

## FREQUENCY OF MICROALBUMINURIA IN TYPE II DIABETES MELLITUS PATIENTS: A CROSS SECTIONAL STUDY

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**Abstract:** Microalbuminuria is an early marker of diabetic nephropathy and an important predictor of cardiovascular and renal complications in patients with Type II diabetes mellitus. Identifying its prevalence and associated risk factors is crucial for early intervention **Objective:** The objective of this study was to determine the frequency of microalbuminuria and its associated risk factors in patients with Type II diabetes mellitus. **Methods:** This cross-sectional study was carried out in the medical ward of a tertiary care hospital from March 2024 to September 2024. Two hundred fifty patients, aged 30 years or older, diagnosed with Type II diabetes, were selected. The presence of microalbuminuria was assessed using urine albumin-to-creatinine ratio measurements. **Results:** Mean age was  $52.04 \pm 12.311$  years, gender-wise there were 152 males (60.8%) and 98 females (39.2%) patients. The frequency of microalbuminuria was 76 (30.4%). Microalbuminuria was notably associated with BMI, duration of diabetes, and the presence of hypertension, with significant associations observed ( $p < 0.05$ ) for all these factors. **Conclusion:** Our study demonstrated that microalbuminuria was found in 30.4% of patients presenting with diabetes type II, with significant associations observed for hypertension, BMI, and the duration of diabetes.

**Keywords:** Type II diabetes mellitus, microalbuminuria, hypertension, BMI, duration of diabetes, cross-sectional study, risk factors.

### Introduction

Type 2 Diabetes Mellitus (T2DM) is a persistent metabolic condition marked by insulin resistance and diminished insulin secretion, resulting in increased blood glucose levels. If not managed properly, this can lead to significant health issues, including cardiovascular disease, kidney failure, neuropathy, and vision impairment. T2DM is marked by a progressive reduction in the body's responsiveness to insulin, known as insulin resistance, along with a relative shortfall in insulin production as time goes on. Elevated blood sugar levels can lead to damage in various organs and systems within the body, such as the heart, kidneys, eyes, and the nervous system. (1-3)

In individuals with diabetes, kidney disease is marked by an elevation in urine albumin excretion, advancing to clear albuminuria, and ultimately leading to the onset of end-stage renal disease (ESRD). Microalbuminuria denotes the presence of minimal quantities of albumin in the urine. While these amounts are generally undetectable by standard urine tests, they can be recognized using advanced laboratory methods, and it is regarded as an initial indicator of kidney impairment. (4, 5) In individuals with T2DM, the filtration function of the kidneys deteriorates over time as a result of sustained hyperglycemia, leading to injury to the glomeruli and facilitating the excretion of albumin in the urine. The presence of microalbuminuria provides additional insight into widespread indiscriminate

vasculopathy as well as endothelial dysfunction, which can lead to atherosclerosis. (6)

In the microcirculation, this may contribute to the onset of insulin resistance. Diabetes mellitus, a common endocrine disorder as well as noncommunicable disease, is associated with prolonged microvascular and macrovascular complications, as well as metabolic abnormalities. Diabetes mellitus is a significant contributor to premature mortality worldwide. It is projected that half of individuals diagnosed with type 2 diabetes will experience premature mortality. Microalbuminuria serves as an early indicator of diabetic nephropathy and functions as an independent risk factor for cardiovascular illness, potentially advancing to overt proteinuria and eventually leading to renal failure. (7-10)

The rationale for performing a cross-sectional study on microalbuminuria in patients with T2DM arises from the increasing global incidence of T2DM and the considerable impact of diabetic nephropathy, which is frequently indicated by the presence of microalbuminuria. The early identification of microalbuminuria is crucial in averting the development of more serious kidney conditions, such as end-stage renal disease, which is the main contributor to mortality and illness among those with diabetes.

