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Prevalence of Diabetic Nephropathy in Type II Diabetes Mellitus Patients Admitted to a Tertiary Care Centre in Mizoram.

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ABSTRACT

Background: Diabetic Nephropathy is a microvascular complication leading to impairment of renal function which occurs in the patient with long standing diabetes mellitus. Diabetic nephropathy is the leading cause of chronic kidney disease (CKD), end stage renal disease (ESRD) and CKD requiring renal replacement therapy. Furthermore, the prognosis of diabetic patients on dialysis is poor, with survival comparable to many forms of cancer. Fortunately, in the recent years, apart from better metabolic control of diabetes, specific nephro-protective interventions have become available. The true prevalence of diabetic nephropathy is underestimated because proteinuric patients are usually asymptomatic. The aim of this research is to find out the prevalence of microalbuminuria, overt proteinuria and ESRD in diabetic patients. **Methods:** The study was conducted in the Department of General Medicine, Civil Hospital, Aizawl. Type II Diabetes Mellitus patients admitted in the General Medicine ward were included in the study. 117 cases of type 2 diabetes were subjected to detailed clinical examination and investigations. Blood glucose estimation, urinary albumin excretion rate, 24 hours urinary protein excretion and renal function tests were performed. Based on the results of these tests, patients were classified into four groups: Normoalbuminuria-54 cases, Microalbuminuria-38 cases, Macroalbuminuria-15 cases & ESRD-10 cases. **Results:** The prevalence of microalbuminuria was 32.5% and prevalence of macroalbuminuria was 21.4%. 8.5% patients had ESRD. 40% of macroalbuminuria patients had end stage renal disease. **Conclusion:** Age of the patients who had microalbuminuria, macroalbuminuria and ESRD were significantly higher when compared to normoalbuminuric patients. The glycemic control was poorer in patients having microalbuminuria, macroalbuminuria and ESRD group as compared to patients having normoalbuminuria.

Keywords: Diabetes Mellitus, Nephropathy, Microalbuminuria, Proteinuria.

INTRODUCTION

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. Depending on the etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization and increased glucose production. DM is classified on the basis of the pathogenic process that leads to hyperglycemia, as opposed to earlier criteria such as age of onset or type of therapy. There are two broad categories of DM, designated type 1 and type 2. It has been predicted that worldwide the prevalence of diabetes in adults would increase to 5.4% by the year 2025 from the prevalence rate of 4.0% in 1995. Consequently the number of adults with diabetes in the world would rise from 135 million in 1995 to 300 million in the year 2025.[1] It is expected that much of this increase in prevalence rate will occur in developing countries. While a 42% increase is expected in developed countries, a 170% increase is expected in the developing countries. In the latter, most of the diabetic patients are in the age range of 45–64 years, while in developed countries most of them are ≥65 years. Therefore diabetic patients in developing countries are even more vulnerable to develop the micro-vascular complications of diabetes including diabetic nephropathy.[1]

In parallel with the increase in diabetes, a dramatic increase in the prevalence of diabetic nephropathy has been noted,[2,3] which has become the single most common cause of end-stage kidney disease according to some, but not all reports. In the elderly, diabetic nephropathy today accounts for no less than

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46% of chronic kidney disease.[4] In the "Chennai Urban Rural Epidemiology Study," the prevalence of overt nephropathy and microalbuminuria was 2.2% and 26.9%, respectively, in the urban citizens with diabetes.[5] The estimated overall incidence rate of chronic kidney disease (CKD) and end-stage renal disease (ESRD) in India is currently 800 per million population and 150–200 per million population, respectively.[3] Furthermore, the prevalence of any type of chronic kidney disease and its rate of progression, but specifically also of diabetic nephropathy, is significantly higher in citizens of Asian origin, as observed both in the UK and in Canada - presumably the result of different genetics and/or lifestyle. In these communities, there is a lack of awareness of kidney complications despite familiarity with diabetes – an educational challenge.[6] The World Health Organization (WHO) has identified diabetes as a major health problem in Asia and, in this context, prevention of diabetes has become a high priority of health policies. The root of the problem is the current lifestyle causing visceral obesity; the long-term solution must be changes in lifestyle.[7] Disappointingly, a recent 6-year lifestyle intervention study while improving the risk of retinopathy failed to improve the risk of nephropathy,[7] but interventions of longer duration may be necessary – illustrating the magnitude of the problem. Nevertheless, the dramatic increase of advanced diabetic nephropathy in type 2 diabetes requires additional measures targeted more specifically to the kidney. The prevalence of diabetic nephropathy is aggravated by today's decreased cardiovascular mortality of diabetic individuals so that even more patients reach the stage of advanced nephropathy.

