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Research Article

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

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ABSTRACT

Background: This study was designed to evaluate the association of microalbuminuria in non-diabetic and non-hypertensive patients with myocardial infarction and to determine whether microalbuminuria is an independent marker of Myocardial Infarction in non-diabetic and non-hypertensive patients.
Methods: This study was conducted over 50 patients diagnosed as ST-segment elevation acute myocardial infarction on the basis of clinical history, examination, ECG changes, & biochemical markers. Cases were selected from a tertiary care hospital, Udaipur.
Results: In our study out of the 50 cases 66% (n=33) had microalbuminuria. The difference was statistically significant $P < 0.001$. Microalbuminuria was found in a lower age group (48.76 ± 6.97) in cases as compared to controls (54.5 ± 4.12) ($P < 0.05$). Among the 30 males in cases 25 (83.33%) had microalbuminuria. ($P < 0.05$) microalbuminuria is seen more among smokers ($P < 0.001$). In cases, 26 had a BMI >25 of these 80.76% (n=21) had microalbuminuria. Microalbuminuria is associated with high cholesterol in IHD.
Conclusions: The microalbuminuria is significantly associated with in non-diabetic non-hypertensive myocardial infarction. Microalbuminuria is seen at a younger age group in MI. Microalbuminuria is associated with male sex significantly. Microalbuminuria is strongly associated with smoking, high body mass index and high total cholesterol. Microalbuminuria is seen independent of smoking status, BMI, total cholesterol in patients of myocardial infarction.

Keywords: Microalbuminuria, Total cholesterol, Myocardial infarction

INTRODUCTION

Coronary heart disease has been defined by WHO as Impairment of heart function due to inadequate blood flow to the heart compared to its needs, cause by obstructive changes in coronary flow. Coronary Heart Disease (CHD) contributed 15.3 million deaths in 2000, accounting for 30% of the global death to that year. In absolute numbers the developing countries contributed 9.77 million deaths due to Coronary Heart Disease (CHD), in contrast to 5.52 million in developed countries (an excess of 76%).[1]

Asian Indians - those living in India and also the diasporas - have one of the highest rates of Coronary Artery Disease (CAD) in the world.[2,3] Among urban Indians the prevalence of coronary artery disease is as high as 10-12%. The coronary artery disease among Indians is usually more advanced at the time of presentation compared with whites or other Asians.[4] The overall social and economic impact of the disease is much greater because the coronary artery disease in Asian Indians affects a younger and working population.[5] While the mortality and morbidity from coronary artery disease has been declining in the western world, it has been climbing among the Indian population.

Microalbuminuria can also signify a deleterious cardiovascular prognosis in other individuals, such as patients with dyslipidemia or the cluster of risk factors that make up cardio-metabolic risk, also known as the metabolic syndrome: abdominal obesity, elevated triglycerides, and elevated fasting blood glucose.[6,7] The early (30-day) mortality rate from Acute Myocardial Infarction (AMI) is 30%, with more than half of these deaths occurring before the stricken individual reaches the hospital. Although the mortality rate after admission for AMI has declined by 30% over the past two decades, approximately 1 of every 25 patients who survives the initial hospitalization dies in the first year after AMI. Mortality is approximately fourfold higher in elderly patients (over age 75) as compared with younger patients.[8]

So this study was planned to see the association of microalbuminuria in non-diabetic and non-hypertensive patients with myocardial infarction.

METHODS

This study was conducted over 50 patients diagnosed as ST-segment elevation acute myocardial infarction on the basis of clinical history, examination, ECG changes, & biochemical markers. Cases were selected from a tertiary care hospital, Udaipur. A well informed consent was remained pre-requisite for all cases included in study.

Fifty age & sex matched healthy controls with no symptoms of coronary artery disease and with a normal ECG.

Exclusion criteria: Age <30 and >60 years, diabetes mellitus, history of hypertension, congestive cardiac failure, renal disease, macro-albuminuria, females taking oral contraceptives, hypertensive at the time of admission.

Micro albuminuria

In this study, we estimated the presence of albumin excretion by an immunoturbidimetric test.

Microalbuminuria - Definition

It has been defined as urinary albumin excretion >30 mom/24 hour (20 µgm/tm) and <300 mg/24 hour. (200 µgm/tm) irrespective of how sample is collected.[9] Albumin excretion in healthy individuals ranges from 1.5-20 µg/ min.[10]

Test component

One test strip contains monoclonal antibodies against human albumin (IgG) labeled with colloidal gold 6 mg. and fixed albumin 9.5 mg.

Procedure

- Immerse the test strip into the urine such that the fluid level is just between the two black bars, withdraw the test strip after 5 seconds and place it across the top of the urine vessels. While immersing and withdrawing the test strip does not allow the test strip to touch the collection vessels.

- After 1 minute compare the colour of test pad above the inscription "Micral" with the colour scale on the test strip vial level. If the colour development is slightly uneven average colour is relevant. Comparison of the colour with the colour scale is possible for another 5 minutes then the colour disintegrates.

