

Prevalence of Urine for Microalbumin in Type 2 Diabetes: A Descriptive Cross-Sectional Study in A Tertiary Care Hospital

BK S¹, K.C. B¹, Dhakal A¹, Paudel S², Sonar AS¹

ABSTRACT

Introduction: Microalbuminuria is an early clinical indicator of diabetic nephropathy and a predictor of cardiovascular morbidity and mortality in patients with type 2 diabetes mellitus (T2DM). Early detection is vital for timely management to prevent progression to overt nephropathy and renal failure. **Aims:** To determine the prevalence of microalbuminuria and its association with glycemic control, blood pressure, and body mass index with type 2 diabetes mellitus. **Methods:** A descriptive cross-sectional study was conducted at Nepalgunj Medical College, from October 2024 to April 2025. Two hundred patients with confirmed type 2 diabetes mellitus of at least one-year duration were enrolled using convenience sampling. Patients with urinary tract infections, pregnancy, or non-diabetic renal diseases were excluded. Demographic data, clinical parameters, and laboratory results including fasting blood sugar, HbA1c, lipid profile, and urine microalbumin levels were recorded. Statistical analysis was performed using SPSS version 25. Student's t-test and Chi-square test were applied, and p-value <0.05 was considered statistically significant. **Results:** Among 200 participants, 30 (15%) had microalbuminuria. The mean age of participants with microalbuminuria (65.07 ± 15.05 years) was higher than those without (52.95 ± 13.34 years). Microalbuminuria was more prevalent among females (9.5%) compared to males (5.5%). Participants with microalbuminuria had significantly higher HbA1c ($8.30 \pm 1.57\%$) and mean random blood sugar levels was (238.23 ± 25.607). Individual without microalbuminuria had HbA1c ($7.22 \pm 1.065\%$) and mean random blood sugar level was (218.15 ± 46.60). The prevalence was greater among obese individuals and those with stage 2 hypertension. Serum cholesterol and triglyceride differences were not statistically significant. **Conclusion:** The prevalence of microalbuminuria among patients with type 2 diabetes was 15%. Poor glycemic control, hypertension, and obesity were significantly associated with its occurrence.

Keywords: Albuminuria, Diabetes mellitus type 2, Glycemic control, Hypertension

Authors:

1. Dr. Shyam Kumar BK
2. Dr. Balam K.C.
3. Dr. Aarati Dhakal
4. Dr. Sakar Paudel
5. Dr. Arjun Sah Sonar

¹Department of Medicine, Nepalgunj Medical College and Teaching Hospital, Kohalpur, Banke

²Department of Medicine, Patan Academy of Health Sciences, Lalitpur, Nepal

Address for Correspondence:

Dr. Shyam Kumar BK
Associate Professor
Department of Medicine
Nepalgunj Medical College and Teaching Hospital
Kohalpur, Banke
Email: dr.shyamyp@gmail.com

INTRODUCTION

Diabetes is a significant global metabolic disorder.¹ Type 2 diabetes mellitus have been a significant global public health issue.² In 2024, the International Diabetes Federation estimated that approximately 589 million adults (aged 20–79) worldwide are living with diabetes.³ Among diabetic patients, 20-40% develop diabetic nephropathy, and 10-20% of them succumb to kidney failure.⁴⁻⁵ The earliest clinical sign of diabetic nephropathy is an increase in urinary protein excretion.⁶⁻⁹ Microalbuminuria (MA) is the earliest detectable clinical sign

of diabetic nephropathy.¹⁰⁻¹¹ The urine dipstick is a relatively insensitive indicator of proteinuria, as it does not show a positive result until protein excretion surpasses 300-500 mg per day.¹² Elevated urinary albumin levels may indicate broader vascular damage.¹³ Microalbuminuria is linked with high blood pressure, dyslipidemia, inflammation, and endothelial dysfunction.¹⁴⁻¹⁷ Microalbuminuria is regarded as an early indicator of diabetic nephropathy.¹⁸ Bruno et al conducted a seven-year study involving 1,253 patients with type 2 diabetes, revealing that 3.7% of them progressed to overt nephropathy annually. Additionally, the presence of microalbuminuria was associat-

ed with a 42% higher risk compared to normoalbuminuria.¹⁹ Microalbuminuria is recognized as a predictor of cardiovascular disease in both diabetic and non-diabetic individuals.²⁰⁻²¹ Recent data from the World Health Organization (WHO) predict a global rise in diabetes prevalence, with developing countries being particularly affected.²² At present, South Asian countries have the highest number of individuals with diabetes globally.²²⁻² In type 2 diabetes mellitus, albuminuria may result from factors unrelated to diabetes.²⁴⁻²⁵ Microalbuminuria helps identify patients who require more aggressive management.²⁶

