

## Association of Microalbuminuria with Glycemic Status Among Patients with Diabetes Mellitus

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### ABSTRACT

**Objective:** The study was designed to evaluate the association between micro-albuminuria and glycaemic status among type II diabetic patients.

**Methodology:** This cross-sectional study was conducted in the medical unit of Isra University, Hyderabad from January 2019 to June 2020. All type II diabetes mellitus patients (both good controlled as well as uncontrolled), reported in the medical unit were included in the study. The participants were divided into two groups according to their glycemic level. Group I comprised of patients with poor glycemic control that is HbA1c >7% while Group II comprises patients with good glycemic control i.e. HbA1c <7%.

**Results:** The mean age of all patients was 42.3 ± 4.1 years. Majority (56.4%) of the participants in study group were males mostly between 41-45 years' age. The mean HbA1c level in group-1 (poorly controlled) and group-2 (good control) participants was 8.12 ± 0.97% and 5.98 ± 0.41% respectively. There was a statistically significant association (p<0.05) between poorly controlled glycemic status and micro-albuminuria.

**Conclusion:** Micro-albuminuria is significantly associated with poor glycemic status among type 2 diabetic patients.

**Key words:** Diabetes Mellitus, Glycemic Control, Micro-albuminuria.

#### Authors' Contribution:

<sup>1,2</sup>Conception; *Literature research; manuscript design and drafting;* <sup>2,3</sup>Critical analysis and manuscript review; <sup>5,6</sup>Data analysis; *Manuscript Editing.*

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### Introduction

Diabetes mellitus (DM) is a chronic and serious non-communicable disease that commonly occurs due to the deficiency of insulin and/ or resistance to utilization of available insulin.<sup>1</sup> Type 2 diabetes mellitus (T2DM) is one of the most frequently occurring types of DM that affects over 462 million individuals worldwide. Several complications like; diseases of the heart and blood vessels, nerve damage, renal diseases, etc. are associated with T2DM.<sup>2</sup> Moreover, cardiovascular complications of T2DM are the leading cause of morbidity and

mortality, while renal complications are predominant among patients with DM in Asian countries.<sup>3</sup>

Micro-albuminuria is characterized as the excretion of albumin in urine around 30–300 mg in 24 hours.<sup>4</sup> It is prevalent in more than one third of T2DM patients. The elevated quantity of albumin in urine might indicate more widespread vasculature damage than injury to renal parenchymal tissue due to the micro vessels alone.<sup>5</sup> In the initial phase after the development of diabetes mellitus, hyper-perfusion of the glomerulus and hypertrophy of the

renal calyces ensues, as evidenced by an increase in the glomerular filtration rate (GFR).<sup>6</sup>

Mortality rate increases 40 times among T2DM patients with proteinuria. It is the single most important and sensitive prognostic indicator for diabetic nephropathy in determining its risk, as well as the early stages of progressive diabetic renal disease.<sup>7,8</sup> Keeping this in view, the present study was designed to evaluate the association between micro-albuminuria and glycemic status among type 2 diabetic patients.

## Methodology

This cross-sectional study was conducted at the medical unit of Isra University, Hyderabad from January 2019 to June 2020. The study commenced after ethical approval from the Ethical Review Board of Isra University. All patients with type-2 Diabetes of either gender, with both good controlled as well as uncontrolled diabetes mellitus type II were included in the study. Patients with a history of hypertension, kidney disease, and taking any type of medication that affects renal functions like Angiotensin-converting enzyme (ACE) inhibitors, diuretics, and non-steroidal anti-inflammatory drugs (NSAIDs) were excluded from the study. A sample size of 220 was obtained using Rao soft online sample size calculator by taking a confidence interval of 95%, margin of error at 5% and prevalence of kidney diseases among diabetic Pakistani population at 21.2%.<sup>9</sup> Participants were selected by convenient non probability sampling technique.

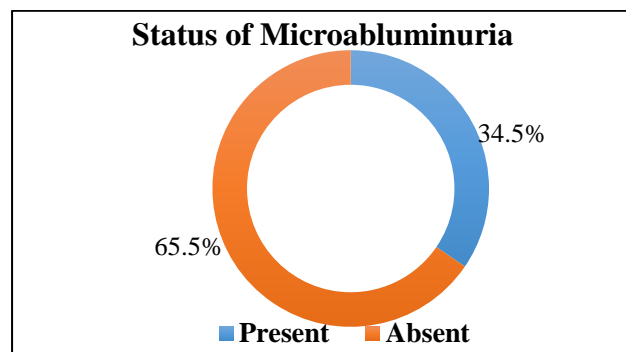
After taking informed consent, all the participants were divided into two groups according to their status of glycemic control. Group-I comprised of patients with poor glycemic control that is HbA1c >7% while Group II comprised of patients with good glycemic control that is HbA1c <7%. Participant's socio-demographic information was collected using a written questionnaire. A blood sample of 3ml was taken from the anterior cubital vein by an experienced phlebotomist. The 24-hour samples of

urine of all the participants were collected in a sterilized container at the medicine ward. Samples were then sent to the Isra University diagnostic laboratory for HbA1c and detecting micro-albuminuria. Data were entered and analysed using SPSS ver. 23.0. The qualitative variables like gender, age group, educational level, glycemic status, and micro-albuminuria are presented as frequency and percentages while the quantitative variables like HbA1c are presented as mean  $\pm$  standard deviation. Chi-square test was used for the analysis of the association between glycemic status and micro-albuminuria. The significance level was set at  $p < 0.05$ .

