

PREVALENCE AND PREDICTORS OF MICROALBUMINURIA IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: A CROSS-SECTIONAL OBSERVATIONAL STUDY

Dr Ashok S Goswami*, Dr Janardan V Bhatt**, Dr Hitesh Patel***

*Associate Professor, Department Of Physiology B J Medical College, Ahmedabad,

**Professor, Department Of Physiology, AMCMET Medical College, Ahmedabad

***Assistant Professor, Department of physiology, JNU Medical college, Jodhpur

Abstract

Backgrounds & Objectives: Albuminuria is a well-known predictor of poor renal outcomes in patients with type 2 diabetes and in essential hypertension. Albuminuria has also been shown more recently to be a predictor of cardiovascular outcomes in these populations. This review discusses the measurement of albuminuria and the association between albuminuria and adverse cardiovascular and renal outcomes in type 2 diabetes and hypertension.

Methods: 1280 type 2 diabetic patients attending a diabetes centre in civil hospital campus, Ahmadabad were recruited for the study. Urinary albumin concentration was measured by immune turbidimetric assay. Microalbuminuria was diagnosed if the urinary albumin excretion was >30 mg/g of creatinine.

Results : Overall prevalence of microalbuminuria was 36.3% (95% confidence interval 33.8 to 38.9). The microalbuminuric patients had significantly increased systolic and diastolic blood pressure compared to normoalbuminuric subjects ($p < 0.01$). The prevalence of microalbuminuria increased with the increase in duration of diabetes.

Interpretation & Conclusion: The presence of albuminuria is a powerful predictor of renal and cardiovascular risk in patients with type 2 diabetes and hypertension. Physicians should measure urinary albumin excretion in patients with type 2 diabetes and hypertension routinely and be as aggressive in treating this modifiable risk factor as they do blood pressure, cholesterol, or blood glucose.

Key Words: Microalbuminuria, Type 2 Diabetes Mellitus, Essential Hypertension

Background: Albuminuria is a well-known predictor of poor renal outcomes in patients with type 2 diabetes and in essential hypertension. Albuminuria has also been shown more recently to be a predictor of cardiovascular outcomes in these populations. This review discusses the measurement of albuminuria and summarizes the association between albuminuria and adverse cardiovascular and renal outcomes in type 2 diabetes and hypertension. **Aims & Objectives:** **1.** To study the effect of microalbuminuria on renal outcomes in diabetics. **2.** To study the effect of microalbuminuria in cardiovascular outcomes in hypertensives. **3.** To study the effect of microalbuminuria on total duration of diabetes.

Methods& results : The study group comprised of 1280 diabetic patients attending diabetes clinic, civil hospital campus, Ahmadabad during the period from year 2010 to year 2013 with patients having incomplete records, presence of urinary tract infection, or heart failure were excluded ($n = 90$). In all study patients, a complete clinical work up was done including height, weight, and BMI. Patients were categorized as being hypertensive if they were on antihypertensive treatment or if they had a blood pressure >140/90 mm Hg. A fasting sample of

blood was drawn after an overnight fast of 10 hours and the following investigations were done: plasma glucose, serum cholesterol, serum triglycerides, high density lipoprotein-cholesterol, and serum creatinine. Urine samples were collected in the early morning after an overnight fast. Urine microalbumin concentration was measured using commercially available immunoturbidometric assay kits from Randox (Randox, UK) on Opera Technicon Auto Analyser (Bayer Diagnostics, USA). **Result:** The 1190 patients studied included 720 males and 470 females. Overall 428 had microalbuminuria (36.3%, 95% confidence interval (CI) 33.8 to 38.9). Prevalence of microalbuminuria among males was 32.1% (95% CI 31.0 to 37.4) and among females, 39.9% (95% CI 35.7 to 44.1).

Table-1 the clinical and biochemical characteristics of the normoalbuminuric and microalbuminuric patients

Parameters	Normoalb uminuric group (n=844)	Microalbu minuric group (n=420)	p Value
Age (years)	51 (10)	54 (11)	<0.00 1
Male (%)	455 (63.6%)	236 (57.7%)	0.03
Age at diagnosis (years)	45 (10)	46 (11)	NS
Age at diagnosis (years)	45 (10)	46 (11)	NS
Duration of diabetes (years)	6 (6)	8 (7)	<0.00 1
BMI(kg/m2)	25.2 (4.2)	24.8 (4.1)	NS
SBP (mm Hg)	133 (16)	138 (17)	<0.00 1
DBP (mm Hg)	83 (7)	84 (8)	0.013
FBS (mmol/l)	9.9 (3.6)	11.5 (4.8)	<0.00 1
HbA1c (%)	9.1 (2.2)	9.7 (2.3)	<0.00 1
S.cr	80.4 (29.2)	84.1 (19.4)	0.010

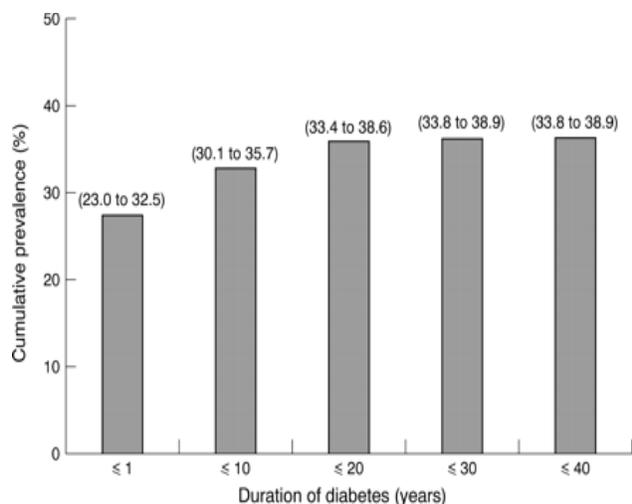
($\mu\text{mol/l}$)			
S.chole(mm ol/l)	5.0 (1.0)	5.0 (1.1)	NS
S.TGs (mmol/l)	2.2 (1.6)	2.2 (2.0)	NS
HDL-Chole (mmol/l)	1.0 (0.26)	1.0 (0.34)	NS
No (%) with ischaemic heart disease			
Ischaemia	45 (5)	47 (9)	0.002
Infarction	18 (2)	15 (3)	NS

