e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2024; 16(3); 842-845

Original Research Article

Study of Micro Albuminuria Levels among Type-II Diabetic Complications

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Received: 01-02-2024 / Revised: 23-02-2024 / Accepted: 25-03-2024

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Conflict of interest: Nil

Abstract

Background: Prevalence of microalbuminuria (MAU) is a biomarker or risk marker for chronic renal failure and cardiovascular diseases. Hence, the presence of MAU has prognostic value for CKD or CVS diseases.

Method: 60 (sixty) adult patients with type II DM with MA are compared with 60 type II DM patients having normal MA; BP was recorded. The blood examination included HbA1C, GFR, lipid profile, fasting plasma glucose, serum creatinine, and urine analysis. A calorimetric semi-quantitative urine test strip, pH, and specific gravity were also carried out.

Results: Clinical and biometric manifestations, BMI, BP, fasting plasma glucose, serum creatinine, and GFR have significant p-values ($p < 0.001$).

Conclusion: The prevalence of microalbuminuria in type-2 DM patients confirms a longer duration of undiagnosed diabetes and prognosis of type-II DM complications. It will help the clinician to treat such patients efficiently to avoid morbidity and mortality.

Keywords: Glomerular Filtration Rate, Semi-Quantitative, Microproteinuria, Renal Failure Calorimetric, BMI, Urine Test.

Introduction

Diabetic nephropathy is the leading cause of end-stage renal disease worldwide. Microalbuminuria is considered to be an early stage of diabetic nephropathy. Microalbuminuria is also considered to be diabetic among both diabetic and nondiabetic patients and is one of the components of metabolic syndrome [1]. Currently India leads the world with the largest number of diabetic subjects, and this is expected to further rise in coming years [2]. The term "microalbuminuria" (MAU) originated in 1964 with Professor Harry Keen, who observed a small amount of albumin in the urine of patients with type-I diabetes [3] It assessed the effects of insulin treatment on exercise-induced MAU and examined albumin excretion in the context of glycemic control. Nowadays MAU is a risk or biomarker that identifies pathophysiological states such as infection or inflammation [4]. Apart from nephropathy, cardiovascular diseases also can be predicted by studying the elevation of MAU in urine. Hence an attempt is made to evaluate cardiovascular and chronic renal diseases (CKD) by studying MAU in adult diabetic mellitus patients.

Material and Method

60 (sixty) patients aged between 45-60 years admitted to Prakash Institute of Medical Sciences, Ishwarpur, Maharashtra-415409 were studied.

Inclusion Criteria: Patients with known type II diabetes with microalbuminuria aged between 45 to 60 years. The patients who gave their consent in writing were selected for the study, 60 (sixty) controlled groups were also included.

Exclusion Criteria: Known type-II diabetes, terminally ill diabetes patients, and urinary tract infections with pus cells in urine ≥ 5/high power field, pregnant women, and febrile patients. Obstructive uropathy and nephrolithiasis were excluded from the study.

Method: 60 (sixty) type-II DM patients with microalbuminuria were compared with 60 healthy type-II DM patients with normal microalbuminuria (controlled group).

Every patient was interviewed with related clinical details, i.e., onset of diabetes, history of hospitalization, history of hypertension, family history of diabetes, and complications of

retinopathy, cardiovascular disease, and cerebrovascular disease were recorded.

Complete physical examination was carried out, and body mass index (BMI) and waist and hip circumferences were measured by the standard technique recommended by WHO. Blood pressure was recorded in the sitting position in the right arm using a mercury sphygmomanometer. The latest fasting plasma glucose, glycated hemoglobin (HbA1C), blood urea, and serum creatinine values were noted and compared with controlled group patients.

Random spot urine was collected, and a calorimetric semi-quantitative urine test strip (Combur 10 (1), Roche Diagnostics Mannhein, Germany) was used to test for pH, specific gravity, leukocytes, nitrite, blood hemoglobin, and protein. If pH and specific gravity were normal and other parameters were negative, then microalbumin was tested using a dipstick (Micral II (2), Roche diagnostics).

The following definitions were used in the present study—

- Macro proteinuria: a change in color of the dipstick that corresponds to ≥|+ (30 mg/dl) was considered to be macro proteinuria.
- MAU: A change in the color of the Micral II strip that corresponds to > 20 mg/L was considered to be positive for MAU.
- Renal failure: Individuals with serum creatinine >1.5 mg/dl were considered to have renal failure and excluded from the study.
- Hypertension: Subjects with self-reported hypertension on drugs and those who had systolic blood pressure > 140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg were considered to have hypertension.
- Obesity: As per WHO Body Mass Index (BMI), a BMI of ≥ 25 kg/m² is considered as obesity.
- Estimated glomerular filtration rate modification of diet in renal disease (MDRD) formula is used to estimate glomerular filtration rate (GFR).

