Section: General Medicine

Original Research Article

PREVALENCE OF DIABETIC NEPHROPATHY AND ASSOCIATED RISK FACTORS AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN MANGALORE, KARNATAKA

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Abstract

Background: Diabetic nephropathy (DN) is a serious microvascular complication associated with type 2 diabetes mellitus (DM). This study aimed to determine the prevalence of albuminuria and associated risk factors among type 2 diabetes mellitus (DM) patients in Mangalore, Karnataka. **Materials and Methods:** This cross-sectional study included 220 type 2 DM patients. Baseline characteristics, including age, BMI, duration of diabetes, HbA1c, blood pressure, history of cardiovascular disease, and treatment regimens, were recorded. Urinary albumin excretion rates were measured to classify patients into normoalbuminuria, microalbuminuria, and macroalbuminuria groups. **Result:** The mean age of participants was 59.60 ± 11.145 years, with mean diabetes duration of 10.08 ± 5.38 years. The mean HbA1c was 9.545 ± 2.60%, and the mean eGFR was 74.10 ± 33.56 mL/min/1.73m². The prevalence of normoalbuminuria, microalbuminuria, and macroalbuminuria was 45%, 40.9%, and 14.1%, respectively. A significant correlation was found between the duration of diabetes and the presence of micro or macroalbuminuria. **Conclusion:** Diabetic nephropathy is highly prevalent among type 2 DM patients in Mangalore. Longer duration of diabetes is a significant risk factor. Early screening and intensive diabetes management are crucial to prevent or delay the progression of diabetic nephropathy in this population.

INTRODUCTION

Diabetic nephropathy (DN), a severe microvascular complication of type 2 diabetes mellitus (DM), is a significant global health concern and a leading cause of chronic kidney disease (CKD) and end-stage renal disease (ESRD) worldwide.[1]Early detection of microalbuminuria, the earliest indicator of diabetic nephropathy (DN), along with proper diabetes management, can help slow the progression of DN.[2] The prevalence of diabetic nephropathy (DN) in patients with type 2 diabetes mellitus (DM) varies widely, with studies reporting rates ranging from 20% to 50%.[1-4] This variability is attributed to differences in study design, population characteristics, diagnostic criteria, and other influencing factors. In India, the prevalence of nephropathy among newly diagnosed patients with type 2 diabetes mellitus was found to be 32.9%.[5]
Several risk factors contribute to the development of diabetic nephropathy (DN), including long-term diabetes, poor glycemic control, hypertension, male sex, lower literacy levels, and a family history of DN.[6] Given the rising prevalence of type 2 diabetes mellitus (DM) and the significant impact of diabetic nephropathy (DN) on both individuals and healthcare systems, it is essential to investigate the prevalence and risk factors of DN in specific populations. This study aims to assess the prevalence of albuminuria (including microalbuminuria and macroalbuminuria) and its associated risk factors among patients with type 2 DM in Mangalore, Karnataka.

MATERIALS AND METHODS

This study was designed as an observational cross-sectional study in patients with type 2 diabetes mellitus (T2DM) treated at Yenepoya Medical College Hospital from 1st May 2017 to 31st May 2018. Ethical approval was obtained from the Institutional Ethics Committee before the commencement of the study. A total of 220 patients

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diagnosed with T2DM for more than five years, as per the American Diabetes Association (ADA) guidelines, were enrolled in the study. Informed written consent was obtained from all participants. Patients with diabetes of less than five years from diagnosis, Type 1 Diabetes Mellitus, significant valvular heart disease, chronic kidney disease on dialysis, glomerulonephritis, polycystic kidney disease, obstructive uropathy, overt pulmonary disease, active urinary tract infection, or pregnancy were excluded from the study.

Data was collected using a structured, pre-prepared case proforma, including clinical history, physical examination findings, and investigation results. Clinical and demographic data collected included age, gender, place of residence, duration of diabetes, history of hypertension, coronary artery disease, cerebrovascular disease, peripheral vascular disease, smoking, and alcohol consumption. Physical examination comprised anthropometric measurements such as height, weight, body mass index (BMI), blood pressure assessment, and fundus examination for diabetic retinopathy. Laboratory investigations included haematological and biochemical parameters (complete blood count, fasting and postprandial blood glucose, glycated haemoglobin (HbA1c), and serum creatinine), renal function assessment (estimated glomerular filtration rate (eGFR) using the Modification of Diet in Renal Disease (MDRD) equation), lipid profile (total cholesterol, triglycerides, high-density lipoprotein (HDL), and low-density lipoprotein (LDL)), and urinary analysis (routine urine examination, dipstick test for proteinuria, and morning spot urinary albumin-creatinine ratio). A 24-hour urine protein test was conducted when clinically indicated. The cardiac evaluation included electrocardiography (ECG) and conventional two-dimensional (2D) echocardiography to assess left ventricular function and cardiac geometry.