Aim of the Study

To study the prevalence of diabetic nephropathy among the diabetic patients admitted in medical wards of Civil Hospital, Aizawl. To study the presence of proteinuria i.e. microalbuminuria and macroalbuminuria as well as altered renal function among the diabetic patients.

MATERIALS AND METHODS

This cross sectional study was conducted in the Department of General Medicine, Civil Hospital, Aizawl from November 2017 to January 2019. During this period 117 Type 2 diabetic patients (91 males and 26 females) within the age group of 27 – 84 years, irrespective of duration of diabetes were randomly selected from the cases admitted in the medical wards of Civil Hospital, Aizawl. They were screened to study the prevalence of diabetic nephropathy. Permission from the institutional ethical committee and review board, informed consent of patients obtained.

Inclusion Criteria:

Patients diagnosed as type 2 diabetes according to WHO guidelines.

Exclusion Criteria:

Patients with history of congestive cardiac failure & urolithiasis, hypertension, urinary tract infection and pregnancy.

Diagnosis of Diabetic Nephropathy was made based on the measurement of high levels of albumin in the urine or evidence of reduced kidney function.

Albumin measurements in urine was defined as follows:-

- Normal albuminuria: urinary albumin excretion <30 mg/24h;
- Microalbuminuria: urinary albumin excretion in the range of 30–299 mg/24h;
- Clinical (overt) albuminuria or Macroalbuminuria: urinary albumin excretion ≥300 mg/24h.

To test kidney functions, the person's estimated glomerular filtration rate (eGFR) was measured from a blood sample using the modification of diet in renal disease (MDRD) GFR equation. Normal eGFR range was considered as a value from 90 to 120 mL/min/1.73 m2.

MDRD GFR Equation: GFR = 186 * Serum Creatinine-1.154 (mg/dl) * age-0.203 * 1.212 (if patient is black) * 0.742 (if female).

Based on eGFR values patients were classified in following 5 groups:

(1) Stage 1 CKD :- eGFR ≥ 90 mL/min/1.73 m2
(2) Stage 2 CKD :- eGFR 60 – 89 mL/min/1.73 m2
(3) Stage 3 CKD :- eGFR 30 – 59 mL/min/1.73 m2
(4) Stage 4 CKD :- eGFR 15 – 29 mL/min/1.73 m2
(5) Stage 5 CKD :- eGFR ≤ 15 mL/min/1.73 m2

Patients with Stage 5 CKD (eGFR values ≤ 15 mL/min/1.73 m2) were considered to have End Stage Renal Disease (ESRD).

Depending on the results of these tests, patients were classified into four groups:-

1. Normoalbuminuria - 54 cases.
2. Microalbuminuria - 38 cases.
3. Macroalbuminuria - 15 cases.
4. End stage renal disease (ESRD) - 10 cases.

After a thorough and meticulous recording of the patient's history of illness and physical examination, all the patients were subjected to a battery of investigations: To assess the renal function, all the patients were subjected to blood urea and serum creatinine estimation by auto-analyzers. For assessing the glycemic status, fasting and 2 hour post prandial plasma glucose measurements were done routinely in all patients by auto-analyzers. In the urine examination, after ruling out history of exercise and urinary tract infection, the prime factor i.e. detection of microalbuminuria as well as overt proteinuria was done by the urine Dip-stick test and by measuring 24 hour urinary protein levels,

respectively. Estimated glomerular filtration rate (eGFR) was calculated in all the patients by MDRD formula for eGFR.

