Original Research Article

Prevalence and biochemical correlates of microalbuminuria in type 2 diabetes mellitus at Puducherry, India

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ABSTRACT

Background: Microalbuminuria is a risk factor for end stage renal disease as a sequalae of diabetic nephropathy and an independent risk factor for cardio-vascular diseases. Early screening for Microalbuminuria can prevent long-term complications. The objective of the present investigation was to study the magnitude of Microalbuminuria among the patients with type 2 diabetes mellitus attending to the diabetic clinic and correlate with other biochemical parameters related to complications of diabetes.

Methods: This observational study was conducted among 500 type 2 diabetic patients attending to the diabetology OPD, Department of General medicine during the time period June 2017 to May 2018. The patients were interviewed for socio-demographic details, history and clinical examination and subjected to blood investigations and ECG.

Results: Microalbuminuria was present in 31.6% (n=158) of the diabetics. Age group 45-55 years, male gender, duration of diabetes >10 years, active smokers, Diabetic retinopathy, Peripheral neuropathy, Ischemic heart disease, SBP 160-170 mmHg, DBP 95-100 mmHg and 100-105 mmHg, BMI 30-35 Kg/m^2, TG >250 mg/dl, LDL >110 mg/dl and HbA1c 7.5-9 % showed a greater odds ratio and significant association (p<0.001) with Microalbuminuria.

Conclusions: There was an increased prevalence of Microalbuminuria among the patients with type 2 diabetes. It also showed significant association of major microvascular and macrovascular complications of diabetes and Microalbuminuria.

Keywords: Biochemical parameters, Microalbuminuria, Risk factors, Type 2 diabetes

INTRODUCTION

Diabetes mellitus is the leading cause of end stage renal disease globally and proteinuria is believed to be the characteristic marker for diabetic nephropathy.[1] Abnormal excretion of albumin in urine is a frequent associate in 30-40% of individuals suffering from type 2 diabetes mellitus. The increased levels of urinary albumin also correlated with the enhanced mortality rates due to cardiovascular deaths.[2] Microalbuminuria is defined as urinary albumin excretion rate of 20-200 µg/min or urinary protein excretion rate of 30-300 µg/min. It is a sensitive screening test to predict the development of overt nephropathy in future.[3] Glomerular hyperperfusion and renal hypertrophy are pathognomic features in diabetes mellitus which reflect as increased glomerular filtration rate. Renal micovascular injury is responsible for increased albuminuria in diabetes but urinary Microalbuniuria is an overall marker of a generalized vascular injury also. Thus, it is associated with increased end stage renal disease in diabetes and independently with cardio-vascular disease as well.[4,5] This study aimed at identifying the magnitude of Microalbuminuria among the patients with type 2 diabetes mellitus attending to the diabetic clinic and correlate with other biochemical parameters related to complications of diabetes.

METHODS

This hospital-based descriptive study was conducted from June 2017 to May 2018 at Diabetes OPD, Department of General Medicine, Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, Puducherry.

Inclusion criteria

- type 2 diabetic patients with duration of diabetes for at least 6 months
- above 18 years of age
- willing to undergo blood investigations and with residence in South India, attending to the diabetology OPD, Department of General medicine during the time period June 2017 to May 2018 (one year).

Exclusion criteria

- patients with previously known renal diseases or nephropathy, urinary tract infections, history of vigorous exercise prior to screening for Microalbuminuria
- patients with history or clinical features suggestive of heart failure
- those not willing for blood investigations.

A total of 500 diabetic subjects who satisfied the inclusion criteria attending to the diabetic OPD during the study period were included in the study. The patients were interviewed, socio-demographic details were collected, history and clinical examination including blood pressure measurement was done and findings were recorded in a proforma. The patients were then referred for blood investigations including lipid profile, HbA1c levels, blood glucose levels, urine examination for Microalbuminuria and ECG to rule out cardiovascular diseases.

