ISSN (Print): 2663-9491 ISSN (Online): 2789-6897

Original Article

Association of Cardiac Troponin I With Different Stages of Chronic Kidney Disease Among Patients with & without Acute Myocardial Infraction: A Cross Sectional Study at DMCH

DOI: dx.doi.org

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Received: 06 APR 2022
Accepted: 19 APR 2022
Published: 20 APR 2022

Published by:
Sheikh Sayera Khatun Medical College Gopalganj, Bangladesh

ABSTRACT

Objective: *Chronic kidney disease (CKD) is a major risk factor for cardiovascular disease (CVD), contributing to substantial amount of mortality and morbidity. Cardiac troponin I has been in use as a biomarker to identify patients with acute myocardial infarction, but among CKD patients, elevated troponin I levels have been found frequently in the absence of acute myocardial infarction. Present study aimed to evaluate the association between cardiac troponin I levels with different stages of chronic kidney disease among patients with & without acute myocardial infraction.* ***Methodology:*** *A cross-sectional study was conducted among 72 diagnosed cases of CKD patients from Department of Nephrology, Dhaka Medical College Hospital, Dhaka, from January 2015 to December 2015. Purposive sampling technique was used. Both male and female patients with different stages of CKD with symptoms of acute coronary syndrome were enrolled in the study. Ethical clearance was obtained from the Institutional Review Board (IRB) of Dhaka Medical College Hospital (DMCH). Selected CKD patients' CBC and serum troponin I were done and recorded. ECG for all the patients were also performed and the results were recorded.* ***Result:*** *Mean age of the study population was 46.9 ± 12.9 years. Male gender was predominant among the study population (72.2%). Glomerulonephritis (45.8%) was the predominant cause of CKD among study population. As for stages of CKD, 41.7% respondents were from stage 5, followed by 38.9% from stage 5D, 11.1% from stage 4 and 8.3% from stage 3. According to ECG report, 27.8% had acute MI. For respondents with a normal ECG report, mean serum troponin I was 24.3 ± 27.2 ng/dl, and for respondents showing acute MI on ECG report, mean serum troponin I was 4585.5 ± 10978.3 ng/dl. There was statistically significant (p <*

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0.05) difference between these two groups. Patients with CKD stage 3 had mean serum troponin I of 1.49 ± 2.36 ng/dl, CKD stage 4 had mean serum troponin I of 3.69 ± 3.26 ng/dl, CKD stage 5 had mean serum troponin I of 15.44 ± 20.49 ng/dl and CKD stage 5D had mean serum troponin I of 44.84 ± 27.16 ng/dl. Statistically significant (p < 0.05) difference was found among four groups. ***Conclusion:*** *Serum troponin I is elevated in CKD patients with or without acute coronary syndrome. Serum troponin I is markedly raised in CKD patients with acute coronary syndrome and is comparatively more raised in advanced stages of CKD than early stage in CKD patients without acute coronary syndrome.*

Key Wards: *Cardiac Troponin I, Chronic Kidney Disease, Acute Myocardial Infraction.*

(The Insight 2021; 4(2): 154-160)

INTRODUCTION

Chronic kidney disease (CKD) is one of the leading causes of mortality and morbidity worldwide, with a prevalence rate of 9-13% and is an independent risk factor for cardiovascular disease (CVD) [1,2]. All stages of CKD are associated with increased risks of cardiovascular diseases[1]. Among patients with CKD, cardiovascular disease causes significant amount of morbidity and mortality and whereas the impaired renal function itself constitutes as a risk factor for CVD [3]. Patients with CKD are at high risk for acute coronary syndrome including acute myocardial infarction and cardiovascular death, as they are predisposed to accelerated atherosclerosis compared to general population [3–5]

For patients with normal renal function, the development of cardiac troponin I have helped the diagnosis and treatment of acute myocardial infarction. Because of their near absolute myocardial tissue specificity, as well as their ability to detect microinfarction despite normal creatine kinase MB levels, cardiac troponin I has become the preferred cardiac biomarker for the diagnosis of acute myocardial infraction.[6,7]. Although cardiac troponin I has been in use as a biomarker to identify patients with acute myocardial infarction, even in patients with CKD [8,9]. studies have shown elevated troponin I levels frequently in the absence of acute myocardial infarction, among CKD patients [6,10,11]. complicating the interpretation of cardiac troponin I levels among CKD patients and questioning its reliability as biomarker for detecting acute myocardial infraction. As a result, these elevations have often described as nonspecific for myocardial injury and disregarded by clinicians. Increased troponin I levels were also identified as predictors for poor cardiovascular outcome among CKD patients [12,13].

