, hypertension, hypercholesterolemia and hypertriglyceridemia. Their thyroid hormone profiles (T3, T4, TSH) were done and were correlated with risk factors for ischemic heart disease.

Result: A total 78 patient included in the study. Most of the study population belongs to the age group of 40 to 50 years (43.6 %). Hypertension was the most common clinical features amongst study population (59%) followed by Diabetes (50%). most of the study population had Normal Thyroid status (57.69%) followed by Hypothyroidism (25.64%) and Hyperthyroidism (16.67%). and SERUM TSH is the most sensitive test for evaluation. Diabetes Mellitus was statistically significant risk factor (p value <0.05) in patients with STEMI with different levels of thyroid.

Conclusion: Patients with coronary artery disease especially in the presence of other risk factors should be screened for diabetes and also for thyroid dysfunction as in our study cases of Hypothyroidism was seen in 25.64% of the population under study. Hence it can be postulated that hypothyroidism may be a predictor for myocardial injury in STEMI. Here we recommend that tests for thyroid disorders in acute coronary syndrome can give predictor for risk of morbidity and mortality in those subjects.

These results also may warrant further larger study to investigate whether reversing the hypothyroidism could benefit the STEMI patients.

Keywords: STEMI- ST segment elevation myocardial infarction, MI- Myocardial Infarction, Hyperthyroidism, Hypothyroidism, TSH- Thyroid Stimulating Hormone

Introduction:

The term "myocardial infarction" focuses on the myocardium (the heart muscle) and the changes that occur in it due to the sudden deprivation of circulating blood. The main change is necrosis (death) of myocardial tissue. The word "infarction" comes from the Latin "infarcire" meaning "to plug up or cram." It refers to the clogging of the artery. The criteria's of Myocardial Infarction are based on symptoms, cardiac enzymes, ST-T changes on ECG,

regional wall abnormality present on imaging and coronary angiography.

Ischemic heart disease (IHD) is the biggest killer of women globally. IHD causes 8.6 million deaths among women annually, a third of all deaths in women worldwide. Every year more women than men die due to Ischemic heart disease. Women in low- and middle-income countries are in a worse situation than men, experiencing higher proportion of IHD deaths than men[1].Women continue to be under represented in research on heart disease. Most of the studies conducted on IHD are based on male population and whether we should implement the same guidelines on women counterparts is an unanswered question[2]. With more data from Women's Ischemia Syndrome Evaluation Study (WISE), as well as other new studies during the past several years, an evolving knowledge regarding sex differences in IHD has emerged. Women and men with heart disease tend to differ in their presenting symptoms, access to investigations, treatment and overall prognosis[3].

Women present with more atypical symptoms than men like back pain, shortness of breath, burning in the chest, nausea, or fatigue, which makes the diagnosis more difficult. Risk factors for IHD vary between males and females [4]. Diabetes mellitus is a stronger IHD risk factor in women than in men. Hypertension is associated with a two to threefold increased risk for IHD in women. In women, low levels of high-density lipoprotein are strong predictors of higher IHD risk than high levels of low-density lipoprotein [5]. Studies have shown complex relationship between IHD risk, estrogen, menopause and serum cholesterol in women[6,7]. Anti-estrogenic effect of tobacco and smoking increases the risk of IHD in premenopausal women [8].

Studies have shown, in women cardiovascular risk profiles improve with increasing levels of physical activity[9]. In women central obesity is observed as one of the major risk factor for IHD[10]. Despite differences between the sexes in risk factors, presentation, and response to treatment, women in our country continue to receive similar treatments to men on the basis of trials that include mainly male participants.

Thyroid hormone has a major role in the cardiovascular function and cardiac hemodynamic as well as to maintain the cardiovascular homeostasis[11,12,13]. A slight change in thyroid status affects ventricular function, serum cholesterol levels, heart rate and rhythm, which increases risk of coronary artery disease and cardiovascular mortality[14]. Nevertheless, the relation between anomalous thyroid function and cardiovascular effects remains indistinct[15].