The duration of the study was from March 2023 to January 2024.

Statistical Analysis: Various clinical and biochemical parameters of microalbuminuria were compared in the controlled group versus the microalbuminuria and macroproteinuria groups using the ANOVA test. Moreover, some parameters were classified with a percentage. The statistical analysis was carried out using SPSS software. The ratio of male and female was 2:1.

Observation and Results

Table 1: Comparison of clinical and Biochemical manifestation of micro albuminuria in type-II DM patients –

- Duration of DM 5.6 (± 1.6) in controlled group, 6.8 (± 2.2) in micro albuminuria, F=48 and p<0.001.
- Hypertension: 21 (35%) in controlled group, 13 (43.3%) in micro albuminuria group (MAP)
- BMI (kg/m2): 23.2 (± 2.6%) in controlled, 25.8 (± 4.32) in MAU, 24.5 (3.89) in MAP, F=591 and p<0.001.
- Waist circumference: 92.6 (± 7.3) in controlled, 92.0 (± 6.4) in MAU, 88.9 (±7.7) in MAP, F=1.46 and p<0.41.
- Blood pressure systolic: 135.2 (± 8.2) in controlled group, 142.38 (± 9.98) in MAU group, 148.42 (± 7.5) in MAP group F=25.2 and p<0.001.
- Blood pressure diastolic: 85.5 (± 8.58) in controlled, 88.96 (± 8.76) in MAU group, 92.42 (± 10.2) in MAP group F=6.99 and p<0.001.
- Retinopathy: 5 (8.3%) in controlled, 7 (23.3%) in MAU group, 13 (40%) in MAP group.
- Coronary artery disease (CAD): 8 (13%) in controlled group, 6 (20%) in MAU group, 4 (14%) in MAP group.
- Cerebro vascular disease: 2 (3.3%) in controlled group, 1 (3%) in MAU group, 2 (6.6%) in MAP group.
- Fasting plasma Glucose (mg/dl): 146 (± 5.28) in controlled group, 164 (±10.8) in MAU group, 178 (± 9.8) in MAP, F=162.4 and p<0.001.
- HbA1C: 7.60 (±1.55) in controlled group, 8.2 (± 1.3) in MAU group, 8.40 (±1.6) in MAP group, F=4.05 and p>0.001
- GFR (ml/Min/173 m^2) 0.94 (0.12%) in controlled group, 1.009 (± 0.16) in MAU group, 1.18 (± 0.25) in MAP group, F=34.1 and p<0.001.
- Serum creatinine: 78.5 (± 8.3) in controlled group, 75.28 (± 8.08) in MAU group, F=18.7 and p<0.001.
- Insulin therapy: 10 (16%) in controlled group, 4 (13.3%) in MAU group, 9 (30%) in MAP group.
- ACE inhibitor or Angio tension blocker therapy: 10 (16%) in controlled group, 8 (26%) in MAU group, 12 (40%) in MAP patient.

Table 1: Comparison of clinical and Biochemical Manifestation of Micro albuminuria in type-II DM patients

Manifestation	Controlled group (60)	Micro albuminuria MAU (30)	Macro proteinuria (30)
Duration of DM years	5.6 (±1.6)	6.8 (± 2.2)	10.4 (± 3.6) *
Hypertension	21 (35%)	13 (43.1%)	19 (63.3%) *
BMI (Kg/m2)	23.2 (± 2.6)	25.8 (± 4.32)	24.5 (±3.89) *
Waist circumference	92.6 (± 7.3)	92.0 (± 6.2)	89.9 (±7.5) *
Blood pressure systolic	135.2 (±8.2)	142.38 (± 9.98)	148.42 (±7.5) *
Blood pressure Diastolic	85.05 (± 8.55)	88.96 (±8.76)	92.42 (±10.2) *
Retinopathy	5 (8.3%)	7 (23.3%)	12 (40%)
Coronary artery disease (CAD)	8 (13.3%)	6 (20%)	4 (13.3%)
Cerebro vascular disease	2 (3.3%)	1 (3%)	2 (6.6%)
Fasting plasma Glucose mg/dl	146 (± 5.28)	164 (± 10.8)	178 (± 9.8) *
HbAIC (%)	7.60 (± 1.56)	8.2 (± 1.3)	8.40 (± 1.6) *
GFR (ml/Mim/1.73 m2)	0.94 (± 0.012)	1.009 (± 0.016)	1.18 (± 0.25) *
Serum creatinine mg/dl	78.5 (± 8.3)	75.28 (± 8.02)	66.55 (± 10.2) *
Insulin therapy	10 (16%)	4 (13.3%)	9 (30%) *
ACE inhibitor or Angio tension blocker therapy	10 (16%)	8 (26.6%)	12 (40%)