SBP – Systolic blood pressure, DBP – Diastolic blood pressure, FBS – Fasting blood sugar, S.cr – Serum creatinine, Chole – cholesterol, TGs – Triglysrides,

Table 2 the prevalence of microalbuminuria in relation to duration of diabetes.

<i>Duration of diabetes (years)</i>	<i>Prevalence No (%)</i>	<i>Odds ratio (95% CI)</i>	<i>p Value</i>
<5	315/665 (30.4)	—	—
6–10	102/286 (38.1)	1.4 (1.06 to 1.8)	0.02
11–15	65/121 (49.7)	2.3 (1.6 to 3.9)	<0.00001
16–20	21/42 (50.0)	2.3 (1.4 to 3.7)	0.0005
>20	15/32 (46.7)	2.0 (1.04 to 3.8)	0.04

Figure 1 shows the cumulative prevalence of microalbuminuria in relation to duration of diabetes.



Discussion: Various epidemiological and cross sectional studies have reported marked variation in the prevalence of microalbuminuria. In the present study the prevalence of microalbuminuria across the genders were not statistically different. Our study revealed age, duration of diabetes, diastolic blood pressure, HbA1c, and fasting plasma glucose as the risk factors for microalbuminuria. In our study we observed that the microalbuminuric patients had a significantly higher prevalence of ischaemic heart disease compared with normoalbuminuric patients. The microalbuminuric patients were older and had a longer duration of diabetes compared with the normoalbuminuric group ($p < 0.001$). The microalbuminuric patients had significantly increased systolic and diastolic blood pressure compared to normoalbuminuric subjects ($p < 0.01$). Fasting plasma glucose and HbA1c concentrations were significantly higher in the microalbuminuric group compared with the normoalbuminuric subjects ($p < 0.001$). Serum creatinine ($p < 0.001$) values were found to be significantly higher in the microalbuminuric group. Serum triglycerides and cholesterol values were not significantly different in both groups. Prevalence of all complications were higher among the patients with microalbuminuria compared to the normoalbuminuric subjects ($p < 0.001$). Altogether 27.5% of the newly diagnosed diabetic subjects had microalbuminuria. The prevalence of microalbuminuria increased with increase in duration of diabetes. The odds ratio for microalbuminuria showed a statistically significant increase with increase in duration of diabetes.

Conclusion: The presence of albuminuria is a powerful predictor of renal and cardiovascular risk in patients with type 2 diabetes and hypertension. Physicians should measure urinary albumin excretion in patients with type 2 diabetes and hypertension routinely and be as aggressive in treating this modifiable risk factor as they do blood pressure, cholesterol, or blood glucose.

References:

1. Cordonnier D, Bayle F, Benhamou PY, *et al.* Future trends of management of renal failure in diabetics. *Kidney Int* 1993;43:8–13.
2. US Renal Data System. *1989 Annual data report*. Bethesda, MD: National Institute of Diabetes and Digestive and Kidney Diseases, 1989.
3. Mogensen CE, Steffes MW, Deckert T, *et al.* Functional and morphological renal manifestations in diabetes mellitus. *Diabetologia* 1981;21:89–93.
4. Yudkin JS, Forrest RD, Johnson CA. Microalbuminuria as predictor of vascular disease in non-diabetic subjects. *Lancet* 1988;ii:530–3.
5. Haffner SM, Stern MP, Gruber KK, *et al.*

Microalbuminuria: potential marker for increased cardiovascular risk factors in non-diabetic subjects? *Arteriosclerosis* 1990;**10**:727–31.

6. Groop L, Ekstrand A, Forsblom C, *et al.* Insulin resistance, hypertension and microalbuminuria in patients with type 2 (non-insulin-dependent) diabetes mellitus. *Diabetologia* 1993;**36**:642–7.
7. World Health Organization. *Diabetes mellitus*. Report of WHO study group. Geneva: World Health Organization, Technical Report Series, No 727, 1985.
8. Mohan V, Meera R, Premalatha G, *et al.* Frequency of proteinuria in type 2 diabetes mellitus seen at a diabetes centre in southern India. *Postgrad Med J* 2000;**76**:569–73.
9. Neil A, Hawkins M, Potok M, *et al.* A Prospective population-based study of microalbuminuria as a predictor of mortality in NIDDM. *Diabetes Care* 1993;**7**:996–03.
10. Collins VR, Dowse GK, Finch CF, *et al.* Prevalence and risk factors for micro and macroalbuminuria in diabetic subjects and entire population of Nauru. *Diabetes* 1989;**38**:1602–10.
11. Gupta DK, Verma LK, Khosla PK, *et al.* The prevalence of microalbuminuria in diabetes: a study from north India. *Diabetes Res Clin Pract* 1991;**12**:125–8.
12. Klein R, Klein BEK, Moss SE. Prevalence of microalbuminuria in older-onset-diabetes. *Diabetes Care* 1993;**16**:1325–9.
13. Allawi J, Rao PV, Gilbert R, *et al.* Microalbuminuria in noninsulin- dependent diabetes: its prevalence in Indian compared

with European patients. *BMJ* 1988;**296**:462-4..