Clinical features characteristic of hyperthyroidism like tachycardia, high cardiac output, increased myocardial contractility, systolic blood pressure, and basal metabolism, as well as tremors suggest a hyperadrenergic state. This is all due to the sensitivity to catecholamine compounds [16-18]. Hypothyroidism instead, seems to evoke a hypoadrenergic state due to the presence of bradycardia, reduced basal metabolism and cardiac output, and the intracellular catecholamine production from circulation, which has been found to be lower during hypothyroidism[19-21].

This study was conducted to evaluate important risk factors contributing to the IHD in women and its association with thyroid hormone profile as it is one of the contributory factor which increases risk of IHD in women with underlying other risk factors ,hence needs to be evaluated.

AIMS AND OBJECTIVES

1. To study clinical profile and cardiovascular risk factors in females admitted with ST elevation myocardial infarction (STEMI) in the Coronary Care unit.
2. To evaluate thyroid hormone profile (T3, T4, TSH) in females with ST elevation myocardial infarction (STEMI)
3. To find if there is any correlation of thyroid hormone dysfunction with other risk factors in females with ST elevation myocardial infarction (STEMI).

MATERIALS AND METHOD

STUDY DESIGN: Cross-sectional study

STUDY SETTING: Intensive Care Unit of a Tertiary Health Care Centre and Teaching Hospital

DURATION OF STUDY: August 2016 To September 2018

STUDY POPULATION: 78 Female patients with ST Elevation Myocardial Infarction (STEMI) admitted to ICU in our Hospital were included in the study.

Inclusion criteria:

1. Female patients, irrespective of age, admitted with new onset STEMI were included in the study.

(Presence of STEMI will be assessed by analysis of standard 12 lead ECG)

ECG criteria for st segment elevation myocardial infarction [22]

1) New ST elevation at the J point in two contiguous leads with the following cut points

- > 0.1 mv in all leads (except V2-V3)
- In leads v2 –v3 the following cut points apply

1) >0.15 mv in women

Exclusion criteria:

1. Females with previous history of myocardial infarction
2. Females with history of neck irradiation, history of thyroidectomy
3. Females with chronic renal failure or other longstanding systemic illness
4. Females on medications like amiodarone, iodides, lithium, and lugols iodine, anti-dopaminergic drugs
5. Patients with valvular heart diseases
6. Patients with congenital heart disease
7. Patients with pericarditis / pericardial effusion
8. Patients with aortic aneurysms
9. Patients who have not given written informed consent

METHODOLOGY

A total number of 78 females having ST elevation myocardial infarction diagnosed through detailed clinical history and ECG evaluation were included after they satisfy the eligibility criteria. Only those patients giving valid informed consent were included in the study.

Female patients with ST Elevation Myocardial Infarction (STEMI) admitted to ICU in a Tertiary Care Hospital were included in the study. Presence of STEMI was assessed by analysis of standard 12 lead ECG. Patients were subsequently evaluated for presence of risk factors of ischemic heart disease such age, marital status, parity, and menopause, use of oral contraceptives, family history, obesity, diabetes mellitus, hypertension, hypercholesterolemia and hypertriglyceridemia. Their thyroid hormone profile (T3, T4, TSH) was done and correlated with risk factors for ischemic heart disease.

Statistical Analysis

All the collected data was entered in Microsoft Excel sheet and then transferred to SPSS software ver. 17 for analysis. Qualitative data was presented as frequency and percentages. P-value < 0.05 was taken as level of significance.

RESULTS

Table 1: Age group distribution amongst study population

Age group	Frequency	Percent
40 to 50 years	34	43.6
51 to 60 years	14	17.9
More than 60 years	30	38.5
Total	78	100.0

As seen in the above table (1), most of the study population belongs to the age group of 40 to 50 years (43.6 %) followed by more than 60 years (38.5%) and 51 to 60 years (17.9%). (Age range = 40 - 73)

Table 2: Comorbidities amongst study population

Comorbidities	Frequency	Percent
Hypertension	46	59.0
Diabetes	39	50.0

As seen in the above table (2), Hypertension was the most common clinical features amongst study population (59%) followed by Diabetes (50%).

Table 3: Habits amongst study population

Habits	Frequency	Percent
Alcohol	3	3.8
Tobacco (Mishri user)	13	16.7

As seen in the above table (3), Habits such as alcohol and Tobacco chewing was observed in 3.8 % and 16.7 % of study population.

Table 4: Distribution of patients according to level of Low density lipoprotein (n=78)

LDL	Frequency	Percentage
Increased (≥130 mg/dl)	47	60.26%
Normal (<130 mg/dl)	31	39.74%
Total	**78**	**100.00%**

As seen in the above table (4), Increased (≥130 mg/dl) LDL was observed in 60.26% of study population

Table 5: Thyroid status findings amongst study population

Thyroid status	Frequency	Percent
Hypothyroidism	20	25.64
Hyperthyroidism	13	16.67
Normal	45	57.69
Total	78	100.00

As seen in the above table (5), most of the study population had Normal Thyroid status (57.69%) followed by Hypothyroidism (25.64%) and Hyperthyroidism (16.67%) and SERUM TSH was the most sensitive test for evaluation.

Table 6: Analysis of Risk Factors of STEMI with Different Levels of Thyroid

Risk Factors	Hypothyroidism		Hyperthyroidism		Normal	
	OR	P value	OR	P value	OR	P value
Diabetes	4.1	0.01	3.4	0.004	2.1	0.005
Hypertension	1.5	0.43	0.7	0.89	1.3	0.711
Dyslipidemia	0.34	0.78	0.4	0.893	1.1	0.69
Alcohol	0.6	0.69	0.3	0.632	0.7	0.87
Tobacco	0.7	0.95	0.3	0.72	0.9	0.45

As seen in the above table (6), Diabetes Mellitus was statistically significant risk factor (p value <0.05) in patients with STEMI with different levels of thyroid.

Discussion

Coronary artery disease is the leading cause of mortality and morbidity of both men and women accounting for over one third of total deaths. [23] It has reached epidemic proportion among Indians. It accounts for 1 out of 3 women death regardless of the race or ethnicity. In women, the annual mortality rate from CAD is high. [24]

Thyroid hormone exerts numerous effects on the cardiovascular system and is therefore not surprisingly, associated with several adverse consequences on it.[25] Overt and subclinical hypothyroidism, with its accompanying hypercholesterolemia and hypertension, has been found to be associated with cardiovascular disease.[26]. Variations of free T3 have been linked to coronary artery disease. Several studies have shown an association between overt and subtle thyroid function abnormalities and atherosclerosis. It remains a matter of speculation that variation of thyroid function within the normal range can lead to adverse outcome with respect to coronary artery disease (CAD) .[27]

Demographic profile

In the present study, most of the study population belongs to the age group of 40 to 50 years (43.6 %) followed by More than 60 years (38.5%) and 51 to 60 years (17.9%) with mean age of 58.12 ± 5.053 years. In the present study, most of the study population was married (91%). This findings is in agreement with the study conducted by Manish Sahni . in which mean age was 62.74 ±13.6 years and in Veena Nanjappa . in which mean age was 64.4 ±11 years.[28, 29] So as age increase risk of myocardial infarction increases in woman. This increase in incidence of IHD with age is observed in Framingham heart study.[30] Protection from IHD in younger women is due to endogenous estrogen. At the age of 60, the level of atherogenic lipids increase and risk of IHD doubles for women .[6,7]

Comorbidities

In the present study, Hypertension was the most common comorbidities amongst study population (59%) followed by Diabetes (50%). This findings is in agreement with the study conducted by Meenakshi Rana et al., in which diabetes Mellitus was statistically significant risk factor (p value <0.05) in patients with STEMI with different levels of thyroid. Women with diabetes are 3–7 times more likely to develop or die of coronary heart disease than women with-out diabetes. This is much higher than the 2- to 3-fold increased risk experienced by men with diabetes. In our study diabetes is observed as a significant risk factors in patients with STEMI with different levels of thyroid. [31]

Furthermore, Diabetes is a predictor of atypical presentation of acute myocardial infarction in women and different researches suggests that shortness of breath may be an important acute coronary syndrome symptom in women with diabetics. [32,33] These two risk factors were found in Palestinian study in 2013 in patients with CAD that showed high prevalence of hypertension and diabetes in women 74.3%, 65.7% respectively. [34]

Diabetes carries a greater risk in females, completely eliminating the ‘‘female advantage’’.[35] Diabetes removes the estrogens protective effects and eliminates the normal sex difference in the prevalence of IHD.[36] Diabetes equalises the risk of IHD between premenopausal diabetic women and non-diabetic men of same age. [37] Diabetes is associated with other IHD risk factors like obesity, dyslipidemia, hypertension, and insulin resistance. Lastly diabetes is associated with various coagulation abnormalities like endothelial dysfunction and platelet abnormalities, additional contributors to IHD. [35]

Habits

In the present study, Habits such as alcohol and Tobacco chewing were observed in 3.8% and 16.7 % of study population. Similarly, in the study conducted by Shruthi Bettegowda. in which tobacco consumption was present in 20% females either in the form of smoking or chewing.[38] Smoking increases the IHD risk in females by its synergistic action with oral contraceptive use, especially in women aged more than 35years.women with smoking attains early menopause, another IHD risk unique to females.[39,40]

Dyslipidemia

Certain lipid components or lipoproteins may pose a greater risk in women than in men and may provide a different target for risk modification. Compared with men, low-density lipoprotein (LDL) cholesterol is lower, on average, and high-density lipoprotein (HDL) cholesterol is higher in premenopausal women. After menopause, LDL cholesterol concentrations rise .

Thyroid status

In the present study, most of the study population had Normal Thyroid status (57.69%) followed by Hypothyroidism (25.64%) and Hyperthyroidism (16.67%)

In the present study, most of the study population had less than 10 days of hospital stay (78.2 %) followed by more than 10 days (21.8 %). Diabetes Mellitus was statistically significant risk factor (p value <0.05) in patients with STEMI with different levels of thyroid.

Literature shows that Thyroid hormones (TH) have sevral effects on cardiovascular system. The active hormone T3 causes tachycardia, increases contractility, cardiac output, and thus elevates consumption of oxygen and other nutrients.

However, it can also decrease systemic vascular resistance and improve the ability of diastolic relaxation, leading to a more efficient metabolic status of myocardium.

Some clinical studies with limited sample size showed low T3 levels were associated with high risk of subsequent mortality of AMI.

And in long-term cohort study, subclinical hypothyroidism has been proved to increase coronary heart diseases (CHD) risk and mortality. Wang et al concluded that as the lower FT3 level correlates with higher level of cardiac markers and lower LVEF, the hypothyroidism may be a predictor for myocardial injury in STEMI [41]

CONCLUSION: Patients with coronary artery disease especially in the presence of other risk factors should be screened for diabetes and also for thyroid dysfunction as in our study cases of Hypothyroidism was seen in 25.64% of the population under study. Hence it can be postulated that hypothyroidism may be a predictor for myocardial injury in STEMI. Here we recommend that tests for thyroid disorders in acute coronary syndrome can give predictor for risk of morbidity and mortality in those subjects.

These results also may warrant further larger study to investigate whether reversing the hypothyroidism could benefit the STEMI patients.

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