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A Study of Microalbuminuria in Type 2 Diabetes Mellitus Patients Coming In OPD of A Tertiary Medical Care Institute

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ABSTRACT

Introduction: Macrovascular and microvascular complications of diabetes mellitus are a consequence of metabolic derangement mainly hyperglycemia .Diabetic nephropathy is the leading cause of end stage renal disease worldwide. Microalbuminuria is considered to be an early stage of diabetic nephropathy. Various studies have shown marked variation in the prevalence of microalbuminuria & Especially Indians have a higher prevalence of microalbuminuria. Hence, to detect renal involvement, microalbuminuria can be considered as an early marker.

Methods: Prospective analytical study involved Prior Consent from the patients & was found to be within ethical standards. It was conducted in four months. Simple random sampling technique was used for data collection. 200 Number of Patients included in the study who were having history of Diabetes mellitus (Known to them) for at least 2 years or more and were undergoing treatment for Diabetes. Detailed Clinical Examination was done & all the patients went through Routine investigations. Patients who didn't wanted to be part of the study, having any evidence of urinary tract infection, Heart Failure & Critically ill patients were excluded from the study

Results: Microalbuminuria was present in 88 of patients, which included 59 (67 %,) Males and 29 (33%) Females. More males patients were having Microalbuminuria. The microalbuminuric patients were older and had a longer duration of diabetes. The microalbuminuric patients had significantly increased systolic and diastolic blood pressure ($p<0.01$). Fasting plasma glucose and HbA1c concentrations were significantly higher in the microalbuminuric group along with Serum creatinine . Prevalence of all complications were higher among the patients with microalbuminuria compared to the normoalbuminuric subjects ($p<0.001$)

Conclusion:. There is an urgent call for regular screening of microalbuminuria and HbA1c in both newly diagnosed and already diagnosed diabetics to prevent Diabetic Nephropathy.

Keywords: Microalbuminuria , Diabetes Mellitus , Diabetic Nephropathy

INTRODUCTION

Diabetes mellitus is a common endocrine disorder globally and is characterized by insulin resistance, impaired insulin secretion, and increased glucose production.[1]

Diabetes mellitus causes progressive changes to the kidneys and ultimately results in diabetic nephropathy2 & Diabetic nephropathy is one of the leading causes of Diabetic complications affecting the world

The risk of chronic complications in patients of diabetes mellitus depends on the duration of hyperglycemia.3 Macrovascular and microvascular complications of diabetes mellitus are a consequence of metabolic derangement mainly hyperglycemia. Diabetic nephropathy being one of them causes end stage renal disease. Hence, to detect renal involvement, microalbuminuria can be considered as an early marker.

Increased intracellular glucose leads to formation of advanced glycosylation end products (AGEs) via non-enzymatic glycosylation of cellular proteins. These advanced glycosylation end products crosslink proteins i.e. collagen, extracellular matrix proteins and hence, promote glomerular dysfunction[4].

In the capillaries of the renal glomeruli, albumin binds to the glycated basement membrane which leads to increased basement membrane thickening and is a characteristic of diabetic microangiopathy[5]. Hence, the development of diabetic nephropathy is initiated. Increased intraglomerular pressure, loss of negatively charged glycosaminoglycans in the basement membrane and increased basement membrane pore size contribute to albuminuria[6].

Microalbuminuria is considered to be an early stage of diabetic nephropathy.[7,8,9,10] Microalbuminuria is also considered to be a predictor for cardiovascular disease both among diabetic and non-diabetic subjects,[11,12,13] and is one of the components of the metabolic syndrome (insulin resistance syndrome).[14,15] Currently, India leads the world with the largest number of diabetic subjects and this is expected to further rise in the coming years.[16,17]

In random spot collection technique, normal albumin excretion is less than 30 µg/mg of creatinine; microalbuminuria is defined as albumin excretion of 30-299 µg/mg of creatinine.[18] Albumin excretion 300 µg/mg of creatinine or higher is called macroalbuminuria. Microalbuminuria is used as a screening test for the presence of Diabetes related kidney disease[18]

Various studies have shown marked variation in the prevalence of microalbuminuria.[19,20,21,22,23] Especially Indians[23,24]

Currently, India has one of the largest numbers of diabetic subjects and this is expected to further rise in the coming years. Hence studies on diabetes related complications are essential to assess the burden of diabetes.

METHEDOLOGY

This Prospective Observational study involved Prior Consent from the patients & was found to be within ethical standards. It was conducted in 4 months at the Department of General Medicine, Raipur Institute of Medical Sciences, Raipur , CG , India. Simple random sampling technique was used for patient selection. 200 Number of Patients included in the study were having history of Diabetes mellitus (Known to them) for at least 2 years or more and were undergoing treatment for Diabetes.

Patients who didn't wanted to be part of the study, having any evidence of urinary tract infection, Heart Failure & Critically ill patients were excluded from the study.

