FREQUENCY OF ELEVATED HIGH-SENSITIVITY TROPONIN T AND ASSOCIATED CARDIAC PREDICTORS IN HIGH-GRADE ATRIOVENTRICULAR BLOCK PATIENTS WITH NON-ISCHEMIC ECG CHANGES

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ABSTRACT

Objective: To assess the frequency of raised hs-TnT levels in patients with non-ischemic high-grade atrioventricular (AV) blocks and also to assess the cardiac risk factors in these patients.
Study Design: Prospective, cross-sectional analytical study.
Place and Duration of Study: This study conducted in the emergency department of Punjab Institute of cardiology, Lahore Pakistan, from Mar 2017 to Jun 2018.
Patients and Methods: Patients with advanced 2nd degree and 3rd degree AV blocks, diagnosed on a 12-lead electrocardiogram (ECG), and no ischemic changes on the ECG were included. hs-TnT levels were done for all patients. All patients filled a preformed questionnaire. Data were entered and analyzed using IBM-SPSS-23.
Results: Of the 138 patients recruited, 60.9% were male patients. The mean age of the study participants was 63.13 ± 14.73 years. Syncope was the most common presentation (78.3%). hs-TnT levels were elevated in 55.8% participants. Elevated Trop T levels were more common in male patients (63.6%). Elevated Trop T levels were significantly associated with co-morbidities including diabetes, hypertension, and smoking, and clinical presence of chest pain and syncope (p>0.05).
Conclusion: Patients with non-ischemic high-grade AV blocks present with syncope. Even in absence of ischemia, troponin levels were seen in many participants. Elevated Trop T levels cannot be considered pathognomonic for myocardial ischemia.

Keywords: Atrioventricular block, High-grade heart block, Elevated troponin T, Non-ischemic heart block.

INTRODUCTION

High-grade atrioventricular (AV) blocks include advanced 2nd degree AV block and 3rd degree AV block. Advanced 2nd degree AV block is when three or four or more consecutive P waves are finally followed by a QRS complex. It can progress into 3rd degree or complete heart block in which the atria and ventricles have independent, uncorrelated contractions and the faster P waves show no relation to the relatively slower QRS complexes[1].

Though there are several systemic etiologies of AV block. Acute coronary syndrome (ACS) including myocardial ischemia/infarction (MI) remains the most frequently encountered cause of ischemic AV blocks[2]. Almost ten percent of all acute myocardial infarctions (AMI) are complicated by complete AV block[3]. Ischemic AV blocks are more frequent in inferior wall AMI and AV blocks in anterior wall MIs are more commonly associated with prolonged hospital stay and mortality[4]. Some patients do respond to atropine; however, in most cases, temporary or permanent pacemaker is required[3].

Non-ischemic AV blocks are commonly caused by fibrosis of / degenerative changes in the His-Purkinje system[2]. Non-ischemic AV blocks are also seen in dilated cardiomyopathy (DCMP)[5]. Complete heart blocks mostly present with syncope, palpitation, shortness of breath (SOB), chest pain, weakness, and dizziness[6].

Over time, high-sensitivity Troponin T (hs-TnT) levels have sustained their position as a sensitive and specific indicator of myocardial injury, and have become a mandatory feature in diagnosing AMI with ischemic ECG changes[7]. However, raised troponins are not patho-

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Received: 05 Dec 2018; revised received: 23 Dec 2000; accepted: 27 Dec 2018

gnomonic for ischemia and numerous studies have reported elevated hs-TnT levels in non-ischemic cardiac injuries[8-10].

The objective of this study was to establish a relationship between raised troponin T levels and non-ischemic high-grade heart blocks (advanced 2nd degree and 3rd degree) and also to assess the cardiac risk factors in these patients.

PATIENTS AND METHODS

It was a cross-sectional analytical study conducted in the emergency department of Punjab Institute of cardiology, Lahore Pakistan, from 1st March 2017 till 30th June 2018. A sample of 140 was calculated by using WHO software "Sample Size Determination in Health Studies"[11].

