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Original Research Article

Study of Microalbuminuria in subjects with Type 2 Diabetes with Ischemic heart disease in Rural population in South IndiaIndumathi S^{*1} and Harishkiran N E²¹Department of Medicine, ²Department of Radiology,
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Article History:*Received:** 02/12/2017**Revised:** 10/12/2017**Accepted:** 10/12/2017**DOI:** <https://doi.org/10.7439/ijbr.v8i12.4518>**Abstract**

Objectives: Ischemic heart disease (IHD) is the frequent causes of morbidity and mortality worldwide. The prevalence of ischemic heart disease in general population being 2-4%, while in people with type 2 diabetes 9.9%. This study was conducted at Subbaiah Medical College & Research Institute, Shimoga to Study Microalbuminuria in subjects with Type 2 Diabetes mellitus with Ischemic heart disease and without Ischemic heart disease, to assess the cardiovascular health status and to take appropriate steps to prevent further morbidity

Methods: We studied 100 patients admitted to Medical wards after meeting the required criteria following investigations was carried out.

1) 12 Lead ECG 2) Spot urine albumin creatinine ratio 3) FBS & PPBS 4) Blood urea and serum creatinine 5) TMT / 2D ECHO 6) Lipid profile.

Results: 100 subjects were included, 59% were males and remaining 41% were females. 50 subjects were having Type 2 Diabetes with IHD considered as cases, other 50 subjects were having Type 2 Diabetes without IHD considered as controls. Among patients with IHD, maximum UACR value is 276 and minimum value is 20, whereas in patients without IHD, maximum is 42 and minimum is 18. There is significant difference in the mean UACR among patients with and without IHD.

T-statistics -7.73 indicates statistically significant with p-value of <0.001 at 5% significance level.

Conclusion: Subjects with Type 2 DM with IHD have been found to have higher UACR levels than those subjects without IHD. Screening for UACR can help clinicians estimate a patient's CVD risk and to take appropriate steps to prevent further morbidity.

Keywords: Ischemic heart disease (IHD), Microalbuminuria, UACR [urine albumin creatinine ratio], Type 2 diabetes mellitus.

1. Introduction

Ischemic heart disease (IHD) is the most frequent causes of morbidity and mortality worldwide [1]. Incidence of IHD has increased in recent decades. In the presence of this alarming epidemic, the case for identifying and targeting patients with IHD for aggressive treatment to reduce cardiovascular risk is well established [2]. Unlike in the West, where older people are most affected, diabetes in India is disproportionately high in young to middle-aged

adults. Risk factors for the development of IHD include age, familial hypercholesterolemia, alcohol, smoking, diabetes, hypertension, sedentary life style, obesity and dyslipidemia [1]. However, these conventional risk factors do not account for all cases of IHD. Therefore effort is made to improve cardiovascular risk assessment by searching for novel biomarkers. Currently, there is an intense debate whether they should be introduced into

routine risk assessment. This especially concerns Lipoprotein (a)[2], C-Reactive Protein[3,4], fibrinogen[5], homocysteine, microalbuminuria[6].

Risk of Cardiovascular disease is increased in individuals with type 1 or type 2 DM when compared to general population. The Framingham Heart Study revealed a marked increase in IHD and sudden cardiac death in Diabetes. The American Heart Association has designated Diabetes as a "CHD risk equivalent." [7] Because of the high prevalence of underlying cardiovascular disease in individuals with diabetes, evidence of atherosclerotic vascular disease should be identified in an individual with diabetes who has symptoms suggestive of cardiac ischemia or peripheral vascular disease or carotid arterial disease. The absence of chest pain ("silent ischemia") is common in individuals with diabetes, and a thorough cardiac evaluation should be considered in individuals with type 2 diabetes. CHD is more likely to involve multiple vessels in individuals with DM [7]. The increase in cardiovascular morbidity and mortality rates is due to the synergism of hyperglycemia with other cardiovascular risk factors.

Microalbuminuria was initially demonstrated in patients with diabetes mellitus, where it was shown to be associated with atherogenic changes in the cardiovascular risk profile [8] and to predict increased mortality due to cardiovascular disease [9,10]. Microalbuminuria (defined as urinary albumin excretion of 30-300 mg/day or 20-200 µg/min) is an early sign of vascular damage. It is a marker of vascular dysfunction and is considered to be a predictor of worse outcomes for both kidney and heart disease.

