

Evaluation of microalbuminuria in non-diabetic and non-hypertensive patients with acute myocardial infarction

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Abstract

Introduction: Microalbuminuria is defined as the excretion of 30 to 300 mg of albumin per day in urine. It is frequently present and a known cardiovascular risk indicator in diabetic populations, in hypertensive and general populations. Elevation of microalbuminuria level is emerging as risk factors in myocardial infarction.

Aim and Objectives: To explicit the relationship between microalbuminuria and acute myocardial infarction as prognostic indicator of cardiovascular morbidity and mortality.

Materials and Method:

Study design: A cross sectional hospital based study.

Study subjects: 120 non-diabetic and non-hypertensive patients of acute myocardial infarction, after taking the consents.

Study duration: August 2012 to November 2014

Study setting: Intensive Care Unit, Gujarat Medical Education and Research Society College, Civil hospital, Valsad, Gujarat.

Study materials: Microalbuminuria was determined by immunoturbidimetric method. Serum glucose and Serum creatinine were measured by GOD-POD end point & Modified Jaffe's method respectively.

Results: 120 patients of myocardial infarction with a mean age of 51.32 ± 11.25 years with range of 30 to 70 years. In majority 79 (65.8%) of the cases found with microalbuminuria while 41 (34.2%) with normal buminuria 79 (65.8%) cases in which presence of microalbuminuria was found and the association between microalbuminuria & mortality in patients with MI shows that, those were died i.e. 33 (27.5%) in which microalbuminuria was present in around 20 (60%) cases.

Conclusion: Association between microalbuminuria and myocardial infarction suggests that microalbuminuria has additional value as a prognostic marker in absence of risk factors like Diabetes and Hypertension.

Keywords: Coronary heart disease, Myocardial infarction, Micro-albuminuria.

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Introduction

Microalbuminuria is defined as excretion of albumin in urine; in the range of 30-300 mg/day.⁽¹⁾ Routine urine tests had limitations that cannot detect this range of albumin in urine. Microalbuminuria is very well known to be associated with diabetes mellitus (type I & II over a period of time). In this disease, microalbuminuria is an early predictor of renal damage. It takes usually more than 5 years for type I diabetics to have microalbuminuria.

Acute myocardial infarction constitutes the commonest diagnosis in industrialized countries, admitted to the hospital. In a year, around 3 million people have ST-elevated myocardial infarction and 4 million have Non-ST-elevated myocardial infarction worldwide from that 1 in 5 deaths occur due to coronary artery disease.⁽²⁾

The prognosis associated with myocardial infarction remains unfavourable, despite successes in treatment recorded in the last decade. Considering the necessity of the precision of the risk in patients with myocardial infarction, many authors pay a lot of attention on the role and prognostic significance of new, non-traditional 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,

condition of the metabolic control – before and during hospitalisation and microalbuminuria.⁽³⁾

Microalbuminuria is the early predictor of death and morbidity in patients suffering from diabetes and hypertension which confirmed the involvement of albuminuria as risk factor for deaths due to heart diseases in future, which is independent of hypertension and diabetes mellitus.⁽⁴⁾

The presence of albuminuria is strongly indicating renal and cardiovascular risk in patients with type 2 diabetes and hypertension. Further it was observed that various studies shown that control over elevation of albuminuria reduce the risk of adverse renal and cardiovascular outcomes. Exact pathophysiology is not known but there is hypothesised about relation with endothelial dysfunction, inflammation or any idiosyncrasy in renin-angiotensin-aldosterone system.

Studies of previous researchers concluded independent role of microalbuminuria and its association with cardiovascular morbidity and mortality in patients with diabetes and hypertension.⁽⁵⁻⁹⁾ It is perhaps proper to remark that few studies have been conducted to evaluate microalbuminuria in the non-diabetic, non-hypertensive patients especially in India. In this study an attempt has been made to find if microalbuminuria is associated with acute myocardial infarction even in non-diabetic, non-

hypertensive local population and whether at all it can predict in-hospital mortality.

Materials and Method

Study design: A cross sectional hospital based study.

Study subjects: 120 non-diabetic and non-hypertensive patients of acute myocardial infarction, after taking the consents.

Study duration: August 2012 to November 2014. Study was conducted for the period of 2 years and 3 months.

Study setting: Intensive Cardiac Care Unit, Gujarat Medical Education and Research Society College, Civil hospital, Valsad, Gujarat.