Variables were presented as Mean ± SD, categorical variables were expressed as frequencies and percentages. Data between the groups was compared using t-test. P<0.05 was taken to indicate statistically significant.

RESULTS

There were 38 (32.5%) cases showing urinary albumin excretion rate (UAER) 30 to 300 mg/min. They were termed as microalbuminuric patients of whom 29 (76.3%) were males and 9 (23.7%) were females [Table 1].

24 hour urinary protein excretion was estimated in the present study. Normal 24 hour urinary protein excretion (i.e. <150 mg) was seen in 56 (47.8%) cases.

Microproteinuria was said to be present when 24 hour urinary protein excretion ranged from 150-500 mg. In the present study there were 36 (30.8 %) cases having microproteinuria.

Overt proteinuria (i.e. 24 hour urinary protein excretion > 500mg) was seen in all the 15 (100%) cases of macroalbuminuria group. Also all the 10 cases of ESRD group have 24 hour urinary protein excretion >500 mg.

The relationship of raised 24 hour urinary protein excretion to urinary albumin excretion rate is found to be significant as shown in [Table 4].

Table 1: Age and sex wise distribution in study groups.

Age in Years	Number of cases (n=117)	Normo-albuminuria		Micro-albuminuria		Macro-albuminuria		End Stage Renal Disease (ESRD)	
		M (n=44)	F (n=10)	M (n=29)	F (n=9)	M (n=10)	F (n=5)	M (n=8)	F (n=2)
<20	0	0	0	0	0	0	0	0	0
20-29	2	2	0	0	0	0	0	0	0
30-39	7	5	0	1	1	0	0	0	0
40-49	20	10	1	2	2	2	1	2	0
50-59	37	11	6	10	1	4	2	3	0
60-69	36	8	2	12	5	4	2	2	1
70-79	14	8	0	4	0	0	0	1	1
>80	1	0	1	0	0	0	0	0	0
Mean (S.D.)	56.2 ±9.6	40.7 ±9.8	45.5 ±9.2	52 ±10.4	58.1 ±9.8	55.2 ±9.6	59.2 ±8.8	56.5 ±9.4	65 ±9.2

(Data are mean ± S.D. as above, t-test)

Normoalbuminuria vs. Microalbuminuria : p<0.05 (significant)
Normoalbuminuria vs. Macroalbuminuria : p<0.05 (significant)
Normoalbuminuria vs, ESRD : p<0.05 (significant)
Microalbuminuria vs Macroalbuminuria : p>0.05 (insignificant)
Microalbuminuria vs ESRD : p>0.05 (insignificant)
Macroalbuminuria vs ESRD : p>0.05 (insignificant)

Age of the patients ranged from 27 to 84 years with a mean of 56.2 ± 9.6 years. Maximum number of cases belonged to the age group of 50-59 years comprising of 37 (31.6%) cases. There were 91 (77.8%) male patients and 26 (22.2%) female patients with a male to female (M:F) ratio of 3.46:1. The age of patients who had microalbuminuria, macroalbuminuria and End stage renal disease (ESRD) were significantly higher when compared to patients who had normoalbuminuria. But there were no significant age differences between patients who had microalbuminuria, macroalbuminuria and End stage renal disease (ESRD). The prevalence of microalbuminuria, macroalbuminuria and End stage renal disease (ESRD) were significantly higher among the older age group (p<0.05) when compared to normoalbuminuria shown in Table 1. The mean age difference was not significant between macroalbuminuric and End stage renal disease (ESRD) group.

Table 2: Duration of diabetes and relationship with various groups.