METHODS

It is a cross - sectional study. This study was conducted in Nepalgunj Medical College located at Kohalpur, Banke, Nepal. This institution was selected due to their high patient volume and diverse patient demographics, making them representative of the western population of the Nepal. This institution provides a range of services, including outpatient clinics, specialized diabetic care units, and diagnostic laboratories, ensuring a thorough evaluation of patients. The study was conducted over 6 months from 2024 October to 2025 April.

SAMPLE SIZE

From the study done by M. Afkhami-Ardekani, M. Modarresi in 2005 , the overall prevalence of microalbuminuria was 14.2%²⁷. Using the formula given below sample size becomes 187.21, taking 200 final sample size considering 5% of non-responsive errors. Inclusion Criteria includes individual who are diagnosed with T2DM for ≥1 year known through history taking, age >18 years, on treatment or not on treatment for DM and the individual who provided informed consent. Whereas exclusion criteria includes individual who are diagnosed with UTI, Acute illness, Known non-diabetic kidney disease, individual who underwent recent surgery, and individual who are unable to provide consent. Patients with suspected hypertensive nephropathy or diabetic with hypertensive renal disease were excluded based on clinical history, ultrasound and previous medical records

Sources of Data : Patient Medical Records: Review of patients' medical records to gather detailed information on diabetes diagnosis, duration, treatment plans, and any other relevant medical history. **Interviews:** Conducting structured interviews with patients to obtain demographic information. **Laboratory Tests:** Collection and analysis of blood and urine samples to measure blood glucose levels, HbA1c, serum creatinine, and urine albumin levels. Microalbuminuria detection was performed using standardized laboratory techniques. Performing physical examinations to assess body mass index (BMI), blood pressure, and other vital health indicators relevant to diabetes and kidney function.

Statistical analysis: Data were analyzed with SPSS independent t-test and chi-square test were used to compare means and proportions.

RESULTS

A total of 200 patients with type 2 diabetes mellitus were included in the study. Among them, 30 (15%) had microalbuminuria, while 170 (85%) did not have microalbuminuria. The mean age of participants with microalbuminuria was 65.07 ± 15.05 years, which was higher compared to those without microalbuminuria (52.95 ± 13.34 years). The prevalence of microalbuminuria was greater among females (19, 9.5%) compared to males (11, 5.5%).

Variable	Without microalbuminurian (%) / Mean ± SD	With microalbuminurian (%) / Mean ± SD
Gender	Male: 106 (53%), Female: 64 (32%)	Male: 11 (5.5%), Female: 19 (9.5%)
Age group (years)	170 (85%) / 52.95 ± 13.34	30 (15%) / 65.07 ± 15.05
Duration of diabetes (years)	8.32 ± 4.31	13.53 ± 6.89
Systolic BP (mmHg)	128.58 ± 20.90	138.67 ± 13.32
Diastolic BP (mmHg)	85.70 ± 12.64	87.67 ± 14.31
Body Mass Index (kg/m ²)	21.46 ± 2.45	23.40 ± 2.77
Smoking habits	Yes 74(37%)	Yes 11(5.5%)
	NO 96(48%)	NO 19(9.5%)

Table I: Comparison of study participants with and without microalbuminuria among different study variables

