

A STUDY ON ASSOCIATION OF MICROALBUMINURIA IN NON-DIABETIC AND NON-HYPERTENSIVE PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

BACKGROUND

Microalbuminuria is an emerging risk factor in evaluation of in-hospital coronary events and long-term morbidity and mortality in patients with acute myocardial infarction. The primary aim of this study is to determine the prognostic significance and the predictive value of microalbuminuria for complications in patients with non-diabetic, non-hypertensive acute myocardial infarction.

MATERIALS AND METHODS

A cross-sectional study was done on 100 non-diabetic, non-hypertensive patients admitted for acute myocardial infarction. Spot urine sample was taken for measuring albumin creatinine ratio. Patients were followed up and observed for complications related to acute myocardial infarction like left ventricular dysfunction, cardiac failure, LV clot, recurrence of angina, occurrence of arrhythmias and death for a period of one year.

RESULTS

Among the 100 patients included in the study group 71% had microalbuminuria while 29% were normoalbuminuric. The difference was statistically significant, and it shows that there is definite association between acute myocardial infarction and microalbuminuria.

Post-myocardial infarction complications were also higher in the group with microalbuminuria indicating its efficacy as a prognostic marker in patients with acute myocardial infarction.

CONCLUSION

Microalbuminuria is a marker of endothelial dysfunction and its level rises in patients with acute myocardial infarction by various mechanisms, most prominent being as a part of systemic inflammatory response.

KEYWORDS

Acute Myocardial Infarction, Microalbuminuria, Endothelial Dysfunction.

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BACKGROUND

The prognosis associated with myocardial infarction remains unfavourable, despite successes in treatment recorded in the last decades, emphasizing the importance of evaluation of risk factors in patients with acute myocardial infarction. Many authors pay a lot of attention on the role and prognostic significance of newer non-traditional risk factors related to the clinical course and the outcome of myocardial infarction (for shorter or longer periods) such as the level of the natriuretic peptide, C reactive protein, status of the

metabolic control before and during hospitalization and microalbuminuria. Microalbuminuria is a considerable predictive factor in intra-hospital mortality coronary events and death over longer periods after myocardial infarction.^{1,2} Microalbuminuria during acute myocardial infarction peaks at the first day and has a rapid decline throughout the first week after the event. Studies have shown that albumin creatinine ratio in patients with acute myocardial infarction is more significant for predicting in-hospital mortality than TIMI risk score.³ It reflects the presence of generalized vascular damage and is strongly predictive of subsequent renal failure, cardiovascular morbidity, and death.⁴

Aims and Objectives

To assess the correlation between microalbuminuria and short-term morbidity and mortality in patients with acute myocardial infarction.

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MATERIALS AND METHODS

This study was conducted among 100 randomly selected patients who were admitted in Govt. Rajaji Hospital, Madurai with acute myocardial infarction during August 2015 to August 2016. Ethical clearance was obtained, and informed written consent was obtained from study population.

Inclusion Criteria

Age >18, Both sexes, Patients diagnosed with acute myocardial infarction with history, clinical examination, ECG, Troponin I

Exclusion Criteria

Patients with previous myocardial infarction, previous cerebrovascular accident, chronic kidney disease or acute kidney injury, Patients with urinary tract infection, known diabetic or hypertensive patients, Patients with fundus changes of hypertensive retinopathy, Patients who are not a known case of diabetes but with HbA1c >5.6, Patients with admitting BP of 140/90 mm of Hg. Patients with history of ACE inhibitors/ARB intake, Patients found to have macro albuminuria at admission.

Ethical Consideration

The study was approved by Government Rajaji Hospital Ethical committee. Informed consent was obtained before enrolling subjects to the study.

Data Collection

A previously designed proforma was used to collect the demographic and clinical details of the patient. Clinical examination including fundus examination was done. An ECG was recorded in each case at the time of admission. Cardiac biomarkers to confirm acute myocardial infarction and spot urine sample to exclude urinary tract infection and macroalbuminuria was done. Simultaneously renal function tests, random blood sugar and HbA1c, total cholesterol values were measured. Spot urine sample was tested for presence of microalbuminuria and urine albumin creatinine (ACR ratio) was measured. Microalbuminuria is defined as urine albumin excretion rate 20-200 mg/l or 30-300 mg/day. Echocardiogram was done during the first week of admission Patients were followed up and observed for complications related to acute myocardial infarction like LV dysfunction, cardiac failure, LV clot in ECHO, recurrence of angina, occurrence of arrhythmias and death for a period of one year

RESULTS

Of the 100 patients, 70(70%) were men and 30 (30%) were women. The mean value of ACR was 99.4 and 92.2 among males and females respectively. The difference in mean ACR values was not statistically significant with p value of 0.6.