The study was approved by the hospital ethics committee and informed consent was obtained from each patient. All patients with AV blocks were evaluated. Patients with advanced 2nd degree and 3rd degree (complete) AV block were included in the study. AV blocks were diagnosed on a 12-lead ECG.

Patients with 1st degree or non-advanced 2nd degree AV blocks, patients with other causes of bradycardia (heart rate less than 60 beats per minute) such as sinus bradycardia, junctional bradycardia, patients with history of ischemic heart disease (IHD) or AV nodal blocking drugs, and hyperkalemia and hypermagnesemia, were excluded from the study in order to reduce bias towards causes of AV block other than degenerative changes in the AV node or bundle branches. Patients with ischemic changes on the ECG were also excluded.

No new ST segment elevation or depression, with or without T wave inversion was taken as non-ischemic ECG. Elevated hs-TnT levels were taken as 14ng/L or above as per the consensus statement by European Society of Cardiology, American College of Cardiology Foundation, American Heart Foundation and World Heart Federation in 2011[12].

Data were stored and analyzed using IBM-SPSS version 23.0. Pearson Chi Square test was used to see the association of Troponin T with indicators and risk factors of cardiovascular disease including age, gender, smoking status and co-morbidities. The *p*-value ≤0.05 were considered significant.

RESULTS

A total of 138 patients with high-grade AV block and non-ischemic ECG changes were recruited during the study period. Their mean age was 63.13 ± 14.73 years; and 55.8% of the study sample was of age more than 60 years. There were 84 (60.8%) male patients and 54 (39.1%) female patients in this study. Hyper-tension was present in 95 (68.8%) participants, diabetes in 52 (37.6%), hyperlipidemia in 88 (63.7%), and 58 (42.0%) participants were current smokers. The socio-demographic characteristics and comorbidity status of the study participants are shown in table-I.

Overall, there were 13 cases (9.4%) of advanced 2nd degree AV block and 125 cases (90.6%) of 3rd degree AV block. There were 108 (78.3%) patients presenting with syncope, 34 (24.6%) presenting with chest pain, and 20 patients (14.5%) presented with shortness of breath as their predominant complain. Gender-wise distribution of the degree of heart block and clinical presentation in the study participants is shown in table-II.

hs-TnT levels were elevated (≤14ng/L) in 77 patients (55.8%) of the study participants. Out of these participants, 49 (63.6%) were men and 28 (36.3%) were women. However, there was no statistically significant correlation between gender and hs-TnT levels. The co-morbidity status of patients with elevated and non-elevated hs-TnT levels is shown in table-III. Elevated hs-TnT levels were significantly associated with hypertension, diabetes mellitus and current smoking.

When hs-TnT levels were correlated with clinical characteristics of the patients, a significant association was seen with elevated Trop T and syncope and chest pain (table-IV).

DISCUSSION

With a mean age of 63.13 ± 14.73 years, there were 60% male patients in this study. Hypertension was the most common co-morbidity (68%). Complete heart block was more common (90%). hospital outcome. An incidence of 0.17% of MI is reported with a 30-day follow-up of patients with non-ischemic ECG changes at the presentation[8].

In this study raised levels of hs-TnT were seen in 55.8% with non-ischemic cardiac injuries;

Table-I: Gender-wise distribution of socio-demographic characteristics and co-morbidity status of the study sample (n=138).

	Male Patients (n=84)	Female Patients (n=54)	*p*-value
Age (Mean ± SD)	62.04 ± 15.68	64.83 ± 13.10	0.28
Hypertension*	48 (57.1%)	47 (88.7%)	0.001*
Diabetes mellitus	26 (31.0%)	26 (48.1%)	0.04*
Smokers	52 (61.9%)	6 (11.1%)	0.001*
Hyperlipidemia	3 (3.6%)	2 (3.7%)	0.97

*p-value ≤0.05 will be considered as significant

Table-II: gender-wise distribution of degree of heart block and clinical presentation (n=138).