RESULTS

Microalbuminuria is associated with IHD. Cases were significantly associated with microalbuminuria. This difference among cases and controls was significant statistically too, $X^2 = 21.58$, $P < 0.001$ (Table 1).

Microalbuminuria was seen at a younger age group. The mean age group difference noted among cases and controls showed that microalbuminuria was found in a lower age group (48.76 ± 6.97) in cases as compared to controls (54.5 ± 4.12). The difference was statistically significant. Z=3.22, P <0.05 (Table 1).

Table 1: Association of microalbuminuria (MAU) in cases and controls.

Total population	MAU positive	MAU negative
Cases	33 (66%)	17 (34%)
Controls	10 (20%)	40 (80%)

Male sex is associated with microalbuminuria. Among the 30 males in cases 25 (83.33%) had microalbuminuria. While among the 20 female cases only 8(40%) had microalbuminuria. The difference was statistically significant $X^2 = 10.04$, $P < 0.05$ (Table 2).

Microalbuminuria is seen more among smokers. In cases who are smokers (n=25), microalbuminuria was present in 92% (n=23). In controls who are smokers (n=18) microalbuminuria was present in 44.4% (n=8). The difference was statistically significant %2 = 15.06 and P <0.001.

Microalbuminuria is independently associated with IHD irrespective of smoking. Out of the 43 smokers, 31 had microalbuminuria. Among these majority 74.19% (n=23) were cases and only 25.80% (n=8) were controls. This was also statistically significant ($X^2 = 11.76$, $P < 0.001$).

Microalbuminuria is associated with high BMI. In cases, 26 had a BMI >25 of these 80.76% (n=21) had microalbuminuria. The difference was statistically significant $X^2 = 5.27$, P <0.05. While in controls, 10 had a BMI >25 of these 50% (n=5) had microalbuminuria. This was also significant statistically $X^2 = 7.03$, P <0.05.

Microalbuminuria is associated with IHD irrespective of BMI. We had 36 people with BMI >25 of these 72.22% (n=26) fall among cases and only 27.77% (n=10) were controls. There were 26 people with microalbuminuria and BMI >25. Of these 80.76% (n=21) were among cases and only 19.23% (n=5) among controls. This was not significant statistically $X^2 = 3.41$, P >0.05

High total cholesterol is a risk factor for IHD. In the present study the total cholesterol value was 188.54 ± 29.25 mg/dl in cases and was 174 ± 17.90 mg/dl for controls. Microalbuminuria is associated with high cholesterol in IHD. Among cases there were 25 with total cholesterol >200 mg/dl of this 88% (n=22) had microalbuminuria. This was significant statistically also $X^2 = 10.78$, P <0.001. Among controls 6 had total cholesterol >200 mg/dl but only 33.33% (n=2) had microalbuminuria. This was not significant % = 0.76 P >0.05.

Microalbuminuria is seen independently in IHD irrespective of total cholesterol. We had 31 people with total cholesterol >200 mg/dl. In which 24 were microalbuminuria positive. Of these 91.66% (n=22) were cases and only 8.33% (n=2) were controls. This was statistically significant $X^2 = 8.27$ P <0.001.

Table 2: Association of microalbuminuria with sex, smoking status, BMI, total cholesterol in cases and controls.

		Cases (n=50)		Controls (n=50)	
		MAU positive	MAU negative	MAU positive	MAU negative
Male		25 (83.33%)	5 (16.66%)	8 (36.36%)	22(73.33%)
Female		8 (40%)	12 (60%)	2 (10%)	18(90%)
Smoking status	Yes	23 (92%)	2 (8%)	8 (44.4%)	10(55.5%)
	No	10 (40%)	15 (60%)	2 (6.25%)	30(93.75%)
BMI	>25	21 (80.76%)	5 (19.24%)	5 (50%)	5(50%)
	≤25	12 (50%)	5 (50%)	5 (12.5%)	35(87.5%)
Total cholesterol	>200	22 (88%)	3 (12%)	2 (33.33%)	4(66.67%)
	<200	12 (48%)	13 (52%)	8 (18.18%)	36(81.81%)

DISCUSSION

Out of the 50 cases present in this study microalbuminuria was found among 33, which was 66% while in controls this was only 10, which means 20%. This observation shows that microalbuminuria is associated significantly with ischemic heart disease (P <0.001). The association of microalbuminuria with myocardial infarction has also been noted by Taskiran M et al.[11]

The age group of the subjects in this study was >30 and <60. The mean age group of microalbuminuria positive cases was 48.76 ± 6.97 years and that for controls was 54.5 ± 4.12 years. This clearly shows that microalbuminuria is seen at a younger age group among cases and the difference is significant Z = 3.22 P <0.05. The observation of presence of microalbuminuria at higher age group among controls goes along with different studies done by Agarwal K[12] B et al., Jensen JS et al.[13] which showed that microalbuminuria is associated with older age group.

We had 60 males (30 cases, 30 controls) and 40 females (20 cases, 20 controls) in the study group. As shown in Table 2, among the cases 25 out of the 30 males had microalbuminuria while only 8 out of the 20 females had it. This shows that among cases males had higher incidence of microalbuminuria (P <0.05).

Among the controls only 8 out of 30 males had microalbuminuria and only 2 out of 20 females had the same. Even through males have a higher rate of microalbuminuria among controls the value is not statistically significant (P >0.05). If we consider cases and controls together males are having more incidence of microalbuminuria with statistical significance 8.81 P <0.05. This observation is similar to The Copenhagen study that microalbuminuria is associated with male sex.[13]

As evident from Table 2, there were 25 smokers among the 50 cases, all being males. Among these 23 (92%) had microalbuminuria which was significant $X^2 = 15.06$ and P <0.001. Which shows that microalbuminuria is significantly associated with smokers with MI. We also had 18 smokers among the controls of which 8 (44.4%) had microalbuminuria as shown in Table 2. This shows that majority of the controls with microalbuminuria were smokers (8 out of 18).

We took the smokers in the study group together and found that (Table 2) of the 43 smokers 25 (58.13%) were cases and 18 (41.86%) were controls. This shows the increased risk of MI among smokers. We also noticed that among smokers 31 were having microalbuminuria. Of the 31, majority 23 (74.19%) belonged to cases and 8 (25.81%) controls. This observation that among smokers microalbuminuria positivity was seen more among cases with statistical significance (P <0.001) makes it obvious that microalbuminuria can be considered independent of smoking status for risk of IHD. This observation is similar to those made by Mimarn et al., Gubbio Population study by Cirillio M et al.[14,15]

We classified the study group according to BMI >25 or BMI <25. We found that among cases there were 26 with BMI >25 as shown in Table 2. Among these, microalbuminuria was seen in 21 (80.76%) and 5 (19.24%) did not have it. This when analyzed was significant %2 = 5.27 P <0.05. This observation has gone along with those made by Cirillio M et al. in Gubbio population study 1998 that microalbuminuria is associated with high body mass index.[15]

We also observed as in Table No.2 that microalbuminuria was seen in 5 out of 10 controls who had BMI >25 this was also significant statistically (P <0.05). This again shows association of microalbuminuria with high BMI.

As shown in Table 2 we found that there were 36 people with BMI >25 in the study group of this 26 (72.22%) were cases and 10 (27.77%) controls. This shown increased incidence of IHD in BMI >25. We also observed that microalbuminuria was seen in 26 in the group, of which 21 were cases and 5 controls. This showed that microalbuminuria was seen more among the cases with BMI >25 than among the controls with BMI >25. But this when analyzed was not significant statistically X^2 = 3.41 P >0.05. Since the % value close to X^2 significant we apply the 95% confidence interval here. The 95% Confidence Interval in these cases has an upper limit 26.58 and a lower limit 0.65. It can be said that the chance of microalbuminuria positivity is more among cases at the high 26.58% and at the low 0.65% than the controls in spite of all having BMI >25. This may show microalbuminuria to be an independent factor of IHD.

We classified the study group according to total cholesterol >200 and <200. As per the Table 2 there were 25 cases with total cholesterol >200, of these 22 (88%) were having microalbuminuria this was significant statistically also X^2 = 10.78 P <0.001. We also had 6 controls as shown in Table 2 with total cholesterol >200, but only 2 (33.33%) of them had microalbuminuria, this was not significant X^2 = 0.76 P >0.05. The association of microalbuminuria with lipid abnormalities has been reported by Jensen JS et al.[16] also. The mean value of total cholesterol of cases was 188.54 ± 29.25 and for controls was 174 ± 17.90 the difference being significant statistically.[13]

As seen in Table 2 we grouped all the individuals with total cholesterol >200 and found that there were 31 in total among those 25 (80.64%) were cases and 6 (19.36%) were controls. This shows the association of increased total cholesterol with IHD. We also observed that in this group microalbuminuria was seen in 24. Of this 22 (91.66%) belonged to cases and 2 (8.33) belong to controls this was statistically significant X^2 = 8.27 P <0.001. This shows in spite of all having total cholesterol >200, microalbuminuria was seen significantly among cases making it an independent marker.

In our study we observed that 10 persons out of 50 among the controls (20%) had microalbuminuria. Of these -8 were males, 2 were females, 8 were smokers (all males), 5 had BMI >25, 2 had total cholesterol >200 mg/dl.

This shows that the finding of microalbuminuria among controls could be explained by all the 8 males being smokers and the 2 females being of older age group (60 year old). This observation is similar to those made by Jensen JS et al. and Hillege et al. This also warrants the need for further follow up of these individuals.[16,17]

CONCLUSION

The conclusions draw from the present study is as follows:

The association of microalbuminuria in non-diabetic non-hypertensive myocardial infarction was 66%. Microalbuminuria is seen at a younger age group in MI. Microalbuminuria is associated with male sex significantly. Microalbuminuria is strongly associated with smoking. Microalbuminuria is strongly associated with high body mass index. Microalbuminuria is strongly associated with high total cholesterol. Microalbuminuria is seen independent of smoking status, BMI, total cholesterol in patients of Myocardial Infarction.

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