Study materials: Microalbuminuria was determined by immunoturbidimetric method (co-efficient variation of 2.47%). Serum glucose and Serum creatinine were measured by GOD-POD end point (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 without preservative and assayed for microalbumin.

The investigations carried out included random blood sugar (RBS) (GOD-POD method), Troponin-T (Sandwich Immunoassay), creatine phosphokinase - MB (CPK- MB) (Immune-inhibition method) and in serum, microalbuminuria (Turbidimetric Immunoassay) and creatinine (Modified Jaffe's method) in urine.^(10,11,12,13,14)

Data analysis: Appropriate statistical test was used for data analysis.

Exclusion from study: Patients with Myocardial infarction following surgery, major trauma, diabetes mellitus, hypertension (BP>140/90 mm Hg) any systemic infection, urinary tract infection, inflammatory conditions like rheumatoid arthritis and nephropathy (serum creatinine >1.6mg/dl).

Results

The study group included 120 patients of myocardial infarction with a mean age of 51.32 ± 11.25 years with range of 30 to 70 years. The gender distribution was 97 males (80.8%) and 23 females (19.2%). Amongst the cases 64 were smokers, 07 were alcoholic, 34 were both smokers and alcoholics and 15 were neither smokers nor alcoholic. (Table1). Among the cases, around 9% of patients had a family history of hypertension while a family history of diabetes mellitus and family history of myocardial infarction which were around 3% & 2% respectively. The remaining patients had no any significant family history.

In present study it was observed that, in majority 79 (65.8%) of the cases found with microalbuminuria while 41 (34.2%) with normoalbuminuria (Table 2). In Table 3 it shows that CK-MB and Troponin-T level had significantly increased in patients of myocardial infarction which were 118 (98.3%) and 114 (95%) respectively.

Based on ECG finding Association of microalbuminuria with various types of myocardial Infarction is given in Table 4. Table 5 shows the Association between age group & mortality in patients with MI in which it was observed that around 58% of patient from age group of more than 60 years amongst total died cases while only 9% of patients from the age group of below 45 years. It was observed that majority of MI attack as well as died were more in older age group compared to younger group while association between the age group & mortality in patients with MI was statistically not significant.

In Table 6 shows the mortality rate and presence of microalbuminuria, in which 33 (27.5%) of MI patients died out of the total no. of cases taken in study. 79 (65.8%) cases in which presence of microalbuminuria was found and the association between microalbuminuria & mortality in patients with MI shows that, those were died i.e. 33 (27.5%) in which microalbuminuria was present in around 20 (60%) cases. While chi square test applied for association that shows statistically insignificant.

Table 1: Distribution of cases as per Diet and personal history

Characteristic	No. (%)
Dietary Pattern	
Vegetarian	34(28.3%)
Mixed	86(71.7%)
History of Addiction	
Smoking	64(53.3%)
Alcohol	07(5.8%)
Smoking and Alcohol	34 (28.3%)
None	15 (12.5%)
Total	120 (100%)

Table 2: Distribution of cases according to level of Microalbuminuria in acute myocardial infarction

Albuminuria	No. (%)
Normomicroalbuminuria	41 (34.2%)
Microalbuminuria	79 (65.8%)
Total	120 (100%)

Table 3: Distribution of cases according to the activity of cardiac Marker

TROP-T (n=120)		CK-MB (n=120)	
Positive	Negative	Raised	Normal
118(98.3%)	2(1.7%)	114(95%)	6(5%)

Table 4: Distribution of the Cases According to Changes in ECG pattern and presence of microalbuminuria

Types of MI as per ECG	Microalbuminuria No. (%)	Normoalbuminuria No. (%)	Total No. (%)
Anterior wall MI	35 (72.9%)	13 (27.1%)	48 (40%)
Inferior wall MI	15(62.5%)	9 (37.5%)	24(20%)
Inf+RV MI	8 (61.5%)	5 (38.5%)	13 (10.8%)
Lateral wall MI	4 (80%)	1 (20%)	5(4.2%)
Posterior wall MI	1 (33.3%)	2 (66.7%)	3(2.5%)
NSTEMI	16 (59.6%)	11 (40.7%)	27(22.5%)
Total (120)	79 (65.8%)	41 (34.2%)	120