Continuous variables were summarized using mean and standard deviation (SD), while categorical variables were presented as frequencies and percentages. The independent t-test was used to compare continuous variables between groups, whereas Chi-square tests were applied to determine associations between categorical variables. A p-value of <0.05 was considered statistically significant. Data analysis was performed using SPSS version 22.

RESULTS

Of the 220 type 2 diabetic patients studied, 138 were males (63%). [Table 1a and Table 1b]summarise the study population's baseline characteristics. The mean age of the participants was 59.60 ± 11.145 years, with a mean duration of diabetes of 10.08 ± 5.38 years. The mean body mass index (BMI) was 25.46 ± 5.53 kg/m². The mean HbA1c level was 9.545 ± 2.60%. The mean estimated glomerular filtration rate (eGFR) was 74.10 ± 33.56 mL/min/1.73m².

Among the study population, 51.4% had systemic hypertension, 20.5% had a history of coronary artery disease (CAD), 6.4% had a history of cerebrovascular accident (CVA), and 4.5% had a history of peripheral vascular disease (PVD). In terms of diabetic management, the majority of patients (61.4%) were on oral hypoglycemic agents (OHA) alone, while 24.5% were using both insulin and OHA. A smaller proportion, 10%, were on insulin alone, and 4.09% were managing their diabetes through diet control or alternative therapies. Regarding renal function, 143 patients (65%) had an eGFR below 90 mL/min/1.73m², while 77 patients (35%) had an eGFR above this threshold. In the study population, 45% had normal urinary albumin excretion rates, 40.9% had microalbuminuria, and 14.1% had macroalbuminuria. An independent t-test was used to analyze the correlation between risk factors and proteinuria, revealing a significant correlation between the mean duration of diabetes and the presence of micro/macroalbuminuria. [Table 2]. Furthermore, a chi-square test was conducted to assess the association between the type of diabetes treatment and diabetic nephropathy. It was found that patients on insulin or a combination of insulin and OHA had a statistically significant correlation with the incidence of diabetic nephropathy (P = 0.001). These findings highlight the interplay between glycemic control, cardiovascular function, and renal outcomes in patients with type 2 diabetes.

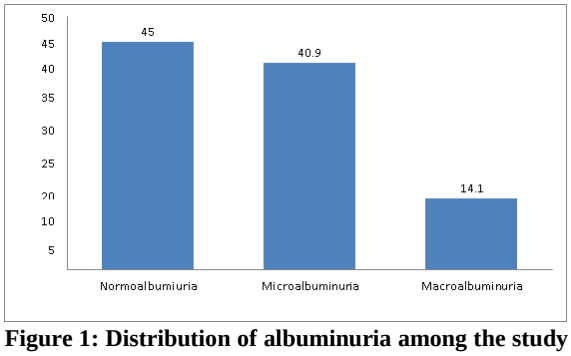

Figure 1: Distribution of albuminuria among the study population

Table 1a: Baseline characteristics of the study population (Quantitative variables)

Variable	Mean ± Standard deviation
Age (years)	59.60 ± 11.14
Duration of diabetes (years)	10.08 ± 5.38

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Body mass index (kg/m2)	25.46 ± 5.53
Systolic blood pressure (mmHg)	126.86 ± 22.57
Diastolic blood pressure (mmHg)	79.05 ± 13.84
Fasting blood sugar (mg/dl)	182.57 ± 80.65
Post prandial blood sugar (mg/dl)	231.01 ± 91.08
HbA1C (%)	9.545 ± 2.60
Total cholesterol (mg/dl)	153.22 ± 41.26
Triglyceride (mg/dl)	143.11 ± 71.03
HDL cholesterol (mg/dl)	31.71 ± 10.41
LDL cholesterol (mg/dl)	94.05 ± 38.00
VLDL (mg/dl)	27.23 ± 12.2
Serum creatinine (mg/dl)	1.32 ± 1.08
Blood urea (mg/dl)	36.61 ± 22.70
eGFR (mL/min/1.73m2)	74.10 ± 33.56
Ejection fraction (%)	54.31 ± 12.7

Table 1b: Baseline characteristics of the study population (Qualitative variables)

Variable	**Number of patients N (%)**
Comorbidities	
HTN	112 (51.4)
CAD	45 (20.5)
CVA	14 (6.4)
PVD	10 (4.5)
Diabetic treatment	
Diet control/alternate medicine	9 (4.09)
OHA	135 (61.4)
OHA+Insulin	54 (24.5)
Insulin	22 (10)
eGFR(mL/min/1.73m2)	
≥90	77(35)
60-89	65 (29.5)
45-59	31 (14.1)
30-44	25 (11.4)
15-29	14 (6.4)
<15	8 (3.6)
Ejection fraction(%)	
<30	20 (9.1)
30 – 44	33 (15)
45 – 59	14 (6.4)
≥60	153 (69.5)
Albuminuria	
Normal	99 (45)
Micro	90 (40.9)
Macro	31 (14.1)
Diabetic retinopathy	
No	117 (53.18)
Mild NPDR	50 (22.7)
Moderate NPDR	36 (16.4)
Severe NPDR	5 (2.3)
PDR	12 (5.5)

