Section: General Medicine

Original Research Article

TO EVALUATE THE RELATIONSHIP BETWEEN MICROALBUMINURIA AND ACUTE MYOCARDIAL INFARCTION IN NON-DIABETIC, NON-HYPERTENSIVE PATIENTS

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Abstract

Background: Microalbuminuria (MA) is a newly recognised risk factor in the analysis of acute myocardial infarction patients' long-term morbidity, mortality, and in-hospital coronary events. Determining the prognostic importance and predictive value of MA for complications in patients with non-diabetic, non-hypertensive acute myocardial infarction is the primary goal of this study. **Materials and Methods:** The present prospective observational study on 100 patients older than 20 was performed in Intensive coronary care unit (ICCU) of tertiary care hospital, Chennai, India, for one year. Subjects were evaluated for various blood and urine parameters like MA, fasting blood sugar (FBS), postprandial blood sugar (PPBS), Blood Urea, and Serum Creatinine. All patients were subjected to 12 lead ECGs, detailed transthoracic echocardiography (ECHO), and Doppler evaluation. Our study took the ejection fraction (EF) of <50% as abnormal. **Result:** The maximum number of patients, 55%, were reported in the age group of 41 to 50. The gender distribution was 78% males and 22% females. Among all cases, 47% were smokers, and 86% were obese. Among the cases, 22% of patients had abnormal cholesterol levels, 34% abnormal triglycerides, 18% abnormal HDL, and 28% abnormal LDL. The MA was found in 76% of the cases. Most patients (50%) were reported with ejection fraction between 50 and 60. A total of 4% mortality was reported among MA patients. **Conclusion:** In the absence of risk factors like diabetes and hypertension, the association between MA and myocardial infarction shows that MA has extra significance as a predictive diagnostic.

INTRODUCTION

Microalbuminuria (MA) is the excretion of fewer than 300 mg of albumin daily in the urine.[1] Standard urine tests cannot detect this range of albumin in urine due to their limitations. It is generally recognised that MA and diabetes mellitus are related (type I & II over a while). MA is an early indicator of renal impairment in this illness. Typically, people with type I diabetes require more than five years to develop MA.

The most frequent reason for hospital admission in developed nations is acute myocardial infarction (MI). Around 3 million ST-elevated myocardial infarctions and 4 million non-ST-elevated myocardial infarctions occur in the globe each year, accounting for 1 in 5 fatalities caused by coronary artery disease.[2]

Although there have been advances in therapy over the past ten years, the prognosis for myocardial infarction remains poor. Many authors focus on the role and prognostic significance of new, non-traditional factors related to the clinical course. The outcome of myocardial infarction (for shorter or longer periods), such as the level of natriuretic peptide, C reactive protein, condition of the metabolic control – before and during hospitalisation, and MA, because they recognise the importance of the precision of the risk in patients with myocardial infarction.[3]

MA is an early indicator of mortality and morbidity in people with diabetes and hypertension, confirming that albuminuria is a risk factor for fatalities from

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cardiac diseases in the future, irrespective of either condition.[4]

Albuminuria is a clear sign of renal and cardiovascular risk in those with type 2 diabetes and high blood pressure. Further research has revealed that lowering elevated albuminuria reduces the likelihood of negative renal and cardiovascular consequences. However, the exact aetiology is unknown. Endothelial dysfunction, inflammation, or any peculiarity in the renin-angiotensin-aldosterone pathway are hypothesised to be related. Studies conducted by earlier researchers concluded that MA had an independent function and was related to cardiovascular morbidity and death in people with diabetes and hypertension.[5-8] Perhaps it is appropriate to note that, particularly in India, few studies have been done to assess MA in non-diabetic, non-hypertensive individuals.

In this study, an attempt has been made to find if MA is associated with acute myocardial infarction even in the non-diabetic, non-hypertensive local population and whether it can predict in-hospital mortality.

MATERIALS AND METHODS

A Prospective observational study was conducted at the Intensive coronary care unit (ICCU) of tertiary care hospital in Chennai from 2021 to 2022.

One hundred patients older than 20 years, with non-diabetic and non-hypertensive patients of acute myocardial infarction, were included in the study after taking consent.

Inclusion Criteria

Non-diabetic, non-hypertensive patients with acute MI admitted to the ICCU of our hospital. Patients aged more than 20 years and with no other known comorbidities.

