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ORIGINAL ARTICLE

Association between microalbuminuria and serum Troponin-I in normotensive and nondiabetic patients with acute myocardial infarction; A cross-sectional analytical study

MD AL-AMIN, AFM AZIM ANWAR, JAHANARA ARZU, MOHAMMAD. SAFIUDDIN, MANZOOR MAHMOOD, NAVEEN SHEIKH, ABU SADIK ABDUALLAH, MD ABDUS SALAM, SOHEL MAHMUD, MASUD RANA, MD NAZMUL HASAN, SHEIKH FAYEZ AHMED, ELORA SHARMIN, CHAUDHURY MESHKAT AHMED.

Dept. of |Cardiology, Bangabandhu Sheikh Mujib Medical University(BSMMU), Dhaka, Bangladesh

Address of Correspondence: Md Al-Amin, Department of Cardiology, Bangabandhu Sheikh Mujib Medical University (BSMMU). Mobile: +8801739711710, E-mail: dralaminzmc@gmail.com

Abstract:

Background: Microalbuminuria (MA) happens more often in diabetic as well as hypertensive patients, but it has been recently reported that, MA can also be present in non–diabetic, normotensive patients with Acute MI (AMI). Serum Troponin-I sensitive and specific marker of AMI, but its costly, as well as, not widely available. This study was carried out to establish the correlation between serum Troponin-I and microalbuminuria in normotensive nondiabetic AMI population with normal renal function.

Material and methods: This cross-sectional comparative observational study was carried out in the department of Cardiology, BSMMU, Dhaka Bangladesh to establish the correlation between microalbuminuria and serum troponin I. 50 non diabetic, normotensive patients of AMI and 50 healthy age and sex matched individuals were chosen. Microalbuminuria was determined by immunoturbidimetric method and plasma glucose were measured by enzymatic method.

Result: There was significant ($p<0.05$) correlation between increased level of microalbuminuria with raised Troponin-I level, in patients with AMI, who were non diabetic and normotensive in comparison to those in the healthy individuals.

Conclusion: Microalbuminuria has positive correlation with raised serum Troponin-I in AMI patients, in absence of traditional risk factors like diabetes and HTN. So, microalbuminuria can be used as a biochemical parameter in non-diabetic, normotensive AMI patients in poor resource settings.

Keywords: Microalbuminuria, AMI, HTN, Diabetes Mellitus, Troponin-I.

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Introduction:

The term coronary artery disease (CAD), ischemic heart disease (IHD) and coronary heart disease (CHD) are synonymous and commonly known as atherosclerotic cardio vascular disease (ASCVD).[1] This is due to atherosclerosis of coronary arteries and manifests as angina pectoris, unstable angina, myocardial infarction and heart failure.[2] Acute myocardial infarction (AMI) is one of the commonest diseases amongst hospitalized patients in industrialized countries with approximately 30% mortality over 30 days and 1 in 25 patients dies in the first year who survive in the initial hospitalization after AMI.[3] The prevalence of coronary artery disease is 3.4% in rural and 19.6% in urban people of southeast Asia [4]. The risk of cardiovascular disease is predicted by various factors such as age, sex, smoking, hypertension and dyslipidemia.[5] In

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most of the cases, the cardiovascular changes are detected only after a person exhibits the classical symptoms and signs of AMI.[6] Also, cardiac biomarker investigations are not readily available in Bangladesh and very expensive also. This indicates the necessity of a marker which can detect the risk of cardiovascular changes in the early stage before MI, which would be readily available and cheap. Comprehensive research in this field has emerged with multiple new biomarkers and inflammatory markers of atherosclerotic cardiovascular disease (ASCVD) such as increased lipoproteins levels, total plasma homocysteine, elevated plasma fibrinogen, plasminogen activating inhibitor, C-reactive protein, different cytokines and microalbuminuria.[7] Microalbuminuria (MA) is a common phenomenon in patients with cardiovascular disease.[8] The excretion of albumin in urine in the range of 20 – 200ig/min (30-300 mg/day) is called microalbuminuria (MA).[9] This range of albumin in urine cannot be detected by routine dipstick urine test.[10] MA is considered to be a predictor of early renal damage in patients with diabetes.[11] Previous studies shown that MA is independently associated with cardiovascular morbidity and mortality in diabetic and hypertensive patients.[12] In clinically healthy subjects, the atherogenic risk factors are increased when associated with microalbuminuria.[13] It is also noticed that the patients with MA have more severe angiographic coronary artery disease (CAD) than those without MA.[14] MA is observed as an early response to myocardial infarction and urinary excretion of microalbumin is proportional to the size of infarct.[15] Higher admission microalbuminuria in AMI patients is associated with increased in-hospital events, 6 month and 1 year mortality.[16] Moreover, elevated microalbuminuria in acute myocardial infarction is associated with coronary slow phenomenon.[17,18] But, the correlation between serum Troponin-I and isolated microalbuminuria in normotensive non diabetic AMI population is still unclear. As there is lack of study of correlation between serum Troponin-I and microalbuminuria in nondiabetic and normotensive patients, this study was carried out.

