Gender-Related Differences of Cardiac Troponin-I Levels in Patients with Acute Myocardial Infarction at Time of Acute Chest Pain

Abstract

Background: Cardiac Troponins-I (CTNI) are myoregulatory polypeptide that control the of actin-myosin interface, considered specific to cardiomyocyte**.** Age and sex variances in the extent of CTNI levels have arisen a recent debatable emphasis. Acute myocardial infarction (AMI) is the principaletiology of mortalityuniversally, and females'death for in the USA roughly 1/4th women deaths. Existing revisions do not display a reliable clinical power of sex-specific CTNI 99th centiles, actually might mirror procedural aspects. Nevertheless, from a biochemicalviewpoint, the trends of sex-specific CTNI 99th centiles seem sensible for the ruling-in of AMI. Vulnerable females may be missed when applying male sex-specific threshold.

This study aimed to determine whether gender differences in CTNI exist in patients with AMI presented with chest pain.

Methodology: The study was a cross-sectional, single-center, included 236-patients with AMI diagnosis by cardiologists at Merjan teaching hospital during the period from April to July 2020 from patients attending the hospital for cardiac consultation complaining of acute chest pain suggestive of AMI. Blood analysis had initiated at time of admission included serum creatinine, blood urea, R/FBS, WBCs, PCV, and serum CTNI. A *p*-value below 0.05 specifies statistical significance. All statistical bioanalyses had performed by IBM-SPSS, version-25 for Windows.

Results: The mean age of participants was 67.5years, the men were dominant 76.2%. The incidence of DM and hypertension were significantly high and 24.5% of the patients were current smokers. Biochemical serum analysis revealed mean creatinine, urea, sugar, and STI values were 79.8±4.2mmol/l, 15.9±1.7mmol/l, 10.9±0.9mmol/l, and 7.9±0.6ng/ml separately. Both hypertension and smoking were significantly (*p*-0.001) more among males compared to the females, which not the case for the prevalence of DM. The males were heavier significantly than females (*p*-0.001). Almost, there was no impact of gender on most of other study variables other than serum TNI levels, which were significantly higher among the males (p-0.001).

Conclusion: In patients with AMI presented with acute chest pain, the routine of CTNI in the diagnosis of AMI is based on patient's gender. The application of gender-dependent cutoff levels for CTNI analyses appears to be highly suggested.

Keywords: acute myocardial infarction, troponin, chest pain.

Introduction

Cardiac Troponins-I (CTNI) are myoregulatory polypeptidethat control the of actin-myosin interface, considered specific to cardiomyocytebecauseno other isoform of this portion has even been found in other muscular tissue. CTNI is independently measured by monoclonalantibodies inbiochemical assays specific (nearlyentirely) to cardiomyocyte-damage. Hence, they are consideredas gold-

standard bioindicator of cardiacinjury and indorsedby contemporary guidelines for detecting of AMI and myocardialdamage[1, 2].
Acute myocardial infarction (AMI) is the principaletiology of mortalityworldwide[3-7], and death for females in the USA approximately 1 inevery 4 women deaths[8]. Acurrentrevision verifiedthat typicalCTNI criteria unable to distinguish one/5thAMIs in women[9-11].
Age and alterations in the extent of CTNIconcentrations have arisen as a new debatable emphasis[12, 13].Researches on experimental animals reveals higher serum CTNI inmalesin comparison to females of the identical species[14]. Similar works exposed that women with AMI frequently havelower CTNIlevels compared with men[15]. Existing revisions do not display a reliableclinical power of sex-specific CTNI 99thpercentiles, actuallymight mirror proceduralfeatures[1]. Nevertheless,from a pathophysiological aspect, the trends of sex-specific CTNI 99th centiles seem sensible for the including ofAMI[15].Generally, these data propose that vulnerablefemales may bemissed when applying male sex-specific threshold.Thus, those femalewithclassical TNIlevelsstandardsof AMI have developed a greater extent of cardiacinjury[8].
In the existing work, our objective was todetermine whether gender differences in CTNIexist in patients with acute myocardial infarction presented with chest pain.

Methodology and subjects

The study was a cross-sectional, single-center, included 236-patients with a definite AMI diagnosis by cardiologists at Merjan teaching hospital during the period from April to July 2020 from patients attending the hospital for cardiac consultation complaining of acute chest pain suggestive of AMI. Those with symptom onset more than 24hrs had excluded. An informed consent initiallyhad obtained from all patients (or attendants), and the whole workhad agreed by the local committee for research ethics at the hospital.

Biochemical analysis had initiated at time of admission where serum creatinine, R/FBS and blood ureahad completed based onlocal available conventional methods. CTNI had assessed by CALBIOTECH® ELISA assay kit. Hematological findings of WBCs and PCV were taken from patients'archives. The whole biochemical analyses had finalized as quantified by the industrial conventions.

Statistical analysis
Comparisons of continuous data (given as mean±SD) hadfinishedbystudents' *t*-tests for independentvariables. A *p*-value of below 0.05 specifies statistical

significance.Allstatistical evaluationshadmadeby SPSS, version-23for Windows.