### Methodology

This cross-sectional study was carried out in the medical ward of a tertiary care hospital from March 2024 to

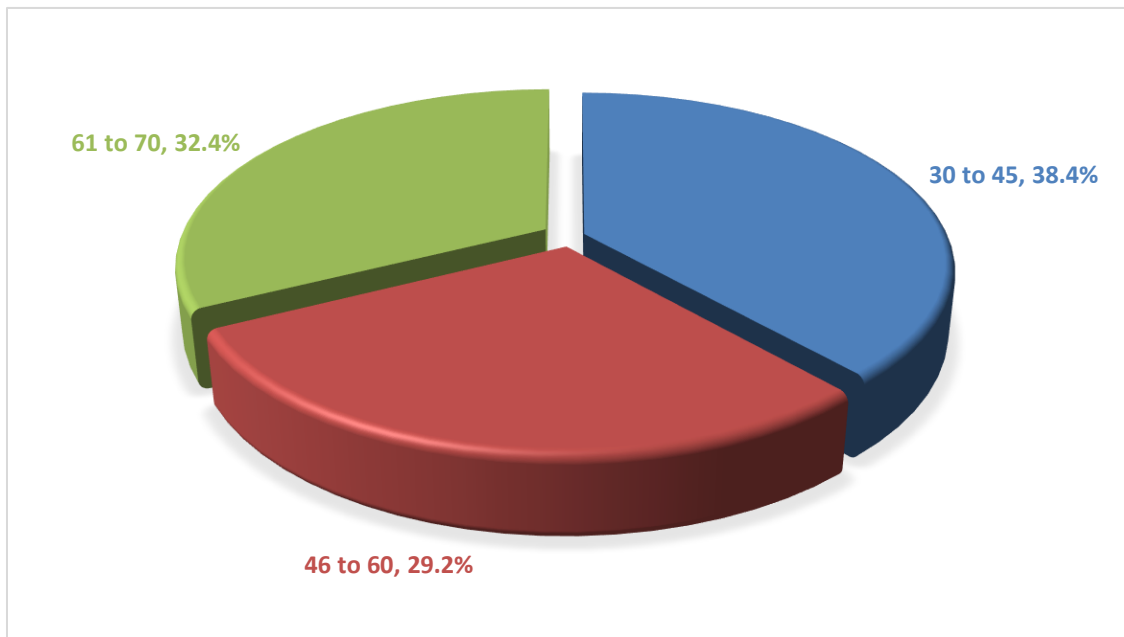
September 2024, at MTI DHQTH/Gomal Medical College, Dera Ismail Khan to determine the frequency of microalbuminuria in type II diabetes patients after taking ethical approval from the hospital. Our study had 250 patients aged 30 years or older who were diagnosed with Type II diabetes, regardless of gender. The selection criteria did not impose any specific exclusions, allowing for a comprehensive analysis of the diabetic population within the specified age range. All participants were evaluated for the presence of microalbuminuria using standard diagnostic methods, including urine albumin-to-creatinine ratio measurements. The data were collected on a pre-designed proforma. The clinical characteristics recorded included age, gender, diabetes duration, BMI, and hypertension. In terms of statistical analysis SPSS 24 was used, Chi-square tests were employed to examine the associations between microalbuminuria and various clinical variables such as hypertension, BMI, and diabetes duration, keeping the P value notable at < 0.05.

**Results**

The study involved 250 patients having a mean age of 52.04 ± 12.311 years, and a mean BMI of 27.15 ± 2.38 kg/m<sup>2</sup>.

Gender distribution showed that 152 (60.8%) were male and 98 (39.2%) were female. Hypertension was present in 135 (54%) of the participants. BMI distribution and diabetes duration distribution are presented in Table 1.

When analyzing the frequency of microalbuminuria, 76 (30.4%) patients were found to have microalbuminuria. Further breakdown of the clinical characteristics revealed that microalbuminuria was more common in patients with hypertension, where 62 (81.6%) of those with hypertension had microalbuminuria compared to 14 (18.4%) without (P = 0.0001). The prevalence of microalbuminuria also varied with BMI distribution: 17 (22.4%) of those with a BMI between 18 and 24.9 kg/m<sup>2</sup> had microalbuminuria. For patients with a BMI between 25 and 29.9 kg/m<sup>2</sup>, 34 (44.7%) had microalbuminuria. Among those with a BMI greater than 29.9 kg/m<sup>2</sup>, 25 (32.9%) had microalbuminuria (P = 0.0001). Regarding the duration of diabetes, 14 (18.4%) patients with 1 to 5 years of diabetes had microalbuminuria. Among those with diabetes for 6 to 10 years, 12 (15.8%) had microalbuminuria. The highest prevalence of microalbuminuria was observed in patients with diabetes for more than 10 years (P = 0.04).