## Results

Total of 220 patients who fulfilled the selection criteria were included in the study. Majority of participants in the study were males and most them belongs to age group 41-45 years while the mean age of all patients was  $42.3 \pm 4.1$  years. Majority of males had poor glycemic status. (Table I) Urine examination revealed that total 76 (34.5%) patients were detected with micro-albuminuria while 144 (65.5%) patients did not have micro-albuminuria. (Figure 2)

A statistically significant difference between poorly controlled glycemic status and micro-albuminuria ( $p < 0.05$ ) was demonstrated among participants. (Table III)



**Figure 1:** Status of micro-albuminuria among study participants (n=220)

<b>Males</b>	124 (56.4 %)		
<b>Females</b>	96(43.6%)		
<b>Age Group</b>	N (%)	N (%)	N (%)
30-35 years	39 (17.7)	22 (17.7)	17 (17.7)
36-40 years	58 (26.3)	33 (26.6)	26 (27.0)
41-45 years	68 (31.0)	39 (31.4)	29 (30.3)
46-50 years	55 (25.0)	30 (24.3)	24 (25.0)
<b>Education</b>			
No education	37 (16.8)	20 (16.2)	17(17.7)
Primary	63 (28.6)	41 (33.0)	22(23.0)
Secondary	80 (36.3)	35 (28.2)	45(46.8)
Higher	40 (18.3)	28 (22.6)	12(12.5)
<b>Glycemic status</b>			
Poor	110 (50.0)	75 (60.8)	35 (36.8)
Good	110 (50.0)	50 (39.2)	60 (63.2)

Groups	Micro albuminuria		P-Value
	Absent n (%)	Present n (%)	
Group I (n=110)	47 (42.7)	63 (57.3)	<b>0.000</b>
Group II (n=110)	97 (88.2)	13 (11.8)	

## Discussion

DM is a chronic non-communicable disease that occurs due to the deficiency of insulin and/ or resistance to utilization of available insulin.<sup>1</sup>The incidence of DM is rising at an alarming rate which in turn has increased the overall risk of accompanying complications. Microalbuminuria is one of the commonly occurring complications that pose a serious threat to the overall well-being of an individual.<sup>6</sup> The results of this study show that the enrolled patients having uncontrolled DM had higher levels of micro-albumin in their urine in comparison to those having controlled DM (<0.05). A significant correlation has been reported in many

other studies.<sup>6,7</sup> A study by Yoo *et al.* and Ullah *et al.* reported that a higher level of micro-albuminuria was associated with uncontrolled glycemic patients among diabetes mellitus type 2.<sup>11,12</sup> A study by Abdel Kareem *et al* showed a positive correlation of microalbuminuria and high blood pressure levels, both systolic and diastolic blood pressure along with decreasing renal function, clearly indicating damage of kidneys.<sup>13</sup>

The relationship between glycemic control and the status of micro-albuminuria among type II diabetes mellitus patients has also been reported by Kantarama *et al* in their study.<sup>7</sup> The results of another study by Habib *et al* showed a significant association of higher level of micro-albuminuria among patients of diabetes mellitus with uncontrolled glycemia.<sup>14</sup> A study by Verma *et al.* found a significant correlation between early diagnosis and controlled glycemic level in T2DM resulting in decreased risk of developing as well as advancement of micro-albuminuria. This lowered the risk of end-stage renal dysfunction hence lesser mortality and morbidity among these patients.<sup>15</sup> Sana *et al.* and Abdel Wahid *et al.* have also reported that uncontrolled glycemia resulted in a higher level of microalbuminuria hence a hallmark of progression of diabetic nephropathy.<sup>16,17</sup>

A higher risk of developing micro-albuminuria was found among type 2 diabetic patients having poor glycemic levels as shown in a study by Karki *et al.*<sup>18</sup> We also found that a poor glycemic control was associated with higher level of urinary albumin. Moreover, in the community factors like smoking, heavy poisoning with metals, exercise, use of NSAIDs, connective tissue diseases obesity, and familial hypertension or diabetes are found to be associated with the development of micro-albuminuria.

## Conclusion

Micro-albuminuria is significantly associated with the poor glycemic status among type 2 diabetic

patients. Diagnosis and prompt treatment of microalbuminuria at early stages may reduce the risk of renal damage.

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