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ORIGINAL ARTICLE

Frequency of microalbuminuria and its relation to HbA1C in type 2 Diabetes mellitus patients.

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ABSTRACT… Objective: To determine frequency of microalbuminuria and relative determination of glycated hemoglobin (HBA1C) in Type II diabetes mellitus patients. **Study Design:** Descriptive Cross Sectional. **Study Setting:** Three Different Hospitals Based in Sindh Pakistan. **Study Period:** March-August 2021. **Material & Methods:** After selection through non-probability purposive sample technique, demographic details of all patients were noted in a written questionnaire. All the confirmed patients of type-II diabetes mellitus were then tested for microalbuminuria and glycated hemoglobin in parallel with the disease progression. All the collected information was analyzed in SPSS ver. 22. **Results:** Among 165 enrolled cases, 89 (54%) type II diabetic patients were normoalbuminuric, 53 (32 %) Microalbuminuria and 14 % macroalbuminuria. Males were at greater risk (65%) of developing type II diabetes mellitus in comparison to females (35%). In total 46 type II diabetes mellitus cases with microalbuminuria represent raised HBA1C levels AT95% CI. **Conclusion:** Prevalence of microalbuminuria among type II diabetic patients visiting the tertiary care hospital is 32.1%. Patients with higher HbA1c or poor glycemic control are present with microalbuminuria.

Key words: Albuminuria, Diabetes Mellitus Type 2, Glycated Hemoglobin A.

INTRODUCTION

The highest incidence estimates of diabetes mellitus in Middle east and African region suggest approximately 37.1 billion USD expenditures to manage the disease rate in next twenty-five years.[1,2] As per International diabetic federation records, Pakistan is ranked in top ten country list with highest (11%) Type-II diabetes prevalence. The comparative diabetic assessment analysis recognized Type II diabetes mellitus a leading cause of multi organ involvement like nephropathy, cardiovascular complications and related disorders.[3,4] In past, Type II diabetes mellitus symptoms were less characterized during acute phase of the disease and patients representing late stage symptoms like, macroalbuminuria (>300mg urinary albumin/24 h), renal insufficiency and renal failure were only diagnosed.[5,6] Whereas, in depth literature exploration confirms that, about 20-40 % cases of Type II diabetes mellitus represent microalbuminuria (30-300 mg urinary albumin/24 h) prior to the progression of disease as well. The microalbuminuria testing can play vital role for timely diagnosis of the Type-II diabetes mellitus and can add prognostic value.[1,7,8]

Beside microalbuminuria, estimation of glycated hemoglobin (HBA1C) levels are also recognized as prognostic marker for the precise diagnosis of Type II diabetes mellitus. The recent research reports highlighted a great variability in glycated hemoglobin level in parallel with the progression of Type II diabetes mellitus.[9] Increased secretion of albumin in urine may indicate a more widespread vascular damage than renal micro-vascular injury alone. Microalbuminuria is less likely to occur and progress if the diabetic patient had a good glycemic control. While diabetic patients who had early diagnosis and treatment with the goal of achieving good glycemic control may avoid the development of nephropathy, improve patient

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outcomes as well as minimize the economic burden. While the incidence of microalbuminuria and relative determination of glycated hemoglobin (HbA1C) in Type II diabetes mellitus patients is still considered debatable.[10]

This study focuses estimation on the correlation between microalbuminuria and glycated hemoglobin in Type-II diabetic patients. This study was designed to estimate the frequency of microalbuminuria and relative determination of glycated hemoglobin (HbA1c) in Type II diabetes mellitus patients.

MATERIAL & METHODS

The multi-centric descriptive cross-sectional study was conducted at three different hospitals (Liaquat University hospital, Hyderabad, Isra University Hospital and) based in Sindh Pakistan from March to August 2021 after getting approval from institutional research review Board of College of Family Medicine, Pakistan 23rd February 2021. Patients aged over 20 years, having history of type II diabetes mellitus onset during ≥ 5 years duration, those with history of higher HBA1c values, newly diagnosed (microalbuminuria) and visited the selected hospitals were included and invited to participate in the study. While patients with history of type 1 Diabetes and those with any other chronic disease, those with history of addiction were excluded from the study.

Socio-demographic and clinical information of all patients were gathered using a written questionnaire. The maximum participation of patients with informed consent was assured. A sample of 165 people participated for this study following purposive non probability sampling method. The P value was taken as 5% at 95% confidence interval. Further, Clinical profile of patients were noted for microalbuminuria, HBA1c and clinical demographics including BMI, blood pressure were correlated with HBA1c levels. The data analysis was done by using SPSS version 22.0 and Microsoft office 2010 multiple tools.

