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Original Article

MICROALBUMINURIA IN DIABETIC PATIENTS: PREVALENCE AND PUTATIVE RISK FACTORS

Deepak Parchwani[1], S. P. Singh[2], Digisha Patel[3]

[1]Associate Professor, Department of Biochemistry, Gujarat Adani Institute of Medical Sciences, Bhuj,(Gujarat) [2]Professor and Head, Department of Biochemistry, M.L.B. Medical college, Jhansi, Uttar Pradesh [3]Student of M.Sc. (Medical Physiology), GSL Medical College, Rajahmundry, Andhra Pradesh

Correspondence:
Dr Deepak Parchwani
H/No-B/17, New G. K. General Hospital,
Gujarat Adani Institute of Medical Sciences , Bhuj (Guj)
E-mail: drdparchwani@gmail.com, drdeepakparchwani@yahoo.com Phone: 7600024672, 9426857672

ABSTRACT

Microalbuminuria refers to the excretion of albumin in the urine at a rate that exceeds normal limits but is less than the detection level for traditional dipstick methods and is considered as a marker of diabetic nephropathy. The current study was conducted to establish the prevalence of elevated urinary albumin levels (microalbuminuria) in a sequential sample of diabetic patients attending hospital diabetic clinics and to determine its relationship with known and putative risk factors, to identify micro- and normoalbuminuric patients in this sample for subsequent comparison of clinical characteristics of the micro- and normoalbuminuric patients identified and to ascertain relationship of serum angiotensin converting enzyme (ACE) activity with diabetic incipient nephropathy. This cross-sectional analytical study was conducted at Gujarat Adani Institute of Medical Sciences Bhuj(Gujarat).Patients having clinical albuminuria and with other causes of proteinuria were excluded. Data was analyzed by SPSS software. Microalbuminuria was observed in 34.48% in patients with type 1 and 28.33% in patients with type 2 diabetes mellitus respectively. There was no statistically significant difference in the frequency of microalbuminuria between type 1 and type 2 diabetes mellitus patients. Having the condition was significantly associated with advanced age, poor glycaemic control, dyslipidemia (with respect to total cholesterol, triglycerides and LDL-C), smoking, body mass index and coexisting hypertension. The duration of diabetes was a significant correlate in type 1 DM subjects only. No significant association with gender, HDL-C levels, age at onset of DM, mode of treatment, socio-economic status and other lifestyle variations was found. All clinical and biochemical parameters in patient with microalbuminuria was more adversely affected than patients with normoalbuminuria. Serum angiotensin converting enzyme (ACE) levels were significantly elevated ($P<0.001$) in both of the diabetic groups, moreover, its levels were higher in subjects with microalbuminuria than in those without this complication ($P<0.05$).

Key words: Microalbuminuria, diabetes Mellitus, angiotensin converting enzyme activity, dyslipidemia.

INTRODUCTION

Diabetic nephropathy is the chief cause of morbidity and premature mortality in patient with diabetes mellitus.This complication is first manifested as an increase in urinary albumin excretion (microalbuminaria) which progresses to overt abluminuria and then to renal failure.[1] Microalbuminuria is usually absent at diagnosis of type 1 diabetes mellitus but may be present at diagnosis of type 2 diabetes Mellitus [1] , partly because diagnosis is often delayed. Microalbuminuria is also considered to be a predictor for cardiovascular disease both among

diabetic and non-diabetic subjects, as the presence of microalbuminuria is more reflective of diffuse generalized vasculopathy and endothelial dysfunction, which in large arterial beds hypothetically leads to atherosclerosis and in the microcirculation ,may precede or contribute to development of insulin resistance.[2] Recent statistics from the World Health Organization (WHO) project an increase in the prevalence of diabetes worldwide particularly in developing countries[3] .Currently, India leads the world with the largest number of diabetic subjects and this is expected to further rise in the coming years[3] .Hence studies on diabetes related complications are essential to assess the burden of diabetes. Thus in this study an attempt has been made to define more precisely the (a) prevalence of microalbuminuria in an unselected population of diabetes mellitus (b) to evaluate possible relationship among microalbuminuria, serum angiotensin converting enzyme and lipid parameters.

MATERIAL AND METHOD

The study was conducted on 180 diabetic patients attending diabetic outdoor of Gujarat Adani Institute of Medical Sciences, Bhuj(Gujarat). These were compared with 50 healthy control.

Exclusion Criteria

1) Patients with overt diabetic nephropathy (urinary albumin excretion rate > 0.5 gm/day) and / or deranged renal function or other renal disease.
2) Patients having history of cardiovascular disease.
3) Urinary tract infection or recent illness.
4) Pregnant and lactating females.

Selected patients were divided into 3 groups according to serum lipid profile. (NCEP Classificaton)[4]

1) Good Metabolic Control: was defined as when serum cholesterol was < 200 mg/dl or serum triglyceride level < 150 mg/dl or serum LDL level < 120 mg/dl.
2) Fair Metabolic Control: was defined as when serum cholesterol was between 200 – 240 mg/dl or serum triglyceride level between 150 –200 mg/dl or serum LDL level between 120 –150 mg/dl.
3) Poor Metabolic Control: was defined as when serum cholesterol was >240 mg/dl or serum triglyceride level > 200 mg/dl or serum LDL level > 150 mg/dl.

Venous blood was collected from subjects after overnight fast and was subjected for following estimations.