Table 5: Association between age group & mortality in patients with MI

Age Group (years)	Patient of MI		Total No. (%)	$\chi^2 = 3.400,$ P Value = 0.1827
	Survival No. (%)	Died No. (%)		
30 to 45	21 (24.1%)	3 (9.1%)	24 (20%)	
45 to 60	25 (28.7%)	11(33.3%)	36 (30%)	
More than 60	41 (47.1%)	19 (57.6%)	60 (50%)	
Total	87 (72.5%)	33 (27.5%)	120	

Table 6: Association between microalbuminuria & mortality in patients with MI

Presence of albuminuria	Patient of MI		Total No. (%)	$X^2= 0.553$ P value = 0.4571
	Survival No. (%)	Died No. (%)		
Microalbuminuria	59 (67.8%)	20 (60.6%)	79 (65.8%)	
Normoalbuminuria	28 (32.2%)	13 (39.4%)	41(34.2%)	
Total	87(72.5%)	33(27.5%)	120	

Discussion

In present study, it's found that microalbuminuria is significantly present in patients of myocardial infarction with non-diabetic and non-hypertensive. PS Singh et al had revealed in his study that Troponin T was positive in all patients (100%) with acute myocardial infarction similarly in our study it was found positive in (98.3%) of the cases.⁽¹⁵⁾ Study done by Ala Hussain Abbase had divided patients into two groups according to level of CK-MB in that group with elevated CK-MB patients were 35.7% and group with normal CK-MB patients were 64.3%.⁽¹⁶⁾ While in our study, cardiac enzyme CK-MB was increased in 95% of cases. Further, complications associated with acute myocardial infarction were observed as Arrhythmias, Shock, Heart block, extension of myocardial infarction, reinfarction of MI, Post myocardial angina and Pericarditis most commonly found in patients with microalbuminuria. Haffner et al in their study suggested that significance of microalbuminuria as a possible predictor of coronary heart disease in persons without diabetes.⁽¹⁷⁾

While Yudkin et. al, considered that microalbuminuria was to be an independent risk indicator of cardiovascular disease, Gosling reported in his study that microalbuminuria helps to identifies patients at risk of developing cardio vascular diseases and it should be considered as a sensitive indicator of inflammation reflecting vascular permeability in absence of renal disease.^(18,19) In his study they revealed that more

studies are required for conclusion about microalbuminuria as a emerging cardiovascular risk factors.⁽²⁰⁾

Our study equates with the fact that presence of Microalbuminuria in non-diabetic, non-hypertensive patients, but it did not match with the percentage of patients with Microalbuminuria found in other studies. Compared to other study in our study the higher values might be due to effect of risk factor smoking which was present in 81.7% (98/120) of patients.

Non-diabetic and non-hypertensive individuals are considered to be in high risk of cardiovascular diseases where other risk factors, markers and elevation of microalbuminuria were present, revealed by Romaunstadt et al.⁽²¹⁾ Similarly a cross-sectional study done by H.L. Hillege et al in the year 2001 found the presence of microalbuminuria were 6.6%.⁽²²⁾ Study was done in population of south Indian by Sathisa T.G, in his study; he concluded that along with lipid profile, microalbuminuria is useful to predict the early detection of cardiovascular renal changes for prevention of morbidity and mortality.⁽²³⁾

Limitations

This study was conducted in Patients of myocardial infarction admitted in the ICCU of civil hospital, Valsad only. It was not possible to include those patients who discharged from ICU so; this will require further details study in other government and private hospital. Long

term study and more data are needed to establish further the prognostic value of microalbuminuria for cardiovascular disease in the population at large.

Conclusion

In our study it was found that elder patients (age>50) with increased level of microalbumin had more chances of mortality as compared to normo-albuminuria. Our findings indicate that microalbuminuria is independently associated with minor as well as major ischemic electrocardiographic abnormalities. Microalbuminuria is relatively simple and affordable investigation for poor resource centers. Microalbuminuria may therefore add value together with traditional risk indicators in strategies to detect high risk individuals and target action to prevent cardiovascular disease. Monitoring of microalbumin as a screening test might be helpful to detect high risk patients with cardiovascular disease.