Studies have shown a clear association between elevated cardiac troponin I and myocardial infraction, but patients with CKD have been underrepresented in these studies [14,15]. Present study aimed to evaluate the association between cardiac troponin I levels with different stages of chronic kidney disease among patients with acute myocardial infraction.

MATERIALS & METHODS

A cross-sectional study was conducted among 72 diagnosed cases of CKD patients from Department of Nephrology, Dhaka Medical College Hospital, Dhaka, from January 2015 to December 2015. Purposive sampling technique was used. Both male and female patients with different stages of

CKD with symptoms of acute coronary syndrome were enrolled in the study. Patients with kidney damage evidenced by structural or functional abnormalities of kidney with or without reduction of GFR persists for > 3 months or reduction of GFR < 60 ml/min/1.73 m^2 body surface area with or without evidence of kidney damage persists for > 3 months, were diagnosed as CKD patients [16]. Patients with AKI, with history of hemodialysis and peritoneal dialysis or transplant, serum TG level > 400 mg/dl or on anti-lipid therapy were excluded from the study.

Ethical clearance was obtained from the Institutional Review Board (IRB) of Dhaka Medical College Hospital (DMCH). The purpose and procedure of the study was properly explained to all patient and or their guardian and written informed consent was taken from each participant during enrollment to the study. Patient confidentiality was strictly maintained. All of the patient's data, including case history, clinical and pathological findings, treatment plan and follow-up of the patients were recorded. Patients were on general dietary restriction applicable to CKD patients. Selected CKD patients' CBC and serum troponin I were done and recorded. ECG for all the patients were also performed and the results were recorded.

All relevant data were collected using research instruments through face-to-face interview and pre-design data collection sheet. All data were compiled and processed with the help of statistician and were analyzed using windows-based computer software with Statistical Packages for Social Sciences (SPSS-16) (SPSS Inc, Chicago, IL, USA). Quantitative data were expressed as mean & standard deviation. Categorical data were expressed as frequency and percentage. Comparison of continuous variables were done by independent sample t-test & ANOVA. For all statistical test, p-values less than 0.05 was considered significant.

RESULT

Mean age of the study population was 46.9 ± 12.9 years (Table I). Male gender was predominant among the study population (72.2%).

Table I: Descriptive statistics of the study population (n = 72).

Variables	Data
Age Group in Years	
<30	10 (13.9%)
31-50	37 (51.4%)
51-70	24 (33.3%)
>70	1 (1.4%)
Mean Age in Years	46.9 ± 12.9
Sex	
Male	52 (72.2%)
Female	20 (27.8%)

Data presented as n (%) or mean ± SD.

Glomerulonephritis (45.8%) was the predominant cause of CKD among study population, followed by diabetes mellitus at 20.8%, hypertension at 16.7%, DM with HTN at 9.7%, obstructive uropathy at 4.2% and ADPKD at 2.8% (Fig 1a). As for stages of CKD, 30 (41.7%) respondents were from stage 5, followed by 28 (38.9%) respondents from stage 5D, 8 (11.1%) from stage 4 and 6 (8.3%) from stage 3 (Fig 1b). According to ECG report, 20 (27.8%) respondents had acute MI (Fig 1c). Serum troponin I was measured for all the respondents. For respondents with a normal ECG report, mean serum troponin I was 24.3 ± 27.2 ng/dl, and for respondents showing acute MI on ECG report, mean serum troponin I was 4585.5 ± 10978.3 ng/dl (Fig 1d). There was statistically significant ($p < 0.05$) difference between these two groups.