	Without Microalbuminuria N=170, 85% Mean ± SD	With Microalbuminuria N=30,15% Mean ± SD	T value	P value
HbA1C	7.22±1.065	8.30±1.579	-	<0.001
Microalbumin (mg/dl)	12.92±7.128	51.43±16.164	-12.83	<0.001
Fasting				
Blood Sugar (mmol/l)	182.31±40.54	183.10±30.33	-0.124	0.919
Random				
Blood Sugar (mmol/l)	218.15±46.600	238.23±25.607	-3.413	0.001
Cholesterol (mmol/l)	195.04±44.347	206.80±43.208	-1.345	0.180
Triglyceride (mmol/l)	240.45±50.718	242.50±56.775	-0.200	0.842

Table II: Comparison of laboratory parameters among patients with and without microalbuminuria (n = 200)

Patients with microalbuminuria had significantly higher mean HbA1c and random blood sugar levels (p < 0.001), indicating poor glycemic control. Differences in cholesterol and triglyceride levels were not statistically significant. Among participants

with microalbuminuria, 60.0% had HbA1c > 8%, compared to 15.3% among those without microalbuminuria. The difference was statistically significant ($\chi^2 = 12.83$, $p < 0.001$), suggesting a strong association between poor glycemic control and microalbuminuria.

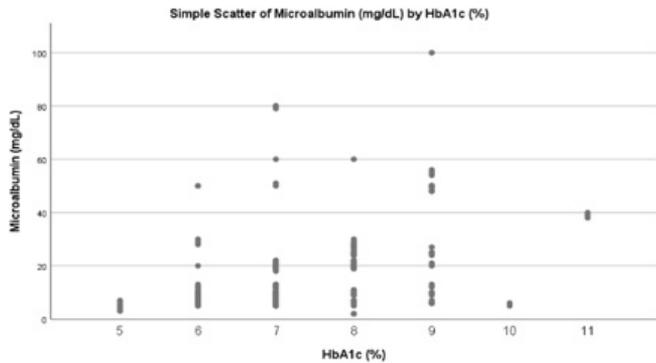


Figure 1: Scatter plot showing correlation between HbA1c and microalbuminuria

HbA1c Category	Without microalbuminuria n (%)	With microalbuminuria n (%)
<7%	57 (33.5%)	5 (16.7%)
7–8%	87 (51.2%)	7 (23.3%)
>8%	26 (15.3%)	18 (60.0%)

Table III: Relation between HbA1c category and microalbuminuria

A significant association was observed between HbA1c level and microalbuminuria ($\chi^2 = 12.83$, $p < 0.001$). Patients with HbA1c > 8% had the highest prevalence of microalbuminuria (60%).

Blood Pressure Category	Without microalbuminuria n (%)	With microalbuminuria n (%)
Normal	38 (22.4%)	1 (3.3%)
Elevated	16 (9.4%)	4 (13.3%)
Stage 1 Hypertension	19 (11.2%)	7 (23.3%)
Stage 2 Hypertension	93 (54.7%)	18 (60.0%)

Table IV: Relation between blood pressure category and microalbuminuria

Microalbuminuria was more prevalent among patients with Stage 1 (23.3%) and Stage 2 hypertension (60%) compared to those with normal blood pressure (3.3%), indicating a significant relationship.

BMI Category	Without microalbuminuria n (%)	With microalbuminuria n (%)
Underweight	17 (10.0%)	0 (0.0%)
Normal	106 (62.4%)	17 (56.7%)
Overweight	12 (7.1%)	0 (0.0%)
Obese I	35 (20.6%)	13 (43.3%)

Table V: Relation between BMI category and microalbuminuria

A higher proportion of obese individuals (43.3%) had microalbuminuria compared to normal-weight patients (56.7%), while no microalbuminuria was observed among underweight or overweight participants.

DISCUSSION

The association of clinical and biochemical parameters to determine the prevalence of microalbuminuria was the aim of the present study. About 15% of participants were found to have microalbuminuria, which is similar to findings in studies done in similar settings. Diabetic nephropathy, generalized endothelial dysfunction, and renal and cardiovascular risk among diabetic individuals are early detected with the help of microalbuminuria.^{6,7,8}

In a study finding by Lutale et al, the reported prevalence was 43% among African diabetic patients where whereas 15% is observed in our study, which is slightly lower.¹¹ Prevalence rates ranging from 10% to 30% are reported in studies from developed countries, depending on the duration of diabetes, glycemic control, and ethnicity.^{16,17,18} The difference in rate in our study could be due to differences in population characteristics, accessibility to healthcare facilities, duration and other factors.