Patients with documented ischemic heart disease, congenital heart disease, valvular heart disease, patients aged less than 20 years and documented kidney disease/diabetes/hypertension, and patients who refused to participate in the study were excluded.

MA was determined by the immunoturbidimetric method (co-efficient variation of 2.47%). Serum glucose and Serum creatinine were measured by GOD-POD endpoint (co-efficient variation of 4.84%) & Modified Jaffe's method (co-efficient variation of 3.54%), respectively. Serum samples were collected for RBS in tubes containing sodium fluoride and ammonium oxalate, and for cardiac enzymes, 3ml venous blood was drawn aseptically in plain tubes. These were centrifuged at 5000 rpm for 5 minutes. The random mid-stream urine samples (10 ml) were collected in sterile containers and assayed for microalbumin without preservatives. The investigations carried out included random blood sugar (RBS) (GOD-POD method) and, in serum, MA (Turbidimetric Immunoassay) and creatinine (Modified Jaffe's method) in urine.

All patients were subjected to 12 lead ECGs and detailed Transthoracic echocardiography (ECHO) and Doppler evaluation using Vivid S5 High-Performance Echocardiography machine by GE Medical System. Modified Simpson's technique was used to determine the end-diastolic volume (EDV), end-systolic volume (ESV) and ejection fraction (EF). EF of <50% was taken as abnormal.

RESULTS

The study group included 100 patients with myocardial infarction (MI) without diabetes and hypertension. Maximum patients (55%) were reported in the age group of 41 to 50. The gender distribution was 78% males and 22% females. Among all cases, 47% were smokers, and 86% were obese [Table 1].

Table 1: Demographic variables of patients

Particulars		Observations N (%)
Gender	Male	78 (78%)
	Female	22 (22%)
Age Group (years)	<40	13 (13%)
	41-50	55 (55%)
	51-60	25 (25%)
	61-70	6 (6%)
	>71	1%
Mean Age± SD		45.4±10.61
Smoking	No	53 (53%)
	Yes	47 (47%)
BMI	Overweight	14 (14%)
	Obese 1	80 (80%)
	Obese 2	6 (6%)
Total cholesterol	Normal	78 (78%)
	Abnormal	22 (22%)
Triglycerides	Normal	66 (66%)
	Abnormal	34 (34%)
HDL	Normal	82 (82%)
	Abnormal	18 (18%)
LDL	Normal	72 (72%)
	Abnormal	28 (28%)

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MA	<30	24 (24%)
	>30	76 (76%)
EF	<50	42 (42%)
	50-60	50 (50%)
	>60	8 (8%)

Among the cases, 22% of patients had abnormal cholesterol levels, 34% abnormal triglycerides, 18% abnormal HDL, and 28% abnormal LDL.

Our study observed that 76% of the cases were found with microalbuminuria, while 24% had normoalbuminuria. The ejection fraction was reported at a maximum of 50% between 50 to 60 (Table 1).

Based on ECG finding association of microalbuminuria with various types of myocardial infarction is given in Table 4. A maximum of 66% of patients were observed with AWMI, followed by IWMI in 28%.

Table 2: Cross-tabulation of Diagnosis and mortality between microalbuminuria

		Microalbuminuria		P-value
		<30	>30	
Diagnosis	AWMI	14 (21.2%)	52 (78.8%)	0.157
	ILWMI	0	1 (100%)	
	IPWMI	3 (75%)	1 (25%)	
	IWMI	7 (25%)	21 (75%)	
	PWMI	0	1 (100%)	
Mortality	No	24 (25%)	72 (75%)	0.251
	Yes	0	4 (100%)	

In the present study of all patients, only 4 MA patients' mortality was reported, and no mortality in patients without MA [Table 2].

