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# Identifying the Risk Factors Associated With Microalbuminuria in Patients with Type 2 Diabetes Mellitus

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## Abstract

**Background:** To identify the risk factors associated with microalbuminuria in patients with type 2 diabetes mellitus. **Subjects and Methods:** The present study was conducted at diabetic clinic of NIMS hospital, a secondary care hospital in Wandoor, Malappuram district, Kerala. From all patients, urine sample was obtained. Ratio of albumin to creatinine of less than 30 mg/g is considered normal. The ratio between 30-300 mg/g signifies microalbuminuria and values above 300 mg/g is considered macroalbuminuria. Risk factors for microalbuminuria was recorded. **Results:** Out of 300 patients, 82 82 (27.33 %) had microalbuminuria. 63% of the study population had a total cholesterol more than 200 mg/dl. 65% of them had a serum triglycerides more than 200 mg/dl and 42% had serum HDL less than 40 mg/dl. Age more than 60 years and duration of diabetes more than 10 years had a significant relationship with microalbuminuria with p value less than 0.001. FBS more than 126 mg/dl, HBA1c more than 6.5 and serum creatinine more than 1.2 mg/dl had a significant relationship with presence of microalbuminuria. Lipid parameters did not have a statistically significant relationship with microalbuminuria. Age, duration of diabetes, fasting blood sugar, glycosylated haemoglobin and serum creatinine have p values less than 0.05. But duration of diabetes does not have odds ratio more than 1. **Conclusion:** The prevalence of microalbuminuria was 27.33%. Age more than 60 years and duration of diabetes more than 10 years had a significant relationship with microalbuminuria with p value less than 0.001. Variables like smoking, alcohol, blood pressure and BMI did not have any statistically significant relationship with microalbuminuria. FBS more than 126 mg/dl, HBA1c more than 6.5 and serum creatinine more than 1.2 mg/dl had a significant relationship with presence of microalbuminuria. Lipid parameters did not have a statistically significant relationship with microalbuminuria.

**Keywords:** Diabetes mellitus, Microalbuminuria, risk factors

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## Introduction

Diabetes mellitus is a metabolic disorder of global importance and is characterized by varying degree of insulin resistance, impaired insulin secretion and increased glucose production. The current global epidemic is associated with an increase of cardiovascular diseases that primarily accounts for the increase in morbidity and mortality seen in patients with diabetes.[1] The high prevalence of microvascular complications of diabetes such as diabetic nephropathy means that the number of patients with end-stage renal disease (ESRD) due to diabetes will also increase dramatically. Hence, diabetes, and especially type 2 diabetes, is becoming the main reason for patients to start renal replacement therapy.[2]

The development of diabetic nephropathy is determined by various risk factors. Among them, the level of glycemic control has been found to be the most dominant factor in the occurrence of microalbuminuria. Apart from such risk factors as hypertension, obesity and hypercholesterolemia, there are some genetic factors which determine the incidence of nephropathy in these patients. Genome-wide association studies identified several loci associated with an increased risk for diabetic nephropathy in both type 1 diabetes mellitus (T1DM) and T2DM.[3]

Diabetic nephropathy is a severe complication and is related to an increased risk of all-cause mortality, cardiovascular disease, and development of end-stage renal disease, requiring expensive renal replacement therapy in the form of dialysis or transplantation.[4] Early screening, medical treatment and appropriate life style modifications have shown to halt or reverse the progression from micro to macroalbuminuria. Hence, it is recommended that microalbuminuria be screened in all diabetic patients.[5] We conducted present study to identify the risk factors associated with microalbuminuria in patients with type 2 diabetes mellitus.

## Subjects and Methods

The present study was conducted at diabetic clinic of NIMS hospital, a secondary care hospital in Wandoor, Malappuram

district, Kerala. All gave their written consent to be the part of the study. Ethical clearance certificate was obtained before starting the study.

Socio- demographic data such as age, sex, duration since diagnosis of diabetes, history of ischemic heart disease and hypertension, smoking, and medication history were recorded. From all patients, urine sample was obtained. Ratio of albumin to creatinine of less than 30 mg/g is considered normal. The ratio between 30-300 mg/g signifies microalbuminuria and values above 300 mg/g is considered macroalbuminuria. Risk factors for microalbuminuria was recorded. Data was entered in Microsoft Office Excel 2007 and SPSS (Statistical Package for Social Sciences) Version 17.0 was used for analysis.

## Results

**Table 1: Gender wise distribution of patients**

| Gender | No. of patients | P value |
|---|---|---|
| Male | 153 (51 %) | 0.92 |
| Female | 147 (49 %) | |

Out of 300 patients, there were 153 (51 %) males and 147 (49 %) females. A significant difference was observed (Table I).