Our study observed a significant relation between a raised level of HbA1c and the presence of microalbuminuria. The highest prevalence of microalbuminuria (60%) was found in Patients with HbA1c > 8%. This finding is similar to results from previous studies showing that poor glycemic control enhances damage to renal microvessels, which eventually increases urinary albumin excretion.^{13,14,15} Nephropathy progression is contributed to by oxidative stress, non-enzymatic glycation of proteins and glomerular hyperfiltration, which are induced by hyperglycemia.¹⁴

In our study, the prevalence of microalbuminuria was higher among hypertensive patients, mainly among those with stage 2 hypertension, which was about 60%. This is in accordance with previous findings that increased blood pressure is an important predictor for renal damage and microalbuminuria among the population with diabetes.^{8,10,18} Association of Body mass index with microalbuminuria was also shown in our study. There are higher rates of obesity (43.3%) who had microalbuminuria compared to normal-weight or underweight individuals. Sys-

temic inflammation, resistance to insulin, and hyperfiltration are contributed to by obesity, which may enhance glomerular injury and albuminuria.^{19,20,21} Intraglomerular pressure is increased by persistent elevated blood pressure, which eventually leads to thickening of the glomerular basement membrane and leakage of albumin.²⁶ The importance of control of BP and in delay in onset and progression of nephropathy is emphasized by these findings.

In accordance with findings reported in the study by Sharma et al in Nepal, our study also has reported obesity, hypertension and diabetes in the Nepalese population as a high prevalence of metabolic risk factors.⁵ The growing public health burden and complications of type 2 diabetes in South Asia which strengthen by the findings, uniform with global estimates by the International Diabetes Federation³ and projections by King et al.²²

This study coincides with prior research because of significant correlation noted between microalbuminuria and HbA1c. Sustained High blood sugar uneven cholesterol levels can predict early kidney complications as shown by these studies.^{12,13,25} Detecting microalbuminuria at an early stage provides a vital opportunity for prompt intervention to prevent the advancement towards severe kidney disease and end-stage renal failure.^{24,25}

In summary, our results underscore the necessity of routine microalbuminuria screening for individuals with type 2 diabetes. Keeping track of blood sugar levels, blood pressure, and body weight should be fundamental aspects of diabetes care. Timely identification and management of these factors can significantly reduce the likelihood of kidney and cardiovascular problems.^{7,8,26}

LIMITATIONS

As, this study was performed at a single tertiary care center with comparatively small size, which may constraint the accountability of the findings. The capability to establish causal interference is also limited by cross-sectional design. Moreover, confounding influences including specific dietary trends and medication compliance were not adjusted. Hence, larger, multicentric and longitudinal studies are suggested to confirm these outcomes and examine the extended impact of microalbuminuria among patients with type 2 diabetes.

CONCLUSION

In conclusion, our findings emphasize the requirement of routine microalbuminuria screening for subjects with type 2 diabetes. Monitoring blood sugar levels, blood pressure, and body weight should be core elements of diabetes management.