RESULTS

This study shows 89 (54%) type II diabetic patients were normoalbuminuric, 53 (32 %) Microalbuminuria and 14 % macroalbuminuria respectively. The type II diabetic patients were characterized into three groups based on urine albuminuria (Table-I). Males were at greater risk (65%) of developing type II diabetes mellitus in comparison to females (35%).

Urine Albuminuria (mg/L)	Frequency (%)
Normoalbuminuric (<30)	89 (53.9%)
Microalbuminuria (≥30)	53 (32.1%)
Macroalbuminuria (≥300)	23 (13.94%)
Total	165 (100.0%)

Table-I. Urine albuminuria in Type-II diabetic patients (n=165).

About 20 % type II diabetic males were representing microalbuminuria and only 9.6% males were facing macroalbuminuria. In contrast women 12 % female patients were diagnosed with microalbuminuria and only 4 % with macroalbuminuria (Table-II).

		Urine Albuminuria (mg/L)	
Gender	Normoal-buminuric (<30)	Microal-buminuria (≥30)	Macroal-buminuria (≥300)
Male	58	33	16
Female	31	20	7
Total	89	53	23

Table-II. Gender wise relative distribution of Urine albuminuria (mg/L).

In total 46 type II diabetes mellitus cases with microalbuminuria represent raised HBA1C levels. From twenty-three type II diabetes mellitus cases about twenty cases of macroalbuminuria were showing raised HBA1C level (Table-III).

HBA1C %		Urine Albuminuria (mg/L)	
	Normoal-buminuric (<30)	Microal-buminuria (≥30)	Macroal-buminuria (≥300)
Normal <6.5)	74	7	3
Raised (>6.5)	15	46	20
Total	89	53	23

Table-III. HBA1C distribution in parallel to Urine albuminuria (mg/L).

The major causes of microalbuminuria include Urinary tract infection, dehydration, febrile illness and hyperglycemia as well. In some cases, glomerular membrane was also damaged and disease progression from microalbuminuria status to macroalbuminuria was also noted.

DISCUSSION

Microalbuminuria is regarded as an early indicator of diabetic nephropathy in type II diabetics.[11] It is a risk factor for diabetic end-stage renal disease as well as an important marker of mortality in diabetics. Its progresses to overt nephropathy, which leads to a decline in glomerular filtration rate and, eventually, end-stage renal disease or premature cardiovascular death.[12] This cross-sectional study was conducted with an objective to determine the frequency of microalbuminuria and its relative determination with glycated hemoglobin among type II diabetic patients. In the present study, 64.8% were male and 35.2% were female. While majority (54%) of type II diabetic patients were reported as normoalbuminuric while 13.9% were having macroalbuminuria. Sana et al. also reported that in their study majority (69.9%) of their participants were normoalbuminuric while 4.5% were having macroalbuminuria.[8] The prevalence of microalbuminuria among the type II diabetic patients in the present study was 32.1%. Consistent findings were reported by Aboelnasr et al. that observed microalbuminuria prevalence of 39.2% among their study type II diabetic patients while Al Fehaid et al. demonstrated that micro-albuminuria was prevalent in 37.4% of their participants.[10,13] Study by Elhefnawy KA et al also reported consistent findings with our study as 60.3% patients in their study were normoalbuminuric, 31.8% had microalbuminuria and 7.9% had macroalbuminuria.[14] Pakistani studies by Sana et. al reported the consistent prevalence of microalbuminuria (29.5%) while another study conducted by Muhammad R. et al. reported much higher prevalence of 60.3% in their study patients.[8,15]

A study led by Ali et al. Iraq reported 16.1% of their participants having microalbuminuria.[16]

The present study demonstrated that higher proportion of patient (56.7%) with microalbuminuria had poor glycemic control that is serum HbA1c > 6.5%. These findings are consistent with the other Pakistani studies by Sheikh et al and Hasan et al.[17,18] These studies also reported a significant correlation of microalbuminuria with HbA1c level among type 2 diabetic patients. Moreover, Ahmed et al and Walraven et al. also reported a strong correlation between the higher glycemic level and microalbuminuria.[19,20]

As this was a hospital-based study conducted at three different tertiary care hospitals and not a community-based study, so the selection bias cannot be ignored and the sample may not represent all patients in the community. Moreover, the data related to commodities like hypertension, history of congenital renal disease and metabolic syndrome were collected from the participants. While information related to dietary intake, drug history and other addiction were also not inquired from patients which may result in minor variations in reported outcomes.

CONCLUSION

Based on the findings, the study concludes that prevalence of microalbuminuria among type II diabetic patients visiting the tertiary care hospital is 32.1%. Patients with higher HbA1c or poor glycemic control are present with microalbuminuria compared with those with controlled limits of HbA1c. There is a significant relationship between poor glycemic control and microalbuminuria among type II diabetic patients.

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