**Table 2: Prevalence of microalbuminuria**

| Microalbuminuria | No. of patients | P value |
|---|---|---|
| Present | 82 (27.33 %) | 0.01 |
| Absent | 218 (72.66 %) | |

Out of 300 patients, 82 82 (27.33 %) had microalbuminuria. A significant difference was observed (Table II).

**Table 3: Lipid parameters**

| S no. | Lipid parameters | No. | Percentage |
|---|---|---|---|
| **Total cholesterol** | < 200mg/dl | 112 | 37.33 % |
| | 200 to 239 mg/dl | 92 | 30.66 % |
| | > 240 mg/dl | 96 | 32 % |
| **Serum triglycerides** | < 150 mg/dl | 8 | 2.66 % |
| | 150 – 199 mg/dl | 96 | 32 % |
| | 200 – 499 mg/dl | 196 | 65.33 % |
| **Serum HDL** | < 40 mg/dl | 127 | 42.33 % |
| | > 40 mg/dl | 173 | 57.66 % |

63% of the study population had a total cholesterol more than 200 mg/dl. 65% of them had a serum triglycerides more than 200 mg/dl and 42% had serum HDL less than 40 mg/dl (Table III).

**Table 4: Relationship between baseline characteristics of the patient and presence of microalbuminuria (MAU)**

| Parameters | Variables | Patients with MAU | Patients without MAU | Chi square value | P value |
|---|---|---|---|---|---|
| **Age** | < 60 Years | 6 | 154 | 96 | <0.0001 |
| | > 60 Years | 76 | 64 | | |
| **Gender** | Male | 45 | 108 | 0.679 | 0.410 |
| | Female | 37 | 110 | | |
| | < 5 Years | 9 | 71 | 22.6 | |
| **Duration** | 5 – 10 Years | 33 | 95 | | <0.0001 |
| | > 10 Years | 40 | 52 | | |

Age more than 60 years and duration of diabetes more than 10 years had a significant relationship with microalbuminuria with p value less than 0.001 (Table IV).

**Table 5: Relationship between certain blood parameters and presence of microalbuminuria (MAU)**

| Parameters | Variables | Patients with MAU | Patients without MAU | Chi Square value | P value |
|---|---|---|---|---|---|
| FBS | < 100 mg/dl | 4 | 20 | 11.2 | 0.004 |
| | 100 to 125 mg/dl | 7 | 51 | | |
| | ≥126 mg/dl | 71 | 147 | | |
| HbA1c | ≤ 5.7 | 3 | 21 | 17.1 | <0.0001 |
| | 5.7 to 6.4 | 10 | 69 | | |
| | > 6.5 | 69 | 128 | | |
| Serum creatinine | ≤ 1.2 mg/dl | 12 | 184 | 128 | <0.0001 |
| | > 1.2 mg/dl | 70 | 34 | | |
| Total cholesterol | < 200mg/dl | 30 | 73 | 0.978 | 0.613 |
| | 200 to 239 mg/dl | 24 | 77 | | |
| | > 240 mg/dl | 28 | 68 | | |
| Serum triglycerides | < 150 mg/dl | 1 | 4 | 0.245 | 0.885 |
| | 150 – 199 mg/dl | 26 | 73 | | |
| | 200 – 499 mg/dl | 55 | 141 | | |
| Serum HDL | < 40 mg/dl | 37 | 90 | 0.359 | 0.549 |
| | > 40 mg/dl | 45 | 128 | | |

FBS more than 126 mg/dl, HBA1c more than 6.5 and serum creatinine more than 1.2 mg/dl had a significant relationship with presence of microalbuminuria. Lipid parameters did not have a statistically significant relationship with microalbuminuria (Table V).

**Table 6: Logistic regression of factors associated with microalbuminuria**

| Dependent variable | Variables | Odds ratio | P value |
|---|---|---|---|
| Microalbuminuria | Age | 42.652 | <0.0001* |
| | Sex | 2.323 | 0.061 |
| | Duration | 0.317 | 0.049* |
| | BMI | 1.071 | 0.880 |
| | SBP | 1.109 | 0.823 |
| | DBP | 2.136 | 0.172 |
| | Smoking | 3.635 | 0.186 |
| | Alcohol | 0.629 | 0.582 |
| | FBS | 1.799 | 0.034* |

| | | | |
|---|---|---|---|
| | HbA1c | 1.051 | 0.0431* |
| | S Creatinine | 40.663 | <0.0001* |
| | S Cholesterol | 1.766 | 0.223 |
| | S TGL | 0.577 | 0.707 |
| | S HDL | 0.934 | 0.885 |

Age, duration of diabetes, fasting blood sugar, glycosylated haemoglobin and serum creatinine have p values less than 0.05. But duration of diabetes does not have odds ratio more than 1 (Table VI).