REFERENCES

1. DeFronzo RA. Pathogenesis of type 2 diabetes. *Diabetes Rev* 1997;5:177.
2. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995–2025: prevalence, numerical estimates, and projections. *Diabetes care*. 1998;21(9):1414-31.
3. International Diabetes Federation. *IDF Diabetes Atlas 11th Edition — Worldwide*, 589 million adults (20 79) living with diabetes in 2024. Brussels: IDF; 2025. *Diabetes Atlas+20UP Academic+2*.
4. Gu K, Cowie CC, Harris MI. Mortality in adults with and without diabetes in a national cohort of the US population, 1971–1993. *Diabetes care*. 1998;21(7):1138-45.
5. Sharma SK, Ghimire A, Radhakrishnan J, Thapa L, Shrestha NR, Paudel N, et al. Prevalence of hypertension, obesity, diabetes, and metabolic syndrome in Nepal. *Int J Hypertens*. 2011;2011.821971.
6. Mogensen CE. Prediction of clinical diabetic nephropathy in IDDM patients. *Alternative to microalbuminuria* *Diabetes* 1990;39:761.
7. Ruggeneti P, Remuzzi G. Nephropathy of type 2 diabetes mellitus. *J Am Soc Nephrol* 1998;9:2157.
8. Ismail N, Becker B, Strzelczyk P, Ritz E. Renal disease and hypertension in non insulin dependent diabetes mellitus. *Kidney Int* 1999;55:1.
9. Russo LM, Bakris GL, Comper WD. Renal handling of albumin: A critical review of basic concepts and perspective. *Am J Kidney Dis* 2002;39:899.
10. Cordonnier D, Bayle F, Benhamou P, Milongo R, Zaoui P, Maynard C, et al. Future trends of management of renal failure in diabetics. *Kidney Int Suppl*. 1993;41:58.
11. Lutale JJ, Thordarson H, Abbas ZG, Vetvik K. Microalbuminuria among type 1 and type 2 diabetic patients of African origin in Dar Es Salaam, Tanzania. *BMC Nephrol*. 2007 Jan 15;8:2.
12. Battisti WP, Palmisano J, Keane WE. Dyslipidemia in patients with type 2 diabetes: Relationships between lipids, kidney disease and cardiovascular disease. *Clin Chem Lab Med* 2003;41:1174-81.
13. MacIsaac RJ, Cooper ME. Microalbuminuria and diabetic cardiovascular disease. *Current Atherosclerosis Reports*. 2003;5(5):350-7.
14. Mogensen CE, Steffes MW, Deckert T. Functional and morphological renal manifestation in diabetes mellitus. *Diabetologia* 1981;21:89-93.
15. Viberti GC, Keen H. The pattern of proteinuria in diabetes mellitus: Relevance of pathogenesis and prevention of diabetes nephropathy. *Diabetes* 1984;33:686-92.
16. Alzaid A. Microalbuminuria in patients with NIDDM: An overview. *Diabetes Care* 1996;19:79-89.
17. Parving HH, Gall MA, Skott P. Prevalence and causes of albuminuria non insulin dependent diabetic patients. *Kidney Int* 1990;41:758-86.
18. Weir MR. CME Microalbuminuria in type 2 diabetics: An important, overlooked cardiovascular risk factor. *J Clin Hypertens* 2004;6:134-43.
19. Bruno G, Merletti F, Biggeri A, Barger G, Ferrero S, Pagano G, Perin PC. Progression to overt nephropathy in type 2 diabetes: the Casale Monferrato Study. *Diabetes care*. 2003 Jul 1;26(7):2150-5.

20. Yudkin J, Forrest R, Jackson C. Microalbuminuria as predictor of vascular disease in non-diabetic subjects: Islington Diabetes Survey. *The Lancet*. 1988 Sep 3;332(8610):530-3.
21. Damsgaard EM, Frøland A, Jørgensen OD, Mogensen CE. Microalbuminuria as predictor of increased mortality in elderly people. *British Medical Journal*. 1990 Feb 3;300(6720):297-300.
22. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995–2025: prevalence, numerical estimates, and projections. *Diabetes care*. 1998 Sep 1;21(9):1414-31.
23. Ramachandran A, Snehalatha C, Latha E, Vijay V, Viswanathan M. Rising prevalence of NIDDM in an urban population in India. *Diabetologia*. 1997 Jan;40:232-7.
24. Mogensen CE. Preventing end-stage renal disease. *Diabetic Medicine*. 1998 Dec;15(S4 4):S51-6.
25. Ritz E, Orth SR. Nephropathy in patients with type 2 diabetes mellitus. *New England Journal of Medicine*. 1999 Oct 7;341(15):1127-33.
26. Weir MR. Microalbuminuria in type 2 diabetics: an important, overlooked cardiovascular risk factor. *The Journal of Clinical Hypertension*. 2004 Mar;6(3):134-43.
27. Afkhami-Ardekani M, Modarresi M, Amirchaghmaghi E. Prevalence of microalbuminuria and its risk factors in type 2 diabetic patients. *Indian J Nephrol*. 2008;18(3):112-7. Available from: https://journals.lww.com/ijon/fulltext/2008/18030/prevalence_of_microalbuminuria_and_its_risk.4.aspx