Methods:

The study was carried out in department of Cardiology, BSMMU, a tertiary care university level teaching hospital, to establish the correlation between microalbuminuria and raised serum Troponin-I in nondiabetic and normotensive AMI patients compared to healthy subjects. Ethical committee clearance was obtained prior to the study. IRB protocol number BSMMU/2022/9131, Research protocol registration number 3994. Study duration was 1 year after IRB approval. The study group consisted of 50 nondiabetic and normotensive patients with AMI and 50 age and sex matched healthy individuals after obtaining their consent. AMI diagnosis was made based on ECG finding, level of cardiac markers and resting echocardiography. Blood pressure was measured using a standard mercury sphygmomanometer and appropriately sized cuff. Patients with a history of diabetes, hypertension, systemic infection, UTI, AKI, CKD, rheumatoid arthritis, SLE and patients who underwent primary PCI were excluded from the study. Random plasma glucose levels were determined for all the cases and controls at the time of admission. Other investigations were done as per need maintaining standard protocol. For glucose estimation 2ml of random venous blood was collected in a fluoride containing collection tube. Random mid-stream morning urine sample was collected in a sterile container without any preservatives for the determination of urinary microalbumin. Samples were estimated with the help of ERBA Chem 5 plus analyzer.

Statistical Analysis : All the data were compiled on standardized tables and was expressed in percentage, range, mean ± standard deviation using Microsoft Excel and SPSS version 28.0. Data was presented in the form of tables and figures. The mean was analyzed by unpaired 't' test and categorical variables were analyzed by Pearson's chi square test. P value less than 0.05 was considered as a cut-off for significance. Finally, correlation coefficient analysis was done to observe the correlation between microalbuminuria and serum Troponin-I in AMI patients who were nondiabetic and normotensive.

Result:

The study included a total 100 subjects out of which 50 were AMI without diabetes and HTN and another 50 were age and sex matched healthy subjects.

Table-I

Distribution of the study population by risk factors (n=100)

Risk factors	Acute MI Group (n=50)		Healthy Group (n=50)		[a]Pvalue
	n	%	n	%	
Smoking	11	44.0	11	44.0	0.258 [ns]
Dyslipidemia	18	72.0	14	56.0	0.713 [ns]
Family H/O CVD	10	40.0	5	20.0	0.889 [ns]

There was insignificant difference of smoking, family history of Cardiovascular Disease (CVD) between two groups but dyslipidemia was more prevalent in AMI group (Table 1).

Table-II

Distribution of the study population by risk factors (n=100)

Variables	Acute MI Group (n=50) Mean ±SD	Healthy Group (n=50) Mean ±SD	P value
Age (years)	50.8 ± 7.4	49.2 ± 7.1	[a]0.538[ns]
BMI (kg/m$^{2)}$	24.1 ± 1.8	25 ± 1.3	[a]0.520[ns]
Pulse	83.6± 9.5	76.1± 3	[a]0.001
SBP	116.4± 10.5	123± 7.5	[a]0.014
DBP	72± 8.3	79.6± 4.3	[a]0.001
RBS (mmol/l)	7.9 ± 0.37	5.9 ± 0.31	[a]0.001
FBS	5.3 ± 0.92	4.8 ± 0.71	[a]0.334[ns]
2HABF	6.8 ± 0.35	6.0 ± 0.51	[a]0.438[ns]
HbA_1C (%)	5.1 ± 0.29	4.7 ± 0.22	[a]0.161[ns]