*** p<0.001 (p value is highly significant)**

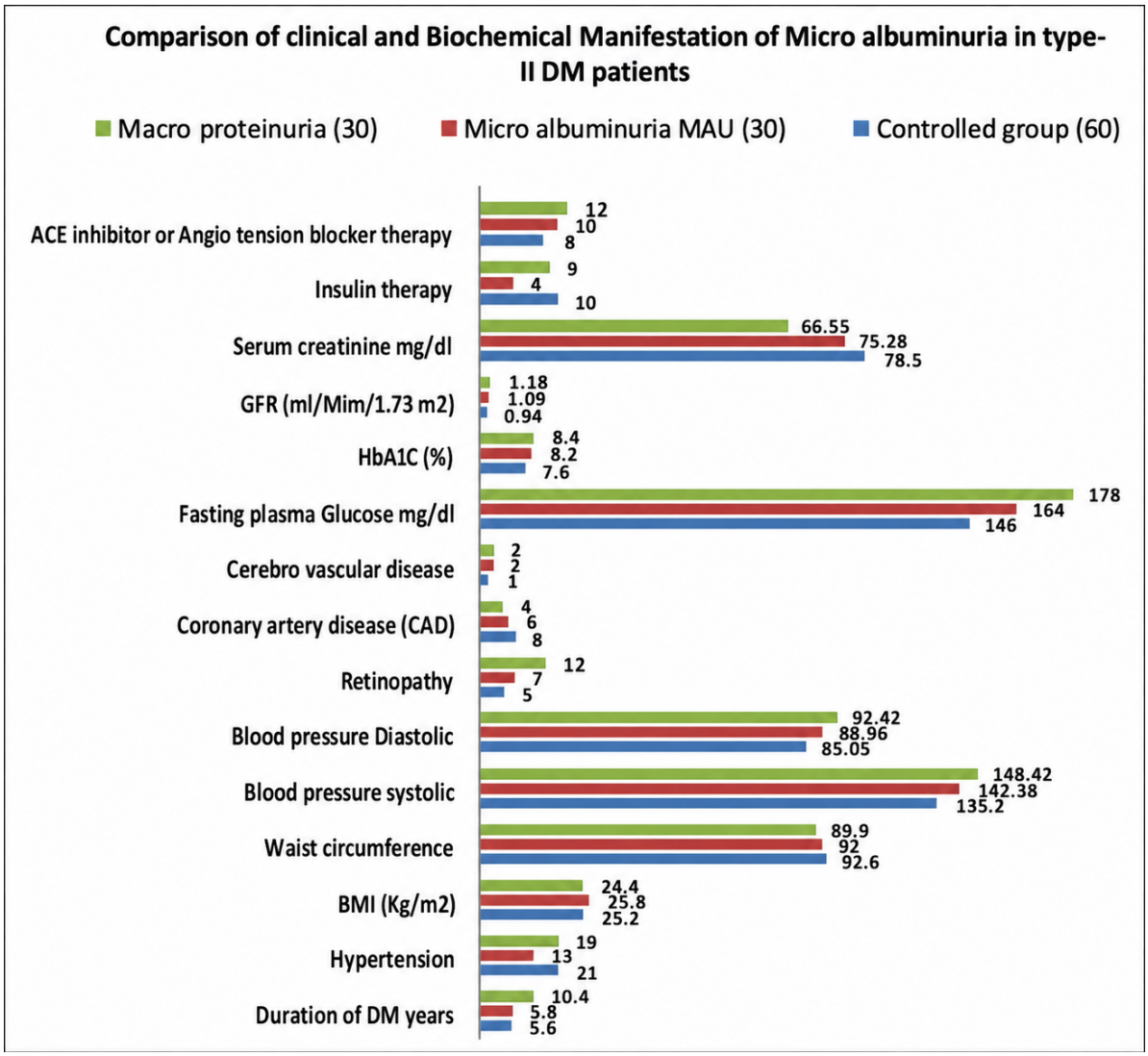

Figure 1: Comparison of clinical and Biochemical Manifestation of Micro albuminuria in type-II DM patients

Discussion

In the present study of microalbuminuria levels among the patients with type II DM complications. Clinical and biochemical manifestations of MAU in type-II DM were compared with type-II DM patients with normal levels of MA (controlled group).