Results

Subjects' characteristics (table-1)

The mean age of participants was 67.5years (31- 5years), the men were dominant 76.2%, while the mean BMI was 26.3 kg/m^2. The incidence of diabetes mellitus (DM) and hypertension were significantly high(48.3% and 44.1%) respectively. The current smokers represented 24.5% of the total. The mean BMI, PCV, WBC were 26.9±7.7 kg/m^2, 42.1±0.4, and 10.3±0.3 individually. Biochemical serum analysis revealed mean creatinine, urea, sugar, and STI values were79.8±4.2mmol/l, 15.9±1.7mmol/l, 10.9±0.9mmol/l, and 7.9±0.6ng/ml separately.

Table-1: Demographic characteristics of the studied subjects

	Minimum	Maximum	Mean±SD
Age	31	95	67.5±0.9
Male sex (N %)		180 (76.2)	
Hypertension (N %)		114 (48.3)	
Diabetes mellitus (N %)		104 (44.1)	
Current smokers (N %)		58 (24.6)	
BMI (kg/m^2)	17.9	51.9	26.9±7.7
Packed Cells Volume	30.0	54.0	42.1±0.4
Leukocytes Count x 10^3	4.0	25.2	10.3±0.3
S. Creatinine (mmol/l)	3.5	569.0	79.8±4.2
Bl. Urea (mmol/l)	2.8	124.0	15.9±1.7
Random/Fasting BS	3.3	154.0	10.9±0.9
S. Troponin I (ng/ml)	0.09	38.0	7.9±0.6

Gender variation of the risk factors (table-2)

Both hypertension and smoking were significantly (*p*-0.001) more among males compared to the females, which not the case for the prevalence of DM. The males in this study were heavier significantly than females (*p*-0.001).

Table-2: Gender variation of the risk factors among the studied subjects

		Sex		Total	Significance
		Females	Males		
Diabetes mellitus	Non- Diabetic	32 (24)	100 (75%)	132	0.47
	Diabetic	24 (23.1)	80 (76.9)	104	
Total		56 (23.7)	180 (76.3)	236	
Hypertension	Non-Hypertensive	16 (13.1)	106 (86.9)	122	0.001
	Hypertensive	40 (35.1)	74 (64.9)	114	
Total		56 (23.7)	180 (76.3)	236	

Smoking	Nonsmokers	34 (43.6)	44 (56.4)	78	0.001
	Ex-smokers	10 (10)	90 (90)	100	
	Smokers	12 (20.7)	46 (79.3)	58	
Total		56 (23.7)	180 (67.3)	236	
BMI		21.8 ± 2.6	29.3 ± (7.8)		0.001

Gender variation of the study variables (table-3)

There was no impact of gender on most of the study variables other than PCV was less in females (p-0.01), and blood urea with serum TNI levels, which were significantly higher among the males (p-0.001).

Table-3: Gender variation of the study variables

	Sex	Mean± SE	Significance
Age/years	M	58.7±0.9	0.12
	F	61.9±1.9	
Packed Cells Volume	M	42.8±0.4	0.001
	F	40.0±0.6	
Leukocytes Count x 10^3	M	10.5±0.3	0.2
	F	9.6±0.5	
S. Creatinine	M	80.2±5.3	0.87
	F	78.6±4.9	
Bl. Urea	M	17.6±2.1	0.01
	F	10.3±1.9	
F/RBS	M	9.6±0.4	0.16
	F	11.0±3.8	
S. Troponin I	M	8.8±0.6	0.001
	F	4.9±0.9	

Discussion:

The current research exposed that CTNIvalues were significantlylower in femalescompared to malesamongstsubjects diagnosed asAMIand presented with acute chest pain.The principles of"the universal definition of AMI analyses" arelargely based on CTNIvalues. Even though the CTNIassaysspecify a significant changes in the cutoff values in males compared to females, there was no agreement on the use of sex-specific limits ofanalyticaldecision [1].Given that the absolute concentration of CTNI is persuasive inguiding therapeuticprotocol, we recommend that lower CTNI may subsidize application of less aggressive therapiesin females.

The higher CTNI levels among males exposed by the present study agreed with several recent epidemiological and experimental researches [16].In an Asian and large American cohorts, the authors reported same results of our study [17,

18]. However, in another study, the authors did not observe a significant variation in the assay or specificityof serum CTNI by gender[19].

There is growing evidence revealed gender-related changes in plasmaCTNI valuesowing to lower 99th URLstandards in females than males[20].It is expected that this difference in CTNI levels might be due to different cardiac mass[21], variability of cardiomyocyte renewal [22].

A current survey confirmed intra-individual biochemical disparity of CTNI inhealthy adults withthose with chronic renal disorders is around 8-10%, while theinterindividualvariation is around 3-times higher, if assessedusing a highly-sensitive technique [23]. These statistics open the enquiryhow to interpret variations greater than the limit of detection value, estimated by highly-sensitiveassays, which still are within the 99th URL level inpatients with AMI[22, 24].As well, disparity in patients'selection criteria (among the studies) regarding concomitant risk factors, includingDM, arterial hypertension, overweight, andsmoking habit which were relatively high in this study.

Conclusion:

This study underline that in patients with AMI presented with acute chest pain, the routineof CTNI for the diagnosis of AMI is based on patient's gender.Application of gender-dependent cutoff levels for CTNIanalysesappears to be highly suggested but further investigations are desirableto estimateprobable cutoff standards to adjustanalyticprecision of CTNI for males and females.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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