**Figure 1** Age distribution of the patients

**Table 1** Presenting characteristics of the patients

Presenting characteristics of the patients		N	%
Gender	Male	152	60.8%
	Female	98	39.2%
Hypertension	Yes	135	54.0%
	No	115	46.0%
BMI distribution (Kg.m2)	18 to 24.9	55	22.0%
	25 to 29.9	152	60.8%
	> 29.9	43	17.2%
Duration of diabetes (Years)	1 to 5	64	25.6%
	6 to 10	51	20.4%
	> 10	135	54.0%

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**Table 2** Frequency of microalbuminuria

Microalbuminuria	Frequency	Percent
Yes	76	30.4
No	174	69.6
Total	250	100.0

**Table 3** Association of clinical characteristics with microalbuminuria

Clinical characteristics	Microalbuminuria				P value	
		Yes		No		
		N	%	%		%
Hypertension	Yes	62	81.6%	73	42.0%	0.0001
	No	14	18.4%	101	58.0%	
BMI distribution (Kg.m2)	18 to 24.9	17	22.4%	38	21.8%	0.0001
	25 to 29.9	34	44.7%	118	67.8%	
	> 29.9	25	32.9%	18	10.3%	
Duration of diabetes (Years)	1 to 5	14	18.4%	50	28.7%	0.04
	6 to 10	12	15.8%	39	22.4%	
	> 10	50	65.8%	85	48.9%	

## Discussion

The overall prevalence of microalbuminuria in our cohort was 30.4%. Chowta NK et al. reported a prevalence of 37%. (11) This range is consistent with global findings, indicating that microalbuminuria remains a common early sign of diabetic nephropathy. (12-14) Additionally, our study observed a notable link between hypertension and microalbuminuria, with 81.6% of hypertensive patients showing microalbuminuria. This aligns with AlFehaid et al., who also found a strong association between hypertension and diabetic nephropathy in T2DM patients. (12) Hypertension is known to exacerbate renal damage by increasing glomerular pressure and contributing to the progression of microalbuminuria to more severe forms of nephropathy. (12)

Sana MA et al., also reported a high prevalence of microalbuminuria in hypertensive patients, confirming the well-established relationship between blood pressure control and kidney function in diabetes. They also emphasized that hypertension is a significant modifiable contributor to diabetic nephropathy, and managing blood pressure effectively can help delay the advancement of microalbuminuria to more severe forms. (13) Our study supports this conclusion, with a Chi-square value of  $P = 0.000$  for hypertension, underscoring its significant role in the onset of microalbuminuria.

In terms of BMI, our study found that 44.7% of patients having a BMI of 25 to 29.9 kg/m<sup>2</sup> had microalbuminuria. This relationship is well-documented in the literature, with several studies reporting a positive correlation between elevated BMI and microalbuminuria. (11-13)

Our study also demonstrated a link between the duration of diabetes and the presence of microalbuminuria. Specifically, 65.8% of patients with diabetes for more than a decade had microalbuminuria, which mirrors findings by Pasko N et al., and AlFehaid et al., both of which found a significant relationship between longer diabetes duration and increased risk of nephropathy. (12-14) The progressive nature of diabetic nephropathy, starting with microalbuminuria, is well documented in the literature. As hyperglycemia persists, it leads to structural changes in the

kidney, making it more susceptible to damage and progression to end-stage renal disease if not managed effectively. (14) Our study's findings underscore the significance of regular screening for microalbuminuria, especially in patients with known risk factors such as hypertension, high BMI, and long-standing diabetes. The findings are consistent with the recommendations by Sana MA et al., which advocate for routine screening of T2DM patients for early kidney damage. Timely intervention could prevent the progression to more severe stages of nephropathy and improve long-term patient outcomes. (13).

## Conclusion

In conclusion, our study on the frequency of microalbuminuria in Type II diabetes mellitus patients demonstrated that 30.4% of participants exhibited microalbuminuria, with notable associations identified between its presence and hypertension, BMI, and the duration of diabetes. These findings highlight the importance of regular screening for microalbuminuria in diabetic patients, particularly those with these risk factors.

## Declarations

### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

### Ethics approval and consent to participate.

Approved by the department Concerned. (IRBEC-AZSH-0377/23)

### Consent for publication

Approved

### Funding

Not applicable

### Conflict of interest

The authors declared an absence of conflict of interest.

### Authors Contribution

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Data Analysis

**SAMAN WAHAB**

Final Approval of version

**SABA HIDAYAT**

Revisiting Critically

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Drafting

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Concept & Design of Study



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