Duration of DM (years), HTN, BMI, waist circumference, blood pressure (systolic and diastolic), fasting plasma glucose (mg/dl), serum creatinine, and GFR had significant p-values ($p<0.001$) (Table 1). These findings are more or less in agreement with previous studies [5,6,7]. Microalbuminuria (MA) is not only a risk factor for end-stage renal failure in diabetes but also an important marker of mortality in diabetic patients. It is suggested that early detection of microalbuminuria in DM patients and treatment of MA to retard progression of diabetes nephropathy. There are multiple risk factors for MA. It is reported that poor glycemic control and increased duration of diabetes increased serum creatinine and are important risk factors [8]. Hypertension (HTN) has a very strong relationship with MA. Angiotensin-converting enzyme inhibitors (ACEIs) or angiotensin II receptor blockers (ARBs) have deranged the renal function in DM patients having MA with HTN patients. It is also revealed that HTN and high HbA1C are important risk factors for MA. It is also reported that raised HbA1c has a direct relationship with MA [9]. Chronic complications of diabetes like diabetic retinopathy, neuropathy, and ischemic heart disease were more common in MA patients as compared to diabetes patients with MA [10].

Patients with MA have significantly more dyslipidemia; the difference was triglyceride level, HDL, and LDL failing to show a significant difference between AM and non-MA groups of diabetes patients. It could be due to the fact that uncontrolled DM is not only a causative factor for MA, but it also increases the triglyceride levels [11]. However, LDL cholesterol was raised in DM patients with MA. A major risk factor for microvascular disease is dyslipidemia [12]. This is significant, the major risk of cardiovascular events.

Summary and Conclusion

In the present study, it is confirmed that microalbuminuria is strongly associated with hypertension, poor glycemic control, and other diabetic complications like neuropathy and retinopathy. The present study demands that such a study must be conducted in a large number of patients in hi-tech research centers to confirm the significance of the present study because there is no ideal parameter or device to find undiagnosed diabetes, which leads to multiple irreversible neurovascular complications.

Limitation of study: Owing to remote location of research centre, small number of patients lack of latest techniques we have limited findings and results.

This research work was approved by the ethical committee of Prakash Institute of Medical Sciences, Ishwarpur, and Maharashtra-415409.

References

1. Boyic PJ: Diabetes Mellitus and microvascular disease mechanisms and mediators. The Am. J. of Medicine 2007, 120 (9); 512-517.
2. Chait AS, Bornfeldt KE: Diabetes and atherosclerosis. Is there a role for hypoglycemia? Journal of Lipid Research 2009, 50(1), 335-339.
3. Costacou T, Ellis. D: Sequence of progression of albuminuria and decreased GFR in persons with type-II diabetes. American J. of kidney diseases 2007, 50; 721-732.
4. F. K. Assadi: Quantization of micro albuminuria using random urine samples J. Paed. Nepho. 2002, 17 (1); 107-110.
5. Mohan V: Epidemiology of type-II diabetes in Indian scenarios. Ind. J. Med. Res. 2007, 125; 217-230.
6. Adler AI, Stevens RJ: Development and progression of nephropathy in type-II diabetes. Kidney Int. J. 2003, 63; 225-232.
7. Makoto Ogi, Takuyaseto: Prediction of micro albuminuria from protienuria in chronic kidney disase in diabetic patients J. clinical and experimental Nephrology 2021, 25; 727-750.
8. Ansar MM, Shahrokhi Rad R: Risk factors of microalbuminuria among type-II DM in the North of Iran. Nephrourol Mon. 2016, 32; 290-295.
9. Walraven I, Mast MR: Distinct HbAIC trajectories in a type-II diabetes cohort. Acta diabetes tol. 2015, 52 (2); 269-275.
10. Gaede P, Oellgaard J: Years of life gained by multifactorial intervention in patients with type II diabetes mellitus and microalbuminuria. Diabetologia 2106, 59 (11); 2298-2307.
11. Former JA: Dyslipidemia and atherosclerosis evidence from clinical trials curr. Diabet. Rep. 2008, 8 (1); 71-77.
12. Chan JC, Chan SP: Diabetic dyslipidemia in the Asian population in the western Pacific region Diabetes Res. Clin. Pract. 2011, 94 (1); 1-13.