Duration in years	Total cases (n=117) (%)	Normo-albuminuria (n=54) (%)	Micro-albuminuria (n=38) (%)	Macro-Albuminuria (n=15) (%)	End stage renal disease (ESRD) (n=10) (%)
<1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
1-5	35 (29.9)	31 (57)	4 (10.5)	0 (0)	0 (0)
6-10	27 (23)	11 (20.3)	11 (28.9)	3 (20)	2 (20)
11-15	34 (21.4)	9 (16.6)	18 (47.7)	4 (26.7)	3 (30)
16-20	19 (16.2)	3 (5.6)	5 (13.2)	7 (46.7)	4 (40)
>20	2 (1.5)	0 (0)	0 (0)	1 (6.6)	1 (10)
Mean S.D.	8.3 ± 5.8	6.3 ± 5.4	8.5 ± 3.8	14 ± 8.1	15 ± 7.9

Normoalbuminuria vs. Microalbuminuria : p<0.05 (significant)
Normoalbuminuria vs. Macroalbuminuria : p<0.05 (significant)
Normoalbuminuria vs, ESRD : p<0.05 (significant)
Microalbuminuria vs Macroalbuminuria : p<0.05 (significant)
Microalbuminuria vs ESRD : p<0.05 (significant)
Macroalbuminuria vs ESRD : p>0.05 (insignificant)

[Table 2] depicts the duration of diabetes ranged from 2 year to 22 years, with average duration of diabetes being 8.3 ± 5.8 years. Maximum numbers of cases were found among the group of 1-5 year duration, comprising of 35 (29.9%) cases. The average duration of diabetes in normoalbuminuria, microalbuminuria, macroalbuminuria and End stage renal disease (ESRD) group were 6.3 ± 5.4 years, 8.5 ± 3.8 years, 14 ± 8.1 years and 15 ± 7.9 years respectively. The increased duration of diabetes was found to be statistically significant in microalbuminuria, macroalbuminuria and End stage renal disease (ESRD) groups compared to normoalbuminuria. Furthermore, when compared to microalbuminuria, macroalbuminuria and End stage renal disease (ESRD) groups have significant longer duration of diabetes (t-test, p<0.05). However there was no significant difference between macroalbuminuria and End stager end disease (ESRD) groups.

Table 3: Glycemic control status in various groups.

Glycemic control status	Fasting blood glucose (mg/dl)	Total cases (n=117) (%)	Normo-albuminuria (n=54) (%)	Micro-albuminuria (n=38) (%)	Macro-Albuminuria (n=15) (%)	End stage renal disease (ESRD) (n=10) (%)
Good control	<120	28 (23.9)	19 (35.1)	6 (15.8)	2 (13.3)	1 (10)
Fair control	121-140	50 (42.7)	25 (46..3)	15 (39.5)	6 (40)	4 (40)
Poor control	>140	39 (33.3)	10 (18.5)	17 (44.7)	7 (46.7)	5 (50)
Mean FBG	-	135.8 ± 25.7	130.7 ± 15.9	138.4 ± 37.8	146.9 ± 23.3	148.0 ± 22.8
Mean PP2BG	-	212.6 ± 65.7	202.9 ± 51.5	216.7 ± 81.5	238.8 ± 64.2	244.0 ± 71.2

FBG = Fasting blood glucose, PP2BG = 2 hours Post prandial blood glucose

Normoalbuminuria vs. Microalbuminuria : p<0.05 (significant)
Normoalbuminuria vs. Macroalbuminuria : p<0.05 (significant)
Normoalbuminuria vs, ESRD : p<0.05 (significant)
Microalbuminuria vs Macroalbuminuria : p<0.05 (significant)
Microalbuminuria vs ESRD : p<0.05 (significant)
Macroalbuminuria vs ESRD : p>0.05 (insignificant)

The average fasting and post-prandial blood glucose levels of the patients were 135.8 ± 25.7 mg/dl and 212.6 ± 65.7 mg/dl respectively.

In the normoalbuminuric group, the fasting blood sugar (in mg/dl) ranged from 112 to 220, with a mean of 130.7 ± 15.9, and the post prandial blood sugar (in mg/dl) ranged from 152 to 360, with a mean of 