DISCUSSION

Al-Saffar et al. research at the college of medicine at Baghdad University in Iraq shows that we can predict the severity of CAD. The likelihood of unfavourable outcomes in non-diabetic patients with unstable angina/non-ST elevation myocardial infarction by evaluating MA.[9] MA was more prevalent in individuals with multivessel coronary artery disease and significantly correlated with ischemia-related echocardiographic abnormalities. MA corresponds with several acute coronary syndrome risk variables, according to research by Bhalavi et al.[10] Abhijit Basu et al., a study in Udaipur, Rajasthan, India, found a strong correlation between the MA and non-diabetic, non-hypertensive myocardial infarction. A younger group with myocardial infarction exhibit MA.[11] MA has a strong relationship with the male sex. Smoking, a high body mass index, and high total cholesterol are all highly linked to MA. In their work, Haffiner et al. raised the possibility that MA may be a predictor of coronary heart disease in those who do not have diabetes.[12]

The current study revealed the maximum number of MA patients in the age groups 41-50 (55%), followed by 51-60 (25%). The least patients were recorded in the age group >61. However, a study by Gamit et al. reported that the maximum number of patients occurred in the age group >60.[13] The mean age that displayed the highest occurrence of MA was found to be 45.4 years in our study. However, Mok et al. report the mean age of MA study patients as 65 years. The patient record revealed a predominant occurrence of male patients (78%) compared to females (22%).[14] A distinctive male dominance for the prevalence of MA was reported by several researchers. Mustafa et al. report 42 cases of male patients and only eight female patients.[15]

Patient characteristics criteria for predicting MA as a risk factor for AMI included the number of patients with smoking habits and recorded their BMIs. Our study reveals 47% of smokers. Gamit et al. have reported smoking could aggravate MA rates in patients who were neither non-diabetic nor non-hypertensive.13 Koulouris et al. reported 48.9% of MA patients with a habit of smoking, although the habit of smoking was found to be insignificant with the prevalence of MA according to them.[16]

Many studies claim the inter-relationship between BMI and body cholesterol levels with MA. Hence, our study investigated BMI, TC, TGL, HDL and LDL levels. BMI was determined, and patients were categorised as overweight and obese (1 & 2). Our analysis indicates 14% of patients as overweight, along with 80 and 6% of others under the obese 1 and 2 categories, respectively. TC levels of 22% of our patients were reported to be abnormal. Abnormal TGL, HDL, and LDL levels were observed in 34, 18 and 24% of patients. A significantly lower number of patients with abnormal lipid levels might indicate an insignificant association with the prevalence of MA.

Mai et al. reported an insignificant association between patients' BMI and control values.[17] They also stated the existence of an insignificant association between BMI and Serum Uric Acid levels. Romundstad et al. also report a statistically insignificant association between TGL, HDL and LDL levels.18 However, Jensen et al. have put forward a positive correlation between them.[19]

Our study observed that 76% of patients were estimated with albumin levels of >30mg/dl. The incidence of MA was higher in our study. Lazzeri et al. reported 52.1% MA incidence in their study.[20]

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Taskiran et al., in their research, report the prevalence of MA at a rate of 68%.[21]

The diagnosis was done to all the patients to associate MA with various types of MI. AWMI was detected in a maximum number of patients (66%). Twenty-eight patients were diagnosed with IWMI. Other MI types, such as IPWMI, ILWMI and PWMI, were detected in very few patients. A similar dominance in the occurrence of IPWMI among MA patients was reported earlier by Mohamed et al. They also reported the occurrence of IWMI in the next significant number of patients.[22] MA is more common in patients with AWMI, followed by IWMI and NSTEMI. Similar findings with a greater incidence of MA in AWMI were found in a study undertaken by Liaquat University in Pakistan, as well as several other studies conducted throughout the world, such as Cirillo et al. However, the type of MI was highly insignificant with the existence of MA (p=0.157).[23] Mortality rates are as low as 4% were observed in this study and were not significantly different with the presence and absence of MA (p=0.251). MA is a strong predictor of intra-hospital mortality from coronary events and death overtime following a MI. According to studies, the albumin creatinine ratio in patients with AMI is more important than the TIMI risk score in predicting in-hospital death. It indicates the existence of widespread vascular injury and is a major predictor of renal failure, cardiovascular illness, and death in the future. Studies by Naidoo et al. showed that MA is a marker of extensive endothelial dysfunction or generalised vasculopathy, which may lead to heightened atherogenic states and increased morbidity and mortality.[24]

CONCLUSION

In non-diabetic, non-hypertensive individuals, microalbuminuria is a common and significant predictor of cardiovascular risk factors and morbidity. Microalbuminuria can be employed as an additional biochemical parameter in individuals with acute myocardial infarction who are neither diabetic nor hypertensive since it is a straightforward inquiry and reasonably affordable test. The measures of urine albumin excretion might eventually be helpful in early risk profiling, preventing cardiovascular morbidities, and developing new treatment approaches to preventing cardiovascular disease.

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