Age	No. of Cases	Mean ACR (microgram/gram)
20-30	0	37.6
31-40	5	80.381
41-50	37	115.06
51-60	42	87.292
61-70	16	74.4

Table 1. Distribution of Mean ACR Along Various Age Groups

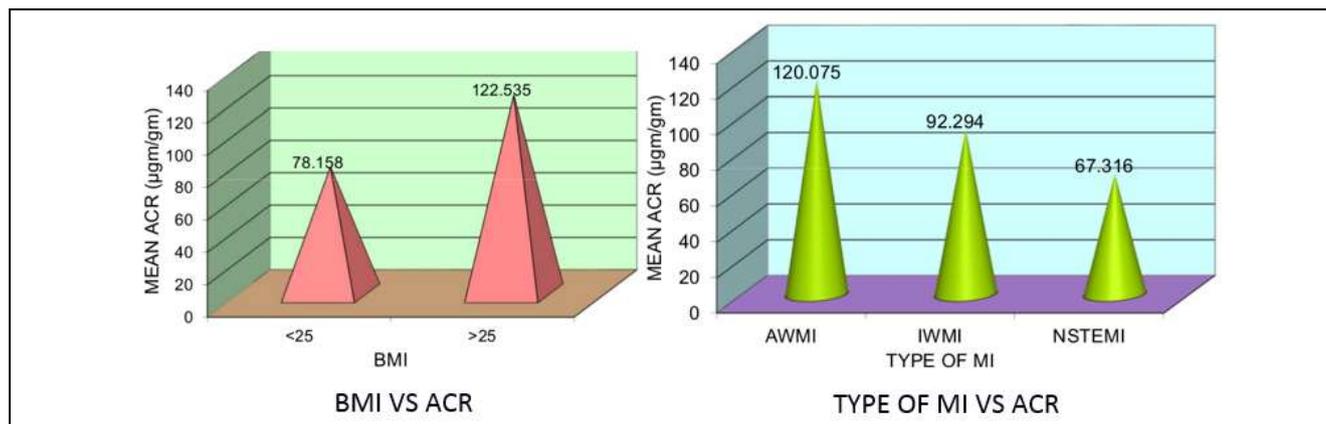


Figure 1

ACR (µgm/gm)	CCF	Heart Block	Arrhythmias	Mechanical Complications	Angina	Mortality	Total
<100(59)	6	3	4	0	1	2	16
>100(41)	11	3	6	2	6	7	35

Table 2. Comparison of ACR with Complications Post Myocardial Infarction

Out of the 100 patients included in the study, 71 patients developed microalbuminuria while 29 patients were normoalbuminuric. There was a statistically significant difference showing that microalbuminuria develops in significant number of non-diabetic and non-hypertensive patients with acute myocardial infarction.

Of the 100 patients 43 were smokers and 57 were non-smokers. The mean ACR was 139.8 among smokers and 102.4 among non-smokers. The difference in mean ACR values was statistically significant.

Comparisons regarding the level of microalbuminuria in various types of myocardial infarction (1.ST elevation MI-a. AWTMI b. IWMI 2.NSTEMI) was made. Of the 100 patients, 43% had AWTMI, 36% had IWMI and 21% NSTEMI. Mean ACR values were 120, 92.2, 67.3 microgm/gm respectively with a statistically significant value of $p < 0.05$.

A comparison was also made to find out relationship between ejection fraction and ACR. Among the 100 patients 55% had EF < 40% and 45% had EF > 40%. The mean ACR value was 113.7 and 73.6 micro/gm respectively for the <40 and >40 groups. The difference was statistically significant with a p value 0.008

Next comparison was made between BMI and ACR. 57% of patients had BMI less or equal to 25 while 43% had BMI >25. Mean ACR values were 78.1 and 122.5 respectively and the difference was statistically significant with a p value of 0.003.

Of the 100 patients studied 41% had ACR >100 while 59% had ACR <100. Among the former group 35 patients (85%) developed one or the other complications while in the latter group only 16 patients (27%) developed complications.

In the group with ACR less than 100 microgram/gram, cardiac failure, heart block, arrhythmias, mechanical complications, angina, mortality were seen in 10%, 5%, 6%, 0%, 1%, and 3% respectively. Out of 59 patients in this group 16 people (27%) developed one or the other complication. On the other hand, in the other group with ACR>100 microgram/gram congestive heart failure, heart block, arrhythmias, mechanical complications, angina, mortality were seen in 26% 7%, 14%, 4%, 14%, 17% respectively. ($P<0.05$)

DISCUSSION

Studies conducted by Al-Saffar⁵ et al at college of medicine, Baghdad University, Iraq showed that by measuring microalbuminuria in nondiabetic patients with Unstable angina/Non-ST elevation myocardial infarction, we can predict the severity of CAD and the risk of adverse outcomes. Microalbuminuria was more common in patients with multivessel coronary artery disease and had a significant correlation with echocardiographic findings of ischemia.