Degree of heart block		Male Patients (n=84) n(%)	Female Patients (n=54) n(%)	*p*-value
Advanced 2nd degree heat block		7 (8.3)	6 (11.1)	0.59
Complete heart block		76 (90.5)	46 (85.2)	0.34
Clinical presentation	Syncope	66 (78.6)	42 (77.8)	0.91
	Chest pain	25 (29.8)	9 (16.7)	0.08
	Shortness of breath	8 (9.5)	12 (22.2)	0.04*

*p-value ≤0.05 will be considered as significant.

Table-III: Correlation of co-morbidity status and Troponin T levels of the study participants (n=138).

hs-TnT levels	Elevated	Not Elevated	*p*-value
Hypertension* (n=95)	61 (79.2)	34 (56.7)	0.005*
Diabetes mellitus* (n=52)	38 (49.4	14 (23.0)	0.001*
Hyperlipidemia (n=88)	5 (6.5)	0 (0.0)	0.043*
Current smokers* (n=58)	39 (50.6)	19 (31.1)	0.021*

*p-value ≤0.05 will be considered as significant

Table-IV: Association of clinical characteristics with Troponin T levels of the study sample (n=138).

Clinical characteristics	hs-TnT levels		*p*-value
	Elevated (n=77)	Not Elevated (n=61)	
	n (%)	n (%)	
Chest Pain	30 (39.0)	4 (6.6)	0.001*
Shortness of breath	11 (14.3)	9 (14.8)	0.94
Syncope	54 (70.1)	54 (88.5)	0.01*
2nd degree advanced AV Block	7 (9.1)	6 (9.8)	0.88
3rd degree AV Block	68 (88.3)	54 (88.5)	1

*p≤0.05 was considered significant using pearson chi square test.

hs-TnT levels were elevated (≤14ng/L) in 55% of the study participants. Elevated troponin T levels were significantly associated with co-morbidities including diabetes, hypertension, and smoking, and clinical presence of chest pain and syncope.

Numerous studies have, however, reported underlying completed heart blocks in settings of AMI[11,13]. However, this study did not follow its patients to comprehend their recovery course and syncope was the most common presentation followed by chest pain and SOB. In a study conducted in United Kingdom among patients with suspected ACS, elevated TnT levels were found in 30.6% patients out of which 37.6% were found to have no ischemic injury. They reported SOB as the common presentation in non-ischemic TnT positive patients followed by collapse and chest pain[9]. In a population-based study in Sweden, chest pain was seen in 13% and syncope

was seen in 1.2% patients with non-ischemic elevated hs-TnT levels[8].

In another recent comparison of patients with ischemic and non-ischemic complete AV block, 77.4% were non-ischemic ECG changes. Diabetes and hypertension were more common in non-ischemic patients and there were more current smokers in the non-ischemic group. Mortality rate was worse in the ischemic group and almost all of the non-ischemic patients required pacemaker placement as treatment modality[6].

The association of diabetes has already been established with complete heart block[14-18]. This study showed 40% of non-ischemic AV block patients to be diabetics. Furthermore, diabetes also showed a significant association with raised TnT levels in these patients. Further studies, based on larger populations, are needed to justify these results.

This study put forward future propositions of long-term studies that follow high-grade heart block patients with non-ischemic cardiac injury to comprehend their hospital outcome as well as long-term mortality. We also purpose clinicians to experiment more on the association between raised troponins and non-ischemic heart blocks.

CONCLUSION

Patients with non-ischemic high-grade AV blocks present with syncope. Even in the absence of ischemic ECG changes, troponin levels were seen to be raised in more than half of the population. Raised troponins were associated with increasing smoking, diabetes, hypertension, syncope, and chest pain. Further studies with long-term follow up and larger study population should be conducted to support these results.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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