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Original Research Article

Evaluate the relation between microalbuminuria and with other biochemical parameters related to complications of type 2 diabetes

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ABSTRACT

Background: Type 2 Diabetes (T2D) with microalbuminuria have increased risk of progression to overt proteinuria, and after some time, renal failure. It is the leading cause of end-stage renal disease as a sequalae of Diabetic Nephropathy (DN) and an independent risk factor for Cardio-Vascular Diseases (CVD). Initial finding for microalbuminuria can prevent long-term complications. The objective of the present investigation was to study the relation between microalbuminuria and with other biochemical parameters related to complications of T2D.
Methods: This observational study was conducted among 150 T2D patients attending to the OPD, Department of General Medicine during the time period March 2018 to April 2019. The patients were interviewed for socio-demographic details, history and clinical examination and subjected to blood investigations and Electrocardiogram (ECG).
Results: Microalbuminuria was present in 47(31.3%) of the diabetics. The age group 48-63 years 18(38.3%), male gender 33(70.2%) duration of diabetes >5 years 11(23.4%). The smokers, Diabetic Retinopathy, Peripheral Neuropathy, Ischemic Heart Disease, SBP 160-170 mmHg, DBP 95-100 mmHg and 100-105 mmHg, BMI 30-35 Kg/m2, 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 patients with T2D. It also showed a significant association of major microvascular and macrovascular complications of T2D and microalbuminuria.

Keywords: Biochemical Parameters, Microalbuminuria, Type 2 diabetes

INTRODUCTION

Type 2 Diabetes (T2D) is the leading cause of end stage renal disease globally and proteinuria is believed to be the characteristic marker for diabetic nephropathy.[1] The presence of microalbuminuria precedes the development of overt diabetic nephropathy by 10-14 years. It is at this stage that one can hope to reverse diabetic nephropathy or prevent its progression. Microalbuminuria has been associated with an increased risk of Cardiovascular Diseases (CVD) in patients with and without T2D.[2,3] In T2D prevalence of microalbuminuria ranges from 8-47%.[4,5]

Diabetic Nephropathy (DN) is an important and life-threatening microvascular complication of T2D. It is usually first manifested as an increase in urinary albumin excretion (which could be microalbuminuria, defined as the urinary excretion of albumin of 20-200 µg/min or 30-299 mg/g of creatinine or macroalbuminuria, defined as urinary albumin to creatinine ratio greater than 200

µg/min or ≥300 mg/gm of creatinine and <30mg/gm is normal.[6,7]

Glomerular hyper perfusion and renal hypertrophy are pathognomonic features in T2D which reflect as increased glomerular filtration rate. Renal microvascular injury is responsible for increased albuminuria in diabetes but urinary microalbuminuria is an overall marker of a generalized vascular injury also. Thus, it is associated with increased end stage renal disease in T2D and independently with CVD as well.[8,9]

Microalbuminuria is the strong predictor of DN, which is the main cause of morbidity and mortality in patients with T2D. Peripheral neuropathy studies in the western literature have documented the linear relationship of degree of microalbuminuria with body mass index (BMI), blood pressure, and duration of diabetes. Gender correlation of microalbuminuria was not seen in T2D.[10,11] The purpose of this study was to determine the prevalence of microalbuminuria in T2D patients and to evaluate the relation between microalbuminuria and with other biochemical parameters related to complications of T2D.

METHODS

An observational study design was conducted at Sri Aurobindo Medical College Indore India, from March 2018 to April 2019. Source populations were all patients who attending to the OPD, Department of General Medicine. The study was approved by clinical research and ethics committee of institute. A total of 150 patients were enrolled in this study. Source of sample collection were obtained from single center. Data were collected on clinical history and physical examinations were performed on the subjects by the doctor. All the cases in T2D group were confirmed diabetics complications Hypertension, Retinopathy, Peripheral Neuropathy, Ischemic Heart Disease and history of smoking habits. Duration of T2D more than 1 year. The BMI was calculated as weight in kilograms divided by height in meters squared; obesity was defined as BMI ≥30 kg/m2. The patients were then referred for blood investigations including lipid profile, Hemoglobin A1C (HbA1c) levels, blood glucose levels, urine examination for microalbuminuria and Electrocardiogram (ECG) to rule out CVD.

Statistical analysis

The collected data was entered and analyzed by using Statistical Package for Social Sciences (SPSS) 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

In this study a total of 150 patients T2D were included. The mean age was 48±4.1 years, percentage of male 62.6% and female 37.3%. Mean BMI was 26.5±3.1 and the mean duration 5±7.2 years were showed in Table 1.

Table 1: Baseline characteristics of the T2D.

Clinico-demographic variables	(n=150)
Age, years	48±4.1
BMI, Kg/m^2	26.5±3.1
Male, n(%)	94 (62.6%)
Female, n(%)	56 (37.3%)
Duration of Diabetes (years)	5±7.2

BMI: Body Mass Index
Data was presented in mean±standard deviation; number (percentage)

Figure 1 presented the status of smoking history was present in 45(30%) of the T2D, family history of hypertension 25(16.6%), hypertension with blood pressure measurement showed that 61(40.6%) of the diabetics had higher systolic (SBP>130 mmHg) or diastolic blood pressure (DBP>85 mmHg). Family history of T2D was present in more than half 79(52.6%) of the patients and family history of renal diseases 2(1.3%).