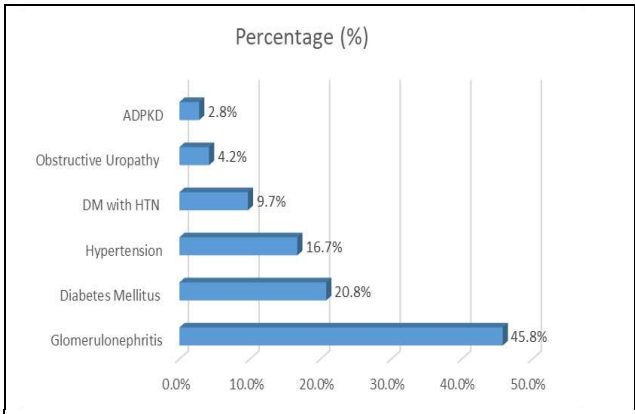

Figure 1a: Clinical parameters of the respondents

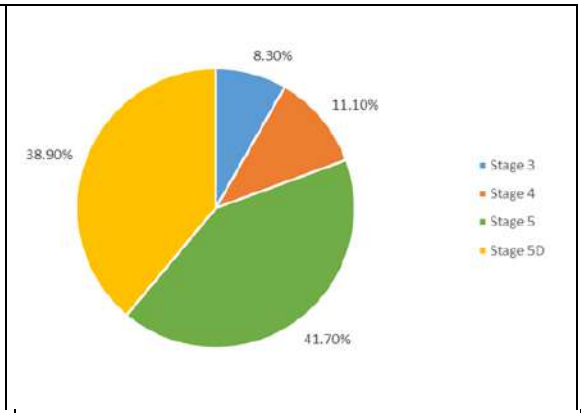

Figure 1b: Stages of CKD among the respondents

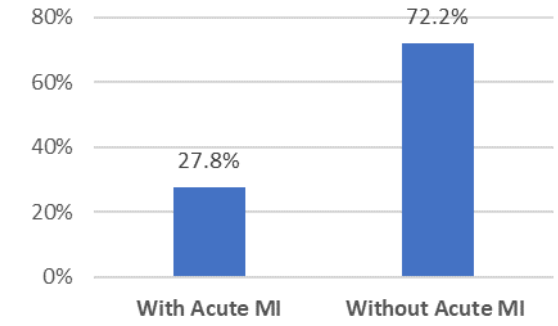

Figure 1c: Distribution of study population according to ECG report

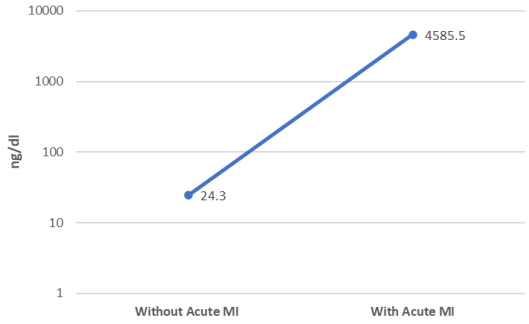

Figure 1d: Mean serum troponin I according to ECG report

Patients with CKD stage 3 had mean serum troponin I of 1.49 ± 2.36 ng/dl, CKD stage 4 had mean serum troponin I of 3.69 ± 3.26 ng/dl, CKD stage 5 had mean serum troponin I of 15.44 ± 20.49 ng/dl and CKD stage 5D had mean serum troponin I of 44.84 ± 27.16 ng/dl (Table II). Statistically significant ($p < 0.05$) difference was found among four groups. Patients with Obstructive uropathy had highest troponin I level at 57.2 ± 45.48 ng/dl, followed by patients with DM with HTN at 43.8 ± 38.94 ng/dl and patients with Hypertension at 37.89 ± 36.03 ng/dl. Statistically significant ($p < 0.05$) difference was found among patients from different etiological groups.

Table II: Pattern of serum troponin I among patients with normal ECG reports (n = 52).

Variables	Serum Troponin I (ng/dl)	p value
Stages of CKD		
Stage 3	1.49 ± 2.36	0.001[a]
Stage 4	3.69 ± 3.26	
Stage 5	15.44 ± 20.49	
Stage 5D	44.84 ± 27.16	
Etiology of CKD		
Glomerulonephritis	18.99 ± 17.47	0.002[a]
Diabetes mellitus	8.97 ± 11.97	
Hypertension	37.89 ± 36.03	

DM with HTN	43.8 ± 38.94
Obstructive uropathy	57.2 ± 45.48
ADPKD	16.5 ± 0

Data presented as mean ± SD.

[a] = ANOVA was used. p value of < 0.05 was considered statistically significant.

DISCUSSION

This study was carried out with an aim to interpret the serum troponin I level in patient with chronic kidney disease with possible acute coronary syndrome. A total of 72 adult male & female with different stages of CKD from indoor and outdoor ward of the Department of Nephrology at Dhaka Medical College Hospital, Dhaka, period of January 2015 to June 2016, were included in this study.