Table 2: Association of various parameters with Albuminuria

Parameters(Mean± SD)	**Albuminuria**		**P-value**
	No	**Yes**	
Age	59.70 ± 10.58	59.46 ± 11.85	0.875
Duration of diabetes	11.90 ± 5.89	7.86 ± 3.63	<0.0001
BMI	25.86 ± 5.812	24.96 ± 5.14	0.227
SBP	126.94 ± 23.52	126.77 ± 21.47	0.955
DBP	79.11 ± 14.68	78.99 ± 12.82	0.950
FBS	180.10 ± 80.5	185.59 ± 81.14	0.617
PPBS	234.29 ± 97.05	227.00 ± 83.52	0.556
HbA1c	9.59 ± 2.65	9.49 ± 2.55	0.795
Totalcholesterol	155.99 ± 44.64	149.83 ± 36.65	0.271
Triglyceride	140.86 ± 76.1	145.87 ± 64.57	0.604
HDL	32.32 ± 11.47	30.96 ± 8.94	0.335
LDL	97.83 ± 40.74	89.43 ± 33.99	0.103
VLDL	27.67 ± 12.73	26.7 ± 11.56	0.556
Serum creatinine	1.52 ± 1.16	1.08 ± 0.92	0.002
Blood urea	41.77 ± 23.57	30.31 ± 19.96	<0.0001
eGFR	65.49 ± 32.80	84.55 ± 31.59	<0.0001

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DISCUSSION

This study of 220 type 2 diabetic patients reveals a high prevalence of reduced kidney function and albuminuria in this population. A significant 65% of patients had an estimated glomerular filtration rate (eGFR) below 90 mL/min/1.73m², indicating some degree of chronic kidney disease. Furthermore, over half the study population exhibited abnormal urinary albumin excretion, with 40.9% having microalbuminuria and 14.1% having macroalbuminuria. This highlights that over half of the patients already had signs of diabetic nephropathy.[7]

The mean duration of diabetes was significantly correlated with the presence of micro/macroalbuminuria. This aligns with existing knowledge that a longer duration of diabetes is a risk factor for nephropathy.[7-9] The finding that patients on insulin, or a combination of insulin and oral hypoglycemic agents (OHA), had a statistically significant correlation with the incidence of diabetic nephropathy (P = 0.001) may indicate that these patients have more advanced diabetes requiring more aggressive treatment. It could also reflect the challenges in achieving optimal glycemic control in these individuals.[3,7,10] Poor blood sugar control is a known risk factor for diabetic nephropathy.[3,7] The mean HbA1c level in the study population was high at 9.545 ± 2.60%, suggesting suboptimal glycemic management.

Beyond hyperglycemia, a combination of additional factors, including high blood pressure, abnormal lipid levels, genetic susceptibility, obesity, and lifestyle choices, contributes significantly to the onset and progression of kidney disease in individuals with diabetes. Preventing and managing chronic kidney disease (CKD) in diabetic patients may rely on lifestyle adjustments and pharmacological interventions, such as integrated therapeutic approaches targeting hyperglycemia, hypertension, albuminuria, and dyslipidemia. The consistent use of renal protective agents may further enhance these efforts by exerting a synergistic effect in mitigating disease progression.[11,12]

Recently, a collaborative panel from the American Diabetes Association (ADA) and Kidney Disease: Improving Global Outcomes (KDIGO) released evidence-based guidelines to optimize clinical outcomes for individuals with diabetes and CKD. These recommendations encompass CKD screening and diagnosis, glycemic monitoring, lifestyle interventions, treatment objectives, and pharmacological strategies.[13] Additionally, non-modifiable factors, including age, sex, and the duration of diabetes, play a pivotal role in disease progression and must be considered in comprehensive patient care.[12]

These results emphasize the need for early screening and intervention to prevent or slow the progression of diabetic nephropathy in type 2 diabetes patients. Managing blood sugar and blood pressure, as well as lifestyle modifications, can help reduce the risk.[7,11] Further research could explore the specific factors contributing to poor glycemic control and the impact of different treatment strategies on renal outcomes in this population.

CONCLUSION

This research underscores the high prevalence of diabetic nephropathy among individuals with type 2 diabetes in Mangalore, Karnataka. The findings highlight the critical need for early diagnosis, stringent glycemic management, and proactive therapeutic interventions to mitigate disease progression and enhance patient outcomes.

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