Detailed Clinical Examination was done & all the patients went through Routine investigations. Patient's history including age, sex, duration of the diabetes was taken. Height and weight and Body Mass Index (BMI) of all patients were calculated. Blood pressure was taken for all the patients for detection of hypertension & Patients were categorised as being hypertensive if they were on antihypertensive treatment or if they had a systolic blood pressure >140 mm Hg and/or diastolic blood pressure >90 mm Hg. Blood was collected for fasting blood sugar, HbA1C, fasting lipid profile levels. Microalbuminuria was assessed using dipstick kits in early morning urine samples.

Microalbuminuria was diagnosed if the albumin creatinine ratio exceeded 30 mg/g of creatinine. Urine samples were collected in the early morning after an overnight fast. Urine creatinine was measured using Jaffe's method. Urine microalbumin concentration was measured using commercially available immunoturbidometric assay kits from Randox (Randox, UK) on Opera Technicon Auto Analyser (Bayer Diagnostics, USA).

Data was filled in Microsoft Excel & analysed using the Statistical Package for Social Sciences (SPSS) for Windows version 21 & a computer software Epi Info version 6.2 (Atlanta, Georgia, USA). Chi-square test was used to analyze nonparametric or categorical data. For analysis of ordinal scale data, Student's t-test was used. Karl–Pearson correlation coefficient was calculated to observe correlation between variables. P value of 0.05 and less was considered as statistically significant

RESULTS

A total of 200 patients including 128 males and 72 females were studied. The mean age of the patients was 50.82 ± 9.17 years.

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In our study, Microalbuminuria was present in 88 (n=200) of patients , which included 59 (67%,) Males and 29 (33%) Females. More males patients were having Microalbuminuria. MA was present in the highest number of patients in 50-60 years age group. Among 200 cases of diabetes mellitus, 35% patients had a familial history of diabetes mellitus.

The microalbuminuric patients were older and had a longer duration of diabetes compared with the normoalbuminuric group (p<0.001). Mean age of detection of diabetes among study population was in the 40s & 50s, but the age when microalbuminuria was detected was a little higher. Body mass index was higher in patients with microalbuminuria. (See Table 1)

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). (Table 1).

Table 1 – Microalbuminuria relation / association with Demographic details of the patients and other risk factors

Factors	Normal Albuminuria (n= 112)	Microalbuminuria (n= 88)
Age at diagnosis	41	58
Duration of Diabetes Mellitus	4 years	9 years
Body Mass Index	25.62	29.14
HBA1c %	5.9	7.9
Total Cholesterol	156	268
Diastolic Blood Pressure	71 mmHg	93 mm Hg
Systolic Blood Pressure	124 mm Hg	141 mm Hg
Creatinine	0.9	1.3

DISCUSSION

Diabetes mellitus is a global problem. The increased morbidity and mortality in Diabetes mellitus lead to search for marker for early detection of renal complications.

Incidence of diabetes mellitus has increased drastically over past decade. Various studies have shown marked variation in the prevalence of microalbuminuria.[20-23] Especially Indians have a higher prevalence of microalbuminuria.[23,24] Microvascular complications such as nephropathy has also increase the prevalence of chronic kidney disease.[25]

In our study, the incidence of microalbuminuria was 44 %, it increased with increased incidence in males compared to females. The average age of onset of diabetes was in the late 40's , while microalbuminuria was detected much later, in the early & late 50's.

Various studies have reported similar incidence of microalbuminuria in diabetes. Vijay et al showed incidence of 15.7% in Chennai.[26] Gupta et al from North India in his study reported an incidence of 26.5% microalbuminuria in patients with type 2 diabetic mellitus.[27]

In our study poor glycaemic control, duration of diabetes, hypertension, increasing age, high HbA1C

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are most important risk factors for microalbuminuria. Vijay et al[26] have reported duration of diabetes, systolic and diastolic BP age and serum creatinine levels to be associated with proteinuria. According to John et al, male gender, increasing age, duration of diabetes, poor glycaemic control and raised blood pressure was associated with microalbuminuria.[28]

In a study conducted by Verghese et al, age, duration of diabetes, diastolic blood pressure, HbA1C, and fasting plasma glucose were reported to be the risk factors.[29]

The level of mean blood glucose, effectiveness of treatment and risk of development of possible long term chronic complications are associated with poor glycemic control.

Awareness campaigns about the common causes, complications and correct practices are recommended. This study and its results are applicable to the geographical and socioeconomic status around our Medical Institute.

CONCLUSION

Our study indicates that increased levels of microalbuminuria have a direct correlation with HbA1c, age , BMI , Systolic & Diastolic BP in diabetic patients. It is also associated with duration of diabetes because of prolonged exposure of hyperglycemia. Microalbuminuria can be considered as an early marker of renal involvement in diabetes mellitus and its early detection can significantly reduce the progression of renal complications associated with it. Additionally, there is an urgent call for regular screening of microalbuminuria and HbA1c in both newly diagnosed and already diagnosed diabetics to prevent Diabetic Nephropathy.

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