'Hypertensives' were subjects who were already diagnosed cases on antihypertensive medications or if they had a systolic blood pressure > 130mmHg or diastolic blood pressure > 85 mmHg.

'Smokers' were subjects who had history of active smoking in the past 6 months.

'Retinopathy' was defined as presence of microdots, hard exudates, soft exudates, new vessels or maculopathy in fundoscopy.

'Peripheral neuropathy' was defined as absent touch or vibratory sensations of the feet. Touch was assessed by 10 gm monofilament and vibration sensation by 128 Hz tuning fork.

'Ischemic heart disease' was defined as presence of history of chest pain on exertion, with unequivocal T wave changes in the ECG or other ECG changes suggestive of myocardial infarction.

Statistical analysis

The collected data was entered and analyzed by using SPSS (Statistical Package for Social Sciences) version19.0 for windows. The findings are expressed in terms of proportions or percentages. Chi-square test was used to check significant associations between categorical variables. A p- value <0.05 was considered as statistically significant. To observe the individual effects of each exposure variable, potential confounders were simultaneously controlled by means of multiple logistic regression and Odds Ratios (OR) with 95% Confidence intervals (CI) were computed.

RESULTS

A total of 500 type 2 diabetics were included in the study. The mean age of the study participants was 46±5.4 years and majority were males (n=310, 62%). The baseline characteristics of the study subjects are given in Table 1.

Table 1: Baseline characteristics of the diabetic patients (n=500).

Clinico-demographic variables	n (%)
Age (mean±SD) years	46.1±5.4
BMI (mean±SD) Kg/m^2	27.3±3.2
Duration of Diabetes (mean±SD) years	6.7±1.1
Gender	
Male	310 (62)
Female	190 (38)
Smoking status	
yes	140 (28)
no	360 (72)
Family history of diabetes	
Yes	266 (53.2)
no	234 (46.8)
Family history of hypertension	
Yes	82 (16.4)
no	418 (83.6)
Family history of renal diseases	
Yes	9 (1.8)
no	491 (98.2)
Hypertension (SBP>130/ DBP >85)	
Yes	202 (40.4)
no	298 (59.6)

History of active smoking was present in 28% (n=140) of the diabetics. Family history of diabetes was present in more than half (53.2%, n=266) of the subjects. Family history of renal diseases (1.8%, n=9) and hypertension (16.4%, n=82) was also present among few of the study subjects overlapping with that of diabetes.

Screening for hypertension with blood pressure measurement showed that 40.4% (n=202) of the diabetics had higher systolic (SBP >130 mmHg) or Diastolic blood pressure (DBP >85 mmHg).

The clinical and biochemical variables were subjected to Univariate analysis and variables showing a p value <0.05 were entered into the logistic model to assess strength of association with confounding effects as shown in Table 2.

Table 2: Association of clinical and biochemical parameters with Microalbuminuria.

Variables	Microalbuminuria		Odds ratio (OR)	
	Present N=158 (%)	Absent N=342 (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age group 45-55 years	54	32	5.03 (3.1, 8.2)	3.9 (1.6, 5.8)
Male	102	90	5.1 (3.4, 7.6)	4.8 (2.9, 8.2)
Duration of diabetes				
1-5 years	22	14	3.8 (1.8, 7.6)	2.4 (1.1, 5.8)
6-10 years	38	19	5.9 (3.3, 10.8)	1.9 (0.8, 7.9)
>10 years	43	22	5.4 (3.1, 9.4)	6.8 (4.2, 11.8)
Smoker	37	46	1.9 (1.2, 3.2)	2.2 (1.1, 6.8)
Diabetic retinopathy	28	42	2.0 (1.2, 4.1)	4.4 (1.6, 7.9)
Peripheral neuropathy	19	37	1.1 (0.8, 2.6)	0.6 (0.1, 8.9)
Ischemic heart disease	9	11	1.8 (1.1, 5.8)	1.1 (0.4, 9.8)
SBP 160-170 mmHg	21	52	1.2 (0.6, 11.2)	0.7 (0.1, 2.2)
DBP 95-100 mmHg	18	26	1.6 (1.1, 4.8)	0.9 (0.3, 5.2)
DBP 100-105 mmHg	20	45	1.1 (0.4, 9.8)	5.8 (2.2, 9.8)
BMI 30-35 Kg/m^2	38	75	1.5 (1.1, 6.7)	0.4 (0.2, 8.2)
TG >250 mg/dl	11	19	1.3 (1.1, 8.5)	4.9 (2, 7.9)
LDL >110 mg/ dl	54	43	3.6 (1.4, 9.7)	5.6 (1.5, 7.6)
HbA1c 7.5- 9%	19	22	2.0 (1.2, 5.6)	4.2 (2.1, 6.9)