1. Plasma sugar by Trindel method.[5]
2. Serum Cholesterol by modified Roeschlau's method.[6]
3. Serum triglyceride by McGrowan method.[7]
4. HDL – C by Bursteim et al method.[8]
5. LDL – C was calculated by Friedewald's formula. [9]
6. Microalbuminuria by Micral method.[10]
7. Serum angiotensin converting enzyme activity by Cushman and Cheung method , modified by Letreut et al(1979).[11]
8. Glycosylated hemoglobin lon exchange Resin method.[12]

RESULTS

Table 1. presents the clinical and biochemical characteristics of control, normoalbuminuric and microalbuminuric subjects and showed that the 180 diabetic patients studied included 101 males and 79 females. Overall 54 had microalbuminuria (30%). Prevalence of microalbuminuria among males was 31.25% and among females was 28.57%. Thus present study shows that prevalence of microalbuminuria across the gender were not statistically significant.

Patients with microalbuminuria had higher BMI compared to normoalbuminuric subjects. (26.40 ± 3.21 Vs 23.21 ± 2.68) ($P < 0.05$). Patients with microalbuminuria had higher duration of diabetes compared to normoalbuminuric subjects ($P < 0.001$_. The prevalence of microalbuminuria significantly increased with diabetes duration.

Glycated hemoglobin (HbA_{IC}) and mean age was significantly higher in microalbuminuric subjects compared to normoalbuminuric ones. There was a very strong increse ($P < 0.01$) at the level of angiotensin converting enzyme activity in both of the diabetic groups. ACE activity levels were also significantly higher in diabetic patients with microalbuminuria than in normoalbuminuric diabetic subjects ($P < 0.05$).

Table 2 shows the increased prevalence of microalbuminuria with increasing dyslipidemia. However no significant difference between prevalence of microalbuminuria with respect to metabolic control of HDL - C was found.

Table 1: Characteristics of control and diabetic (normoalbuminuric and microalbuminuric) subjects (Mean ± SD)

Parameters	Control subjects	Normoalbuminuric subjects	Microalbumiburic subject
N	50	126	54
Male / Female	27/23	72/54	29/25
Age in years	39.24 ± 10.20	40.10 ± 12.00	45.70 ± 14.00*
Duration of Diabetic (years)	-	6.2 ± 4.0	9.0 ± 6.8 **
BMI (Kg/m2)	22.0 ± 1.04	23.2 ± 2.68	26.40 ± 3.21 *
HbA_{1C} (%)	5.20 ± 1.40	7.98 ± 1.96	9.01 ± 2.20 **+
Serum Cholesterol (mg/dl)	170.40 ± 34.46	200.20 ± 26.47	227.26 ± 33.81 *
Serum Triglyceride (mg/dl)	96.45 ± 14.34	164.40 ± 49.03	228.30 ± 56.06
HDL – C (mg/dl)	52.96 ± 6.78	45.70 ± 7.46	45.42 ± 6.42
LDL –C (mg/dl)	98.46 ± 18.49	125.50 ± 24.38	142.60 ± 36.48
Serum Angiotensin Converting enzyme (SACE) (U/L)	17.46 ± 2.41	40.80 ± 3.96 +	46.42 3.71 * +

* P < 0.05 Vs normoalbuminuric Subjects, ** P < 0.001 Vs normoalbuminuric Subjects
*+ P < 0.001 Vs Control Subjects.

Table 2: Prevalence of microalbuminuria according to levels of serum cholesterol, triglyceride, HDL-C and LDL–C.

	Good control	Fair control	Poor control
Serum Cholesterol (mg/dl)	< 200	200 – 240	> 240
Microalbuminuria Cases (%)	8	30	60*
Serum Triglyceride (mg/dl)	< 150	150-200	> 200
Microalbuminuria Cases (%)	22	26	48 % *
LDL –C (mg/dl)	< 120	120-150	> 150
Microalbuminuria Cases (%)	15	25	62*
HDL – C (mg/dl)	> 45	35 – 45	< 35 **
Microalbuminuria Cases (%)	25	32	37

* P < 0.05 Vs Fair Control, ** P = ns Vs Fair Control or Good Control

DISCUSSION

Various epidemiological and cross sectional studies have reported marked variation in the prevalence of microalbuminuria.[13] Earlier studies on Asia Immigrant Indians and native Indians have suggested a high prevalence of microalbuminuria.[14] Gupta et al reported a prevalence of 26.6% in 65 type 2 north Indian non-proteinric patients,[14] while John et al reported a prevalence of 19.7% from a tertiary hospital in vellore, south India.[13] Studies in the white UK population revealed a prevalence of microalbuminuria of 7% - 9%.[14]

This variation in prevalence can be attributed to factor such as difference in populations, in the defination of microalbuminuria, method of urine collection, etc. However this could also reflects true differences in the ethnic susceptibility to nephropathy. In the present study the prevalence of microalbuminuria across the genders were not statistically different. Earlier studied have reported an increased prevalence of microalbuminuria in men compared with women.[1]

The casual risk factors for microalbuminuria are raised blood pressure, poor glycemic control, older age, duration of diabetes, male sex and pre existing retinopathy. Microalbuminuria has also been reported to be associated with generalized vascular disease.[2] In our study we observed that the microalbuminuria patients had a significantly higher serum angiotensin converting enzyme activity than normoalbuminuric and control subjects which supports the hypothesis that microalbuminuria reflects more of a generalized vascular damage than of diabetic glomerolopathy and ACE activity has an essential role in the development of complications in diabetes.In conclusion, Microalbuminuria in diabetes, which represents an earlier phase in the development of clinical nephropathy, is associated with many

potentially modifiable risk factors. In estimating diabetic nephropathy risk, AER is most important and should be done frequently but there are gains to be made in predictive precision by considering family history, smoking habits, glycemia, B.P.,BMI lipid levels and ACE activity. Early screening for incipient diabetic nephropathy and aggressive management of these risk factors is important in optimising the renal outcome of patients with diabetes mellitus.

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