Microalbuminuria has been used for many years as a predictor of incipient nephropathy in diabetic patients [10]. It has been reported in international literature that microalbuminuria is an independent predictor of IHD [11]. Microalbuminuria can be taken as an indicator of insulin resistance and of the increased renal and cardiovascular risk associated with metabolic syndrome. It is demonstrated that cardiovascular and renal risk is elevated even in the high normal range of microalbuminuria (below 30 mg/day)[12]. So in the present study we compared and studied the pattern of microalbuminuria in Type 2 diabetes subjects with and without ischemic heart disease. Screening microalbuminuria in diabetes subjects helps to prevent further morbidity.

2. Materials and Methods

2.1 Source of data

Primary observed data of subjects with type 2 diabetes admitted to Medicine wards for ischemic heart disease in Subbaiah Medical College, Shimoga during the period of November 2013 to November 2014.

Control group of Type 2DM without IHD

2.2 Method of collection of data

(Including sampling procedure if any)

In the present study done at Subbaiah Medical College, Shimoga, 100 subjects admitted to Medical wards who met the inclusion and exclusion criteria were selected for the study after obtaining the informed consent. Detailed history, clinical examination and the following investigations were carried out.

- 1) 12 Lead ECG; 2) Spot urine albumin creatinine ratio; 3) FBS & PPBS; 4) Blood urea and serum creatinine; 5) TMT / 2D ECHO; 6) Lipid profile

This study proposes to include people with diabetes mellitus with IHD as cases and without IHD as controls. Sample size is 100.

- Control group {people with type 2 diabetes without IHD} -50 subjects
- Test group {people with type 2 diabetes with IHD} -50 subjects

2.3 Statistical method

Descriptive study

2.4 Statistical tests

Chi square test, students T test Bar & Pie chart. Related statistical techniques using SPSS version 18.0

2.5 Statistical Analysis

Data Analysis and Interpretation:

- Data was entered into Microsoft excel and analyses were done using the Statistical Package for Social Sciences (SPSS), Windows software (version 18.0)
- Descriptive statistics such as mean and standard deviation (SD) for continuous variables and frequency and percentage for categorical variables were determined.
- The chi-square test and student T test (when appropriate) were used to show the associations between predictor and outcome variables.
- The level of significance was set at 0.05.

3. Results and observations

3.1 Population characteristics:

Among the 100 subjects chosen for the study, 59 subjects were males (59%) and remaining 41 subjects were females (41%).

Majority of the subjects were in the age group of 50-69 years (60%).

Table 1: Population characteristics

IHD	Sex	Number of subjects	Percentage
Without	F	21	42%
	M	29	58%
With	F	20	40%
	M	30	60%

Above table indicates 59% of the subjects are male and remaining 41% are female patients. 50 subjects were having Type 2 Diabetes with IHD as cases; other 50 subjects were having Type 2 Diabetes without IHD as controls.

3.2 Age distribution

Table 2: Age distribution

Age group	Number of subjects	Percentage of subjects
40 to 49	23	23%
50 to 59	40	40%
60 to 69	26	26%
70 to 79	10	10%
80 to 89	1	1%

77% of the subjects are older than 50 years.

3.3 Mean age distribution:

Table 3: Mean age distribution

	Age	N	Minimum	Maximum	Mean	Std. Deviation	Variance	t-value (T-test)	P-value
IHD	control	50	44	72	56.68	6.68	44.63	-0.12	0.89
	cases	50	40	80	56.9	10.20	104.17		

Mean age among subjects with and without IHD is statistically same. P-value 0.89 indicates that mean age of subjects with and without IHD is statistically same.

3.4 Urine albumin creatinine ratio

Table 4: Urine albumin creatinine ratio

	UACR	N	Minimum	Maximum	Mean	Std. Deviation	Variance	t-value (T-test)	P-value
IHD	control	50	18	42	25.98	5.38	29.04	-7.73	<0.001
	cases	50	20	276	68.78	38.76	1502.37		

There is significant difference in the mean UACR between subjects with and without IHD. T-statistics -7.73 indicates statistically significant with p-value of <0.001 at 5% significance level. UACR is statistically different among subjects with IHD compared to subjects without IHD.