## Discussion

Diabetes mellitus type 2 (DM2) is a metabolic disorder of multiple etiologies due to disturbances of carbohydrate, fat, and protein metabolism. It is characterized by chronic hyperglycemia, and it is associated with cardiovascular and renal complications. These complications result in diminished quality of life and reduced life expectancy. Microalbuminuria is an early predictor and a sensitive assay to detect urinary albumin excretion which can precede the development of overt nephropathy in T2DM.[6] Prompt detection and treatment can reduce the risk and possibly delay the development of ESRD. The American Diabetes Association recommends annual screening for microalbuminuria in patients of T2DM. However, due to poor healthcare infrastructure and lack of education, people are not routinely screened in developing or underdeveloped countries and end up presenting late in the disease course.[7] We conducted present study to identify the risk factors associated with microalbuminuria in patients with type 2 diabetes mellitus.

Our study revealed a prevalence of microalbuminuria of 27.33% among patients of Type 2 Diabetes Mellitus visiting a secondary care hospital at Malappuram, Kerala. Various epidemiological and cross- sectional studies have reported marked variation in the prevalence of microalbuminuria.[8,9]

We observed that out of 300 patients, there were 153 (51 %) males and 147 (49 %) females. It is hypothesized that (micro) albuminuria and the associated complications are due to genetic polymorphism of enzymes involved in the metabolism of heparan sulphate proteoglycan (e.g. Ndeacetylase). Genetic polymorphism of diabetes – sensitive enzymes involved in the metabolism of glycosaminoglycans has been demonstrated in rats. Accordingly, patients who develop (micro) albuminuria are characterized by isoenzymes which are extremely vulnerable to poor diabetes control.[10] In these patients a critical reduction of normal heparan sulphate would be expected, leading to albuminuria and progression of mesangial expansion, retinopathy and macroangiopathy, whereas persons equipped with iso enzymes less vulnerable to hyperglycemia would be protected.[11]

We found that 63% of the study population had a total cholesterol more than 200 mg/dl. 65% of them had a serum triglycerides more than 200 mg/dl and 42% had serum HDL less than 40 mg/dl. Age more than 60 years and duration of diabetes more than 10 years had a significant relationship with microalbuminuria. Parving et al[12] evaluated 32 208 type II diabetic patients without known albuminuria from 33 countries was performed. Overall, 8057 patients were excluded, either because of prior known proteinuria or non-diabetic nephropathy (3670), or because of invalid urine collections (4387). One single random urinary albumin/creatinine ratio was obtained in 24 151 patients (75%). The overall global prevalence of normo-, micro-, and macroalbuminuria was 51, 39, and 10%, respectively. The Asian and Hispanic patients had the highest prevalence of a raised urinary albumin/creatinine ratio (55%) and Caucasians the lowest (40.6), Po0.0001. HbA1c, systolic blood pressure (BP), ethnicity, retinopathy, duration of diabetes, kidney function, body height, and smoking were all independent risk factors of MA, Po0.0001. Estimated glomerular filtration rate was below 60 ml/min/1.73 m2 in 22% of the 11 573 patients with available data. Systolic BP below 130 mmHg was found in 33 and 43% had an HbA1c below 7%. The frequency of patients receiving aspirin was 32%, statins 29%, and BP-lowering therapy 63%.

It was observed that FBS more than 126 mg/dl, HBA1c more than 6.5 and serum creatinine more than 1.2 mg/dl had a significant relationship with presence of microalbuminuria. Lipid parameters did not have a statistically significant relationship with microalbuminuria. Age, duration of diabetes, fasting blood sugar, glycosylated haemoglobin and serum creatinine have p values less than 0.05. But duration of diabetes does not have odds ratio more than 1. Pasko et al[13] in their study 321 patients with type 2 diabetes were enrolled. Microalbuminuria was assessed using dipstick kits in early morning urine samples. The prevalence of normoalbuminuria was 56.3%, microalbuminuria 40.8% and macroalbuminuria 2.8%. Systolic and diastolic blood pressure, HbA1c and fasting plasma glucose were significantly higher in microalbuminuric than in normoalbuminuric subjects. Independent risk factors for microalbuminuria were duration of diabetes, systolic blood pressure and waist circumference in males and poor glycemic control, duration of diabetes and waist circumference in females.

## Conclusion

The prevalence of microalbuminuria was 27.33%. Age more than 60 years and duration of diabetes more than 10 years had a significant relationship with microalbuminuria with p value less than 0.001. Variables like smoking, alcohol, blood pressure and BMI did not have any statistically significant relationship with microalbuminuria. FBS more than 126 mg/dl, HBA1c more than 6.5 and serum creatinine more than 1.2 mg/dl had a significant relationship with presence of microalbuminuria. Lipid parameters did not have a statistically significant relationship with microalbuminuria.

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