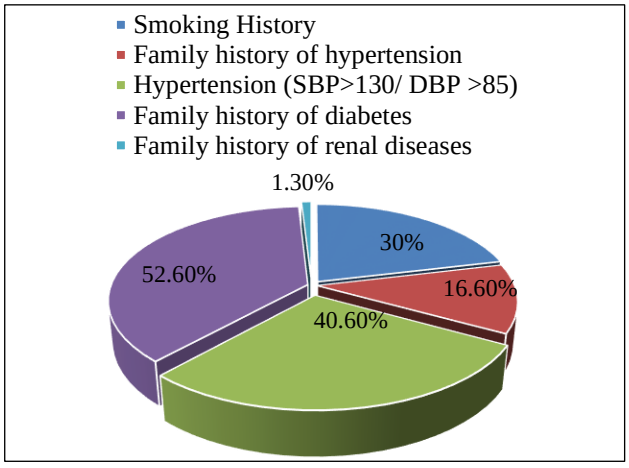

Figure 1: Association of Clinical Status.

The association of clinical and biochemical parameters with microalbuminuria were showed in Table 2. The age group 48-63 years 18(38.3%), male gender 33(70.2%) duration of diabetes >5 years 11(23.4%), smokers 11(23.4%), Diabetic Retinopathy 8(17%), Peripheral Neuropathy 6(12.7%), Ischemic Heart Disease 2(4.2%), SBP 160-170mmHg 6(12.7%), DBP 95-100mmHg 5(10.6%) and BMI 30-35 Kg/m2, 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.

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

Variables	Microalbuminuria Present (n=47)	Microalbuminuria Absent (n=103)	Odds ratio (OR) Unadjusted OR (95% CI)	Odds ratio (OR) Adjusted OR (95% CI)
Age group 48-63; years	18(38.3%)	12(11.6%)	4.05 (2.3, 6.6)	6.7 (3.3, 7.8)
Male; n (%)	33(70.2%)	61(59.2%)	3.1 (2.1, 6.7)	3.7 (1.9, 6.3)
Duration of T2D				
<2; years	3 (6.3%)	2 (1.9%)	2.7 (1.5, 6.9)	2.6 (1.5, 4.3)
3-5; years	6 (12.7%)	4 (3.8%)	5.9 (3.3, 10.8)	1.9 (0.8, 7.9)
>5; years	11 (23.4%)	5 (4.8%)	5.9 (2.8, 7.9)	7.7 (5.1, 9.9)
Other Status and Related to Complications				
Smoker; n (%)	11 (23.4%)	14 (13.5%)	1.1 (0.8, 2.6)	0.6 (0.1, 8.9)
Diabetic Retinopathy; n (%)	8 (17%)	13 (12.6%)	2.0 (1.2, 5.6)	4.2 (2.1, 6.9)
Peripheral Neuropathy; n (%)	6 (12.7%)	13 (12.6%)	1.2 (0.8, 2.5)	0.8 (0.1, 8.8)
Ischemic Heart Disease; n (%)	2 (4.2%)	4 (3.8%)	1.9 (1.2, 3.2)	2.2 (1.1, 6.8)
SBP; 60-170 mmHg; n (%)	6 (12.7%)	8 (7.6%)	1.2 (0.6, 10.2)	0.7 (0.1, 2.3)
DBP 95-100 mmHg; n (%)	5 (10.6%)	8 (7.6%)	1.7 (1.1, 4.7)	0.9 (0.3, 5.3)
BMI 30-35 Kg/m^2; n (%)	11 (23.4%)	22 (21.3%)	1.1 (0.4, 9.7)	2.7 (2.2, 9.7)
TG >250 mg/dl; n (%)	3 (6.3%)	6 (5.8%)	1.5 (1.1, 6.7)	0.4 (0.2, 8.2)
LDL >110 mg/dl; n (%)	16 (34%)	13 (12.6%)	3.6 (1.4, 9.7)	5.6 (1.5, 7.6)
HbA1c 7.5- 9%; n (%)	6 (12.7%)	7 (6.7%)	2.0 (1.2, 4.1)	2.0 (1.2, 4.1)

DISCUSSION

This observational study presents data on prevalence and associations of microalbuminuria with various parameters in T2D. Present study has shown prevalence of microalbuminuria at 47(31.3%), which is higher when compared to the study by Ghai et al, where prevalence was reported at 25%.[12] Compare with the previous study by Ahmedani et al,[13] the prevalence of microalbuminuria was 31.3% which was almost similar to reported 34% and other previous Asian study done by Varghese et al. Dinneen and Gerstein in their meta-analysis of 11 prospective studies proved clearly that microalbuminuria is associated with CVD.[14-15] 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.[16]

As age advances the drop in renal parameters and advent of microalbuminuria is more rampant as we reported the age group 48-63 years had higher incidence of microalbuminuria (OR= 6.7, 95% CI: 3.3, 7.8) than lesser age groups. Previous studies have also shown positive correlation of microalbuminuria with age of the patients.[10,11] The duration of diabetes >5 years had odds of 7.7 times (OR=7.7, 95% CI: 5.1, 7.8) 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.[13]

In the present study the presence of Ischemic Heart Disease was more (OR=2.2, 95% CI: 1.1, 6.8) among T2D 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/m2 (OR=2.7, 95% CI: 2.2, 9.7), LDL>110 (OR=5.6, 95% CI: 1.5, 7.6) and HbA1c 7.5- 9% (OR=2.0, 95% CI: 1.2, 4.1).

CONCLUSION

The study showed an increased prevalence of microalbuminuria among the patients with T2D. It also showed significant association of major microvascular and macrovascular complications of T2D and microalbuminuria. Further studies are needed long-term follow up and multicentric study to establish authentic relationships between long term complications with microalbuminuria in T2D.

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