Nondiabetic, non-hypertensive AMI group consisted of 52% male and 48% were female with a mean age of 50.8 ±7.4 years. In the nondiabetic non-hypertensive apparently healthy individuals, there were 48% male and 52% female with a mean age of 49.2±7.1 years. Mean BMI was 24.1±1.8 in AMI patients and 25±1.3 in healthy counters, that was statistically insignificant. RBS was significantly higher in AMI patients whereas FBS, 2HABF and HbA1C was not different in between the groups (Table 2)

The mean urinary microalbumin level in AMI was 30.5±7.0mg/L and in healthy group was 4.3±2.1mg/L. This increased excretion of microalbumin in AMI patients was clinically and statistically highly significant (P< 0.001 (Figure 1).

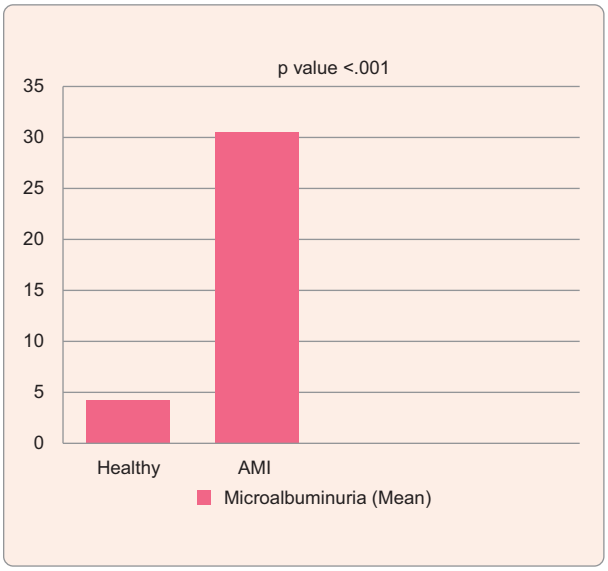

Figure 1: *Association of microalbumin in MI and Healthy group*

Table-III

Correlation coefficient of microalbuminuria with different quantitative variables, including serum Troponin-I

	Urinary microalbumin	'P' value
Age	0.16	0.267
BMI	-0.327	0.020
Pulse	0.531	0.001
SBP	-0.412	0.003
DBP	-0.501	0.001
hs Troponin I	0.695	0.001
CK_MB	0.751	0.001
RBS	0.381	0.065
FBS	0.20	0.01
HABF	0.160	0.01
HbA1C	0.130	0.01
Total cholesterol	0.319	0.001
LDL	0.327	0.016
HDL	-0.371	0.011
TG	0.207	0.057
S. Creatinine	0.182	0.147
s. Urea	0.120	0.04
CRP	0.209	0.029
LVEF	-0.796	0.001

Above Table shows, there is significant (p<.05) correlation between microalbuminuria and serum Troponin-I.

Discussion:

Microalbuminuria is considered to be a strong and independent indicator for cardiovascular risk[19,20] This study was done to establish the correlation between microalbuminuria and serum Troponin-I in nondiabetic, non– hypertensive patients with AMI.

Our study shows, urinary microalbumin was significantly higher in AMI patients than healthy group (p value <0.001). We did correlation coefficient analysis with microalbuminuria and continuous variables of AMI patients, including serum Troponin-I and found strong positive correlation with pulse and serum Troponin-I, whereas strong negative correlation with LVEF, indicating more the severe myocardial infarction more the microalbuminuria. Higher microalbumin level in AMI patients was moderate positive correlation with RBS, total cholesterol, LDL and moderate negative correlation with SBP, DBP and HDL cholesterol (Table 3)

Conclusion

In this study, we found a significant correlation between serum Troponin-I and high MA in nondiabetic, non-hypertensive, AMI patients in absence of any renal insufficiency. So, microalbuminuria can be used as a highly sensitive marker of myocardial infarction in poor resource setup, where serum Troponin-I is not readily available.

Author Contributions: All authors participated in idea generation, data collection, data processing, manuscript preparation, revising and drafting.

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Conflict of Interest: The authors have none to declare.

Data & Materials: Available from the corresponding author, on reasonable request.

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