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Conflict of interest

None declared

Reference

- American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 2005; 28(Suppl 1):S4- S36.
- Yuyun M F, Adler A I, Wareham N J. What is the evidence that microalbuminuria is a predictor of cardiovascular disease events? *Curr Opin Nephrol Hypertens.* 2005;14:271-6.
- Mogensen CE et al. Microalbuminuria predicts clinical proteinuria and early mortality in maturity-onset diabetes. *N Engl J Med* 1984;310(6):356-360.
- Sonmez K, Eskisar AO, Demir D, Yazicioglu MV, Mutlu B. Increased urinary albumin excretion rates can be a marker of coexisting coronary artery disease in patients with peripheral arterial disease. *Angiology* 2006;57:15-20.
- Bigazzi R, Bianchi S, Baldari D. Microalbuminuria predicts cardiovascular events and renal insufficiency in patients with essential hypertension. *J Hypertens* 1998;16(9):1325-1333.
- Jensen JS, Feldt-Rasmussen B, Strandgaard S. Arterial hypertension, microalbuminuria, and risk of ischemic heart disease. *Hypertension* 2000;35(4):898-903.
- Deckert T, Yokoyama H, Mathiesen E. Cohort study on the predictive value of urinary albumin excretion for atherosclerotic vascular disease in patients with insulin dependent diabetes. *Br Med J* 1996;312(7035):871-874.
- Dinneen SF, Gerstein HC. The association of microalbuminuria and mortality in non-insulin-dependent diabetes mellitus: a systematic overview of the literature. *Arch Intern Med* 1997; 157(13):1413-1418.
- Gerstein HC, Mann JF, Yi Q. Albuminuria and the risk of cardiovascular events, death, and heart failure in diabetic and non-diabetic individuals. *J Am Med Assoc* 2001; 286(4):421-426.
- Sacks, Burtis, C.A., Ashwood, E.R., editors *Tietz Textbook of Clinical Chemistry.* 3rd ed. Philadelphia, W.B. Saunders Company, 1999, p 750-808.
- Sorensen, J.T. Terkelsen, C.J, Steengaard, C. et al. Pre-hospital Troponin T testing in the diagnosis and triage of patients with suspected acute myocardial infarction. *Am J Cardiol.* 2011, 107(10):1436-40.
- IFCC methods for the measurement of catalytic concentrations of enzymes, *JIFCC.* 1989,1:130
- S.R. Hamed, P. Pavkovic, Z. Metelko. *Microalbuminuria and Diabetes mellitus, Diabetologia Croatica,* 2002; 31-4.
- Burtis, C.A., Ashwood, E.R., editors, *Tietz Textbook of Clinical Chemistry.* 2nd ed. Philadelphia, W.B. Saunders Company, 1994, p 1532-1537.
- PS Singh, Singh G, Singh SK, *Clinical profile and risk factors in acute coronary syndrome. JIACM* 2013;14:130-132.
- Ala Hussain, Abbase Haider, Dheya Kazim Al-Khefaji, *Prognostic Significance of Troponin T and Creatine Kinase-MB Activity in Sera of Acute Ischaemic Stroke Patients. Medical Journal of Babylon.* 2010; 7; p469-479.
- Haffner SM, Stern MP, Gruber MK, Hazuda HP, Mitchell BD. *Microalbuminuria. Potential marker for increased cardiovascular risk factors in non-diabetic subjects? Arteriosclerosis* 1990;10:727-731.
- Yudkin JS, Forrest RD, Jackson CA. *Microalbuminuria as predictor of vascular disease in non-diabetic subjects. Islington Diabetes Survey. Lancet* 1988; ii: 530-3.
- Gosling P et al. *Microalbuminuria and cardiovascular risk: a word of caution. J Hum Hypertens* 1998; 12: 211-213.
- Gosling P, Sutcliffe AJ, Cooper MA, Jones AF, Burn and trauma associated proteinuria: the role of lipid peroxidation, renin and myoglobin. *Ann Clin Biochem* 1988;25:53-59.
- Klausen KB, Johnson K, Rasmusen B, Jensen G; *Very low levels of Microalbuminuria are associated with increased risk of coronary heart disease and death independently of renal function, hypertension and diabetes. Circulation* 2004;110:32-35.
- Hillege HL, Janssen WM, Bak AA. *Microalbuminuria is common, also in a non-diabetic, non-hypertensive population, and an independent indicator of cardiovascular risk factors and cardiovascular morbidity. J Intern Med* 2001;249(6):519-526.
- Sathisha T.G., Manjunatha Goud B.K., Avinash S.S., Jeevan Shetty, Oinam Sarsina Devi, Devaki R.N.. *Microalbuminuria in non-diabetic, non-hypertensive myocardial infarction in south Indian patients with relation to lipid profile and cardiac markers. Journal of Clinical and Diagnostic Research.* 2011 November (Suppl-1), Vol-5(6):1158-1160.