Similar study by Bhalavi,⁶ Hillege HL, Janssen WM⁷ et al concluded that microalbuminuria correlates with multiple risk factors in acute coronary syndrome.

Study conducted by Abhijitbasu⁸ et al in Udaipur, Rajasthan, India concluded that the microalbuminuria is significantly associated with non- diabetic non-hypertensive

myocardial infarction. Microalbuminuria is seen at a younger age group in myocardial infarction. Microalbuminuria is associated with male sex significantly. Microalbuminuria is strongly associated with smoking, high body mass index and high total cholesterol.

In another study by Abdul Ghaffar Memon and Mubashir Kolachi,⁹ Department of Cardiology, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan they concluded microalbuminuria may have an association with acute myocardial infarction in absence of traditional risk factors like Diabetes and Hypertension and also that the level of significance of microalbuminuria in these patients was comparable to the conventional cardiac markers like TROP-T and CK-MB.

Haffner¹⁰ et al in their study suggested that significance of microalbuminuria as a possible predictor of coronary heart disease in persons without diabetes

Of the 100 patients 43 were smokers and 57 were non-smokers. The mean ACR was 139.8 among smokers and 102.4 among non-smokers. The difference in mean ACR values were statistically significant and was in agreement with various studies like PREVENT study¹¹ which showed statistically significant difference in urinary albumin excretion in non-smokers and smokers. Endothelial dysfunction by inducing an imbalance between the contracting and relaxing substances produced by the endothelium is the underlying postulated mechanism. The plasma concentration of endothelin 14 has shown to be increased in smokers as compared to non-smokers, also indirect evidence available for a disturbance of endothelin, prostacyclin or nitric oxide release on stimulation in smokers^{12,13,14}

Of the 100 patients, 43% had AWTMI, 36% had IWMI and 21% NSTEMI. Mean ACR values were 120, 92.2, 67.3 microgm/gm respectively. Patients with AWTMI are more prone to develop microalbuminuria followed by IWMI and NSTEMI. Similar results with higher incidence of microalbuminuria in AWTMI were obtained in the study conducted by Liaquat university Pakistan and various other studies conducted across the globe like Cirillo et al and Berton et al.^{15,16,17}

The mean ACR value was 113.7 and 73.6 micro/gm respectively for the LVEF <40 and >40 groups which signifies that people with high ACR values are prone to have decreased ejection fraction and therefore LV failure.¹⁸ Similar reports were observed in the study conducted by Abdul Ghaffar Memon and Mubashir Kolachi.

57% of patients had BMI < or equal to 25 while 43% had BMI >25. Mean ACR values were 78.1 and 122.5 respective. This observation was in par with results in various other studies like Al Saffar et al which observed that microalbuminuria was associated with high BMI. ACR levels were significantly higher in persons with higher total cholesterol level. In the study conducted by Klaussen et al in a US based study, similar observations were made. They found that high total cholesterol was an independent risk factor for microalbuminuria, atherosclerosis and CAD.

In the group with ACR less than 100 microgram/gram, cardiac failure, heart block, arrhythmias, mechanical complications, angina, mortality were seen in 10%, 5%, 6%, 0%, 1%, and 3% respectively. On the other hand, in the other group with ACR>100 microgram/gram CCF, heart block, arrhythmias, mechanical complications, angina, mortality were seen in 26% 7%, 14%, 4%, 14%, 17% respectively. Among the total 41 patients in this group 35 of them (85%) developed one or the other complications. The data shows that microalbuminuria levels significantly correlates with complications and those people who develop microalbuminuria after myocardial infarction should be carefully monitored for the development of complications. Among these complications, congestive cardiac failure, angina, mechanical complications were more common in the 1st month following myocardial infarction while heart block and arrhythmias were seen equally distributed throughout the follow up period.

The association between the albumin excretion rate and mortality that has been described in recent years in patients may be present in elderly people in general, even when other known risk factors are taken into account.¹⁹

Studies by Naidoo²⁰ et al showed that microalbuminuria is a marker of extensive endothelial dysfunction or generalised vasculopathy, which may lead to heightened atherogenic states and increased morbidity and mortality.

CONCLUSION

Microalbuminuria is associated with impaired survival in patients hospitalized with myocardial infarction. Microalbuminuria may be useful for risk stratification in these patients and, moreover, should be included as a baseline variable risk factor in intervention trials.

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