Age group 45-55 years, male gender, duration of diabetes >10 years, active smokers, Diabetic retinopathy, Peripheral neuropathy, Ischemic heart disease, SBP 160-170mmHg, DBP 95-100mmHg and 100-105mmHg, BMI 30-35 Kg/m^2, TG >250 mg/dl, LDL >110mg/dl and HbA1c 7.5-9% showed a greater odds ratio and significant association (p<0.001) with Microalbuminuria.

DISCUSSION

Microalbuminuria is the first detectable sign of renal involvement in diabetes and is an indication of progression to proteinuria over next 5-10 years in at least 20-50% of subjects.

The cascade of fall in renal functions has wide variation across the globe but the glomerular filtration rate declines around 10-12 ml/min per year.[6] As age advances the drop in renal parameters and advent of Microalbuminuria is more rampant as we reported the age group 45-55 years had higher incidence of Microalbuminuria (OR= 5.03, 95% CI: 3.1, 8.2) than lesser age groups. The duration of diabetes over 10 years had odds of 5.4 times (OR=5.4, 95% CI: 3.1, 9.4) more incidence of Microalbuminuria compared to lesser disease durations. In a multi-centric study by Ahmedani et al at Pakistan, the duration of diabetes over 11 years had more odds (OR= 5.36, 95% CI: 3.85, 7.47) of Microalbuminuria.[7] The age group above 50 years had higher prevalence of Microalbuminuria compared to younger ages as documented in present study. In present study, the prevalence of Microalbuminuria was 31.6% which was almost similar to the previous study by Ahmedani et al.[7] which reported 34% and other previous Asian study done by Varghese et al.[8] Dinneen and Gerstein in their meta-analysis of 11 prospective studies proved clearly that Microalbuminuria is associated with cardio-vascular diseases (CVD).[9] In the present study the presence of ischemic heart disease was more (OR= 1.8, 95% CI: 1.1, 5.8) among diabetics who had Microalbuminuria compared to those without. This may be due to the presence of risk factors for CVD like obesity and lipid metabolic derangements. The study reported an increased proportion of Microalbuminuria among those with BMI >30-35 Kg/m^2 (OR=1.5, 95% CI: 1.1, 6.7) and LDL>110 (OR=3.6, 95% CI: 1.4, 9.7). Similar results were documented by Mohan et al who showed association of deranged lipid parameters and increased presence of diabetic retinopathy (34.4%) among the type 2 diabetics.[10]

CONCLUSION

The study showed an increased prevalence of Microalbuminuria among the patients with type 2 diabetes. It also showed significant association of major microvascular and macrovascular complications of diabetes and Microalbuminuria. Further long-term follow

up studies are needed to establish authentic relationships between long term complications with Microalbuminuria in type 2 diabetes.

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Cite this article as: Hussain KSA. Prevalence and biochemical correlates of microalbuminuria in type 2 diabetes mellitus at Puducherry, India. Int J Adv Med 2018;5:865-8.