Present study showed 51.4% respondents from 31 – 50 years age group with a mean age of 46.9 ± 12.9 years, which is consistent with a 2014 study showing mean age of study population to be 47.77 ± 17.53 years.[17] On the other hand, mean age was found to be 60.2 – 62 years from other studies, which is higher than present study.[4,6,10,18] The higher mean age and age range may be due to geographical variations, racial, ethnic differences, genetic causes and different lifestyle in their study population. Present study showed male predominance (72.2%) among study population, similar to older studies among CKD patients.[6,10,17]

Glomerulonephritis was the predominant cause of CKD among study population at 45.8% and 27.8% had changes on ECG, which is consistent with other study among CKD patients, where glomerulonephritis was found among 47.5% of the respondents and 17.8% had ECG changes [17]. As for stages of CKD, 30 (41.7%) respondents were from stage 5, followed by 28 (38.9%) respondents from stage 5D, 8 (11.1%) from stage 4 and 6 (8.3%) from stage 3. This high prevalence of CKD stage 5 is consistent with Chen et al. (2011) study, showing in a population of 602 patients, the presence of cardiovascular disease increases with the CKD stages, reaching 56.2% among CKD stage 5 [19]. For respondents with a normal ECG report, for 72.2% of the respondents with normal ECG report, mean serum troponin I was 24.3 ± 27.2 ng/dl, and for the rest of the respondents showing acute MI on ECG report, mean serum troponin I was 4585.5 ± 10978.3 ng/dl. There was statistically significant (p < 0.05) difference between these two groups. Previous study on similar subjects showed 43.34% patients to have an elevated cardiac troponin I level and 56.66% to have normal cardiac troponin I level, which is closer to present study findings [10].

There are two main limitations for the use of troponins for the diagnosis of acute myocardial infraction in CKD patients: first, the commonly unusual clinical and electrocardiographic presentation [20]. ; second, patients with CKD have baseline higher serum troponin levels when compared with healthy population [21]. This situation occurs specially in early stages of CKD [22]. A 2005 study evaluated the levels of serum troponin I in 222 patients at different stages of renal disease, showing a significant inverse association [23]. In present study, among the participants with normal ECG report, patients with CKD stage 3 had mean serum troponin I of 1.49 ± 2.36 ng/dl, CKD stage 4 had mean serum troponin I of 3.69 ± 3.26 ng/dl, CKD stage 5 had mean serum troponin I of 15.44 ± 20.49 ng/dl and CKD stage 5D had mean serum troponin I of 44.84 ±

27.16 ng/dl. This is consistent with prior studies showing compared to stage 1-4 CKD, patients with stage 5 CKD had higher serum troponin I levels and serum troponin I was increased among CKD patients [10,23]. In present study this difference in serum troponin I levels among patients from different CKD stages were statistically ($p < 0.05$), which is also consistent with these study findings.

Present study also showed serum troponin I to be many folds raised for the patients of chronic kidney disease with acute myocardial infraction (4585.5 ± 10978.3 ng/dl), then patients without acute myocardial infraction (24.3 ± 27.2 ng/dl). Comparison of troponin I between these two groups was statistically significant ($p<0.05$). Present study showed CKD patients with diabetes mellitus had mean serum troponin I of 8.97 ± 11.97 ng/dl, CKD patients with hypertension had mean serum troponin I of 37.89 ± 36.03 ng/dl and CKD patients with DM with HTN had mean serum troponin I of 43.8 ± 38.94 ng/dl. Similar findings were shown by a 2005 study, where serum troponin I was found to be more likely to be increased in patients with diabetes or cardiovascular disease [23].

CONCLUSION

Serum troponin I is elevated in CKD patients with or without acute coronary syndrome. Serum troponin I is markedly raised in CKD patients with acute coronary syndrome and is comparatively more raised in advanced stages of CKD than early stage in CKD patients without acute coronary syndrome.

LIMITATIONS

The study population was selected from one hospital, so the results do not represent the entire population. Due to the nature of the study, follow up ECG and serum troponin I were not done. Sample size and duration of the study were also limiting factors. A study with much larger sample size from different hospitals for a longer duration with follow up tests would generate more reliable results.

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