4. Discussion

Association between diabetes and heart disease was described more than a century ago which initially was presumed to be caused by atherosclerosis. Diabetes as a cardiovascular risk equivalent was confirmed by Framingham study and other landmark studies [13]. Diabetic nephropathy remains the leading cause of end stage renal disease (ESRD). Microalbuminuria (Persistence albumin excretion in urine in the range 30-299 mg/24 h), is indicator of incipient nephropathy and may lead to nephropathy or end stage renal disease (ESRD). Microalbuminuria is also a risk factor and an indicator for the future development of Ischemic heart disease [14-16].

Among the 100 subjects chosen for the study, 59 subjects were males (59%) and remaining 41 subjects were females (41%). Majority of the subjects were in the age group of 50-69 years (60%). Mean age among patients with and without IHD is statistically same. P-value 0.89 indicates that mean age of patients with and without IHD is statistically same. There is significant difference in the mean UACR between subjects with and without IHD. T-statistics -7.73 indicates statistically significant with p-value of <0.001 at 5% significance level. UACR is statistically different among subjects with IHD compared to subjects without IHD.

Microalbuminuria seems to correlate with various cardiac abnormalities and diseases, including left ventricular dysfunction, hypertrophy, electrocardiographic abnormalities and ischemic heart disease [17]. The Strong

Heart Study demonstrated a significant association between microalbuminuria and echocardiographic parameters of LV systolic and diastolic function in a cohort of 1576 Native Americans with diabetes [18].

Dick de Zeeuw *et al*, conducted study in 2006 and showed microalbuminuria not only predicts CV risk but also seems to be a sensitive marker for detecting new onset of other CV risk factors, such as hypertension and diabetes [19].

Brantsma *et al* showed that individuals with microalbuminuria had an approximately four-fold increase in the risk for developing subsequent new-onset diabetes than those with low normal urinary albumin levels, even after correcting for baseline glucose and insulin levels or after excluding those with impaired fasting glucose or metabolic syndrome [20]. They also found that microalbuminuria increased the risk for de novo hypertension by two-fold as compared with normal albuminuria levels and hence microalbuminuria is to be considered as an early marker of cardiovascular disease [20].

Heart Outcomes Prevention Evaluation (HOPE) Study, showed that for every 0.4 mg/mmol increase in baseline urine albumin creatinine ratio, the adjusted hazard of major cardiovascular events increased by 5.9%. [21]

A study of 308 patients who underwent elective coronary angiography revealed that patients with angiographic evidence of CAD had significantly higher urinary albumin levels than disease-free individuals (28

versus 10 mg/g; P 0.001) and that UAE (urine albumin excretion) increased progressively with CAD severity [22].

The presence of microalbuminuria also seems to predict all cause mortality in the general population [23]. This was initially shown in the Prevention of Renal and Vascular End stage Disease (PREVEND) study, in which inhabitants of Groningen, The Netherlands, who were aged 28 to 75 yr were sent a questionnaire and a vial to collect an early-morning urine sample for measurement of UAE. A total of 40, 548 participants who were followed for 2.6 yr were included in an analysis of mortality by baseline UAE. A clear positive relationship was observed between UAE and all-cause cardiovascular, and non cardiovascular death. A two-fold increase in UAE was associated with a 1.29 (95% CI 1.18 to 1.40) higher RR for cardiovascular death and a 1.12 (95% CI 1.04 to 1.21) higher RR for non cardiovascular death.

5. Conclusion

100 subjects were included in the study. 50 of them are subjects with TYPE2 DM with IHD; other 50 are subjects with Type 2 DM without IHD. Majority of the subjects were in the age group of 50-69 years (66%). 59% were males and remaining 41% were females. Mean age among patients with and without IHD is statistically same. P-value 0.89 indicates that mean age of patients with and without IHD is statistically same. Among patients with IHD, maximum UACR value is 276 and minimum value is 20, whereas in patients without IHD, maximum is 42 and minimum is 18. There is significant difference in the mean UACR among patients with and without IHD. T-statistics - 7.73 indicates statistically significant with p-value of <0.001 at 5% significance level. UACR is statistically different among subjects with IHD compared to subjects without IHD.

Hence subjects with Type 2 DM with IHD have been found to have higher UACR compared to subjects without IHD. Screening for UACR levels can help clinicians to estimate a patient's CVD risk and, if positive, should prompt the early introduction of a multi factorial intervention strategy that aim to improve the overall CVD risk factor profile as well as prevents further morbidity and mortality.

Conflict of interest: There is no conflict of interest.

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