Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/18679
DOI URL: http://dx.doi.org/10.21474/IJAR01/18679

RESEARCH ARTICLE

CORRELATION OF CARDIAC MARKERS WITH THYROID STIMULATING HORMONE IN SUBCLINICAL HYPOTHYROIDELDERLY

Dr. Premjeet Kaur[1] and Dr. Amandeep Birdi[2]

1. Assistant Professor, Biochemistry Department, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab. India.
2. Assistant Professor, Biochemistry Department, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab. India.

Manuscript Info

Manuscript History
Received: 05 March 2024
Final Accepted: 09 April 2024
Published: May 2024

Key words:-
Cardiac Markers, Subclinical Hypothyroidism, Elderly

Abstract

Cardiac markers (CPK-MB and TroponinT (TnT)) are often used to differentiate between cardiac and non cardiac chest pain. Subclinical hypothyroidism (SCH) has increased incidence of cardiovascular risk factors and disease. Elderly have an increased incidence of SCH. However, no study has specifically examined the association between cardiac markers and SCH in elderly population.

Aims and Objectives: To determine the association of cardiac markers with thyroid stimulating hormone (TSH) in elderly patientswith subclinical hypothyroids and euthyroid.

Method: The present study was designed as a retrospective cross-sectional study conducted in Biochemistry department of Adesh institute of medical sciences and research (AIMSR) Bathinda from a period of May 2023 to April 2024.The data was obtained from the lab computers and the subjects were divided into four groups. Group 1 included patients who had MI and SCH. Group 2 consisted of patients who had MI and were euthyroid. Group 3 were those who presented with chest pain only (no MI) and SCH. Group 4 were those who had acute chest pain (no MI) and were found to be euthyroid. Results:Our study showed significant correlation of TSH with CPK-MB (r=0.69, p=0.001)and Troponin T (r=0.201, p= 0.04) in Group 1 while a non significant correlation was found in Group 2, CPK-MB (r=0.06, p=0.67) and Troponin T (r= 0.156, p= 0.57). There was a significant correlation of TSH with CPK-MB (r=0.71, p=0.02) and Troponin T (r=0.84, p= 0.001) in Group 3. A nonsignificant correlation was found in Group 4, between TSH and CPK-MB (r=0.116, p=0.68) and Troponin T (r= 0.001, p= 0.99).

Conclusion: Elevations of TSH levels may cause a significant rise in the cardiac markers in SCH elderly as compared to euthyroid.

Introduction:-

SCH is biochemically defined as a TSH level above the upper limit of the reference range with normal thyroid hormone levels. (1) SCH is associated with an increased risk of coronary heart disease (CHD) and mortality. (2)

Corresponding Author:- Dr. Premjeet Kaur
Address:- Assistant Professor, Biochemistry Department, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab. India.

Incidence of cardiovascular disease increases with age. At the same time TSH values are found higher with advancing age. (1). Thus, Subclinical hypothyroidism (SCH) is a common condition present in the geriatric age group that significantly affects the cardiovascular system.(3)The sensitivity and specificity of ECG are low in diagnosing acute myocardial infarction (AMI), hence the criteria for AMI were decided by the European Society of Cardiology (ESC) and the American College of Cardiology (ACC). Accordingly, a patient has to have at least two of the following: typical symptoms, a characteristic elevation pattern in cardiac markers (eg, CK-MB izoenzymes), preferably serum troponins (cTnI or cTnT), or a typical ECG trace with Q waves that indicate a diagnosis of AMI.(4) The present study tried to find association between TSH and cardiac markers in elderly subclinical hypothyroid patients presenting with chest pain and myocardial infarction.

Objectives of the study:-

Material and Methods:-

Study design:

The study was designed as hospital-based retrospective cross-sectional study conducted in Central Clinical Laboratory of Adesh Institute of Medical Sciences and Research, Bathinda, a tertiary care teaching hospital in Punjab, India, from a period of May 2023 to April 20234. All participants were in the age group of >60 years. The average age group of the subjects came out to be 70±8 years. Hence serum TSH reference rangein relation to age for the present study was 0.48 IU/L to 4.59 IU/L. (5) Subjects were divided into four groups. Group 1 consisted of 100 patients presenting with chest pain and MI and were found to have subclinical hypothyroidism. Group 2 consisted of subjectspresenting with chest pain and MI but were euthyroid. Group 3 included patients presenting with chest pain only and were having SCH. Group 4 consisted of subjects who presented with chest pain only and were found euthyroid. Both emergency and outdoor patients were included in this study.

Sample size:

The sample size was calculated based on the average prevalence rate of hypothyroidism (18%) (3) by using Cochran's formula.

$Z^2 PQ/e^2$

Where Z is Z score.

It was increased to 100 to have adequate number and to draw significant conclusion. Hence, we included 100 subjects for each group.

Data collection:

The data was collected from the previous one-year data (May 2023 to April 2024) maintained in the laboratory computer.

Sampling procedure:

Patients presenting with acute chest pain and MI with SCH or euthyroidswhose cardiac markers and TSH available in the records were enrolled for study analysis.

Sample estimations:

Cardiac markers were analysed by pocttechnique. The thyroid function tests were estimated by chemiluminescence assay (Maglumi 2000 Fully automated analyzer).

Inclusion Criteria:

Patients >60 years of age presenting with acute chest pain or MI or both, having SCH OR euthyroid.

Exclusion criteria:

Patients with history of myocarditis, cardiomyopathies, arrhythmias, valvular heart disease cardiac contusion, renalfailure, sepsis, anemia, hypotension, hypoxia, andnoncardiac surgery were excluded.

Statistical analysis:

Data was analyzed using SPSS software. Pearson's correlation was calculated. The data was presented as mean ± SD. A p value of < 0.05 was taken as statistically significant.

Results:-

There was no significant difference between age and gender of the groups. Average age group of the subjects was 70 ±8 years.The present study showed a non significantly high (r=0.268, p=0.03) levels of TSH in cases (Group 1&3) (90.9 ± 6.6 uIU/ml) as compared to the controls Group 2&4) (1.6 ± 0.8 uIU/ml).Our study showed significant correlation of TSH withCPK-MB (r=0.69, p=0.001)and Troponin T (r=0.201, p= 0.04) in Group 1 while a non significant correlation was found in Group 2, CPK-MB (r=0.06, p=0.67) and Troponin T (r= 0.156, p= 0.57). There was a significant correlation of TSH with CPK-MB (r=0.71, p=0.02) and Troponin T (r=0.84, p= 0.001) in Group 3. A nonsignificant correlation was found in Group 4, between TSH and CPK-MB (r=0.116, p=0.68) and Troponin T (r= 0.001, p= 0.99). (Table 1 and 2)

Table 1:- Correlates the levels of CPK-MB, TnT and BNPin Group 1and2.

Variables		TSH in Group 1	TSH in Group 2
CPK-MB	r	0.69	0.06
	p	0.001	0.67
TnT	r	0.21	0.15
	p	0.04	0.57
BNP	r	0.64	0.01
	p	0.001	0.62

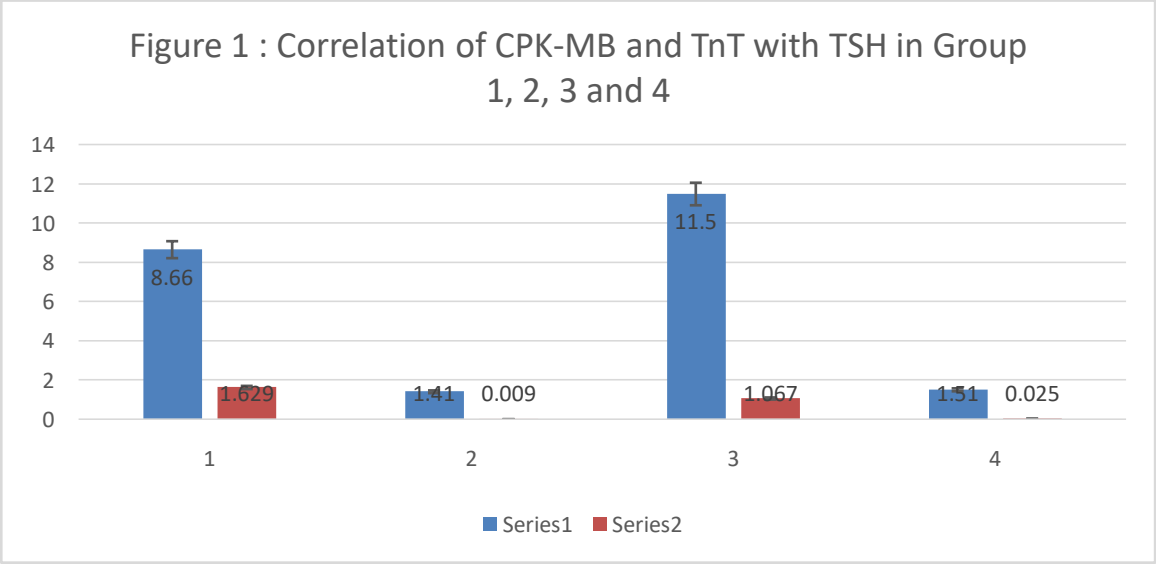
r is the correlation coefficient, p is the values obtained from Spearman correlation analysis, $p<0.05$ is considered statistically significant.

Table 2:- Correlates the levels of CPK-MB, TnT and BNPin Group 3 and 4.

Variables		TSH in Group 3	TSH in Group 4
CPK-MB	r	0.71	0.11
	p	0.02	0.68
TnT	r	0.84	0.001
	p	0.001	0.99
BNP	r	0.13	0.08
	p	0.58	0.55

r is the correlation coefficient, p is the values obtained from Spearman correlation analysis, $p<0.05$ is considered statistically significant.

Figure 1:-



Discussion:-

There was no significant difference in age and gender ratio in cases and controls. The present study showed a nonsignificant (r=0.04, p=0.65) elevation in the levels of TSH in subclinical hypothyroid patients (7.9 ± 1.9 uIU/ml)

as compared to euthyroid subjects (2.0 ± 1.0 uIU/ml). Similar results were found byC.Baumgartner et. Al (6). Reference range for TSH is 0.48 IU/L to 4.59 IU/L. (5). Our study showed significant correlation of TSHwith CPK-MB (r=0.69,p=0.001) Troponin T (r=0.201, p= 0.04)and BNP (r= 0.64, p=0.001) in Group 1 while a non significant correlation was found in Group 2, CPK-MB (r=0.06, p=0.67) Troponin T (r= 0.156, p= 0.57) and BNP (r= 0.07, p=0.62). This shows that slight elevations of TSH levels causes a significant rise in the cardiac markers in SCH as compared to euthyroid.

Though a large amount of data is available which gives an explanation on the association of the cardiac functions and subclinical hypothyroidism. (1,5,7,8) Another viewpoint of our study can be, despite the nonsignificant difference in the levels of TSH in pairs of group 1& group 2 and group 3 & 4, there exists a significant rise in the levels of the cardiac markers. These results may point towards a need for revised reference ranges for the cardiac markers with respect to SCH in elderly in cases of acute chest pain or MI in order to reduce the over diagnosis of MI patients based on cardiac markers.

The dimeric enzyme, consisting of two subunits, M and B, has three isoenzymes: CK-BB (CK1), CK-MB (CK2), and CK-MM (CK3). CK-MB can be found in the heart, skeletal muscle, small intestine, diaphragm, uterus, tongue, and prostate.Therefore, its increasing level during trauma and inflammation reduces its specificity. Moreover, it cannot detect minor myocardial damage, due to its high molecular weight. (4)

One of the conditions in which CK-MB is false positive in diagnosis of AMI is hypothyroidism. It can cause false-positive results in CK-MB measurements. Therefore, this condition should be considered when using CK-MB as a biomarker in the diagnosis of AMI. (9)

There are many proteins released into the circulation by the cardiac system, such as myoglobin, BNP, TnI (blocking actin–myosin interaction), and TnT (bound to tropomyosin). cTn has many isoforms specific to tissue. (4)

The amount of cTnpresent in the cytosolic pool is similar to the amount of CK-MB, but there is also a significant amount of cTn in the contractile apparatus. Therefore, the amount of cTn per gram of myocardium is 13–15 times greater than the amount of CK-MB. This explains the higher sensitivity of cTn compared with CK-MB in the early period and the elevated level of cTn in peripheral blood despite the normal level of CK-MB after myocardial tissue damage. The reason for the long-lasting elevation is the continuation of the release of cTn from the contractile apparatus in the late period. (10) (11)

Elevated cardiac troponin (representing true myocardial injury) is present in several cardiac and noncardiac conditions in the absence of acute MI. Heterophile antibodies are widely accepted to be risk factors for true false positive troponin results in the absolute absence of myocardial injury. In addition to interfering with troponin assays, heterophile antibodies can also interfere with thyroid function tests, hormones, and tumor markers. Therefore, elevation of troponins should not always be interpreted in favor of coronary ischemia. (12,13)

Limitations of the study:
Our study is just a proposed conclusion on the findings obtained, morelarge-scale detailed studies may be required to prove the facts.

Conclusion:-

Our study is a significant reminder of the importance behind consideration of impact of high TSH levels in elderly SCH on cardiac markers.

Conflict of interest:
Nil.

Ethical clearance:
The approval from the institutional ethical committee was not required.

Source of funding:
Nil.

Data Availability:
Data included within this article.

Authors' Contributions:
Dr Premjeet Kaur: Designed the study, retrieved literature, extracted data and wrote article.

References:-

1.Maja Udovic, Raul Herrera Peña, BhargaviPatham. Hypothyroidism and the heart. MDCVJ.2017, XIII (2):55-59.
2.Jing Sun, Liang Yao, Yuan Fang et al. Relationship between Subclinical Thyroid Dysfunction and the Risk of Cardiovascular Outcomes: A Systematic Review and Meta-Analysis of Prospective Cohort Studies. Int J Endocrinol. 2017:2017:8130796. doi: 10.1155/2017/8130796
3.PriyankaPandey, Ana ParchiaFranchini et at. Subclinical hypothyroidism in geriatric population and its association with heart failure. Cerus. 2021.13(4)e14296.
4.Suleyman Aydin, KaderUgur, SunaAydin, İbrahimSahin, MeltemYardim. Biomarkers in acute myocardial infarction: current perspectives. Vasc Health and Risk Manag. 2019,15:1-10.
5.OwainLeng and Salman Razvi. Hypothyroidism in the older population. Thyroid Research. 2019.12;2:1-10. ://doi.org/10.1186/s13044-019-0063
6.Christine Baumgartner, Bruno R da Costa, Tinh-Hai Collet, Martin Feller, Carmen Floriani, Douglas C Bauer et.al. Thyroid Function Within the Normal Range, Subclinical Hypothyroidism, and the Risk of Atrial Fibrillation. Circulation. 2017 Nov 28;136(22):2100-2116
7.Meng Y, Zhao T, Zhang ZY, Zhang DK. Chin. Association between sub-clinical hypothyroidism and heart failure with preserved ejection fraction. Med J (Engl) 2020; 133:364–366.
8. Razvi S, Jabbar A, Pingitore A, Danzi S, Biondi B, Klein I, et al. Thyroid hormones and cardiovascular function and diseases. J Am Coll Cardiol. 2018; 71:1781–96. https://doi.org/10.1016/j.jacc.2018.02.045.
9.Kim S, Um TH, Cho CR, Jeon JS. False-positive elevation of creatine kinase MB mass concentrations caused by macromolecules in a patient who underwent nephrectomy for renal cell carcinoma. Ann Lab Med. 2014;34(5):405–407.
10.Shah AS, McAllister DA, Mills R, et al. Sensitive troponin assay and the classification of myocardial infarction. Am J Med. 2015;128(5):493–501.
11.Thygesen K, Alpert JS, Jaffe AS, et al. Fourth universal definition of myocardialinfarction (2018). J Am Coll Cardiol2018; 72:2231–64.
12.McCarthy CP, Raber I, Chapman AR, et al.Myocardialinjury in the era of highsensitivity cardiac troponin assays: a practical approach for clinicians. JAMA Cardiol. 2019; 4:10344–42.
13.James L. Januzzi, Cian P. McCarthy. Cardiac Troponin and theTrue False Positive. JACC: CASE REPORTS, VOL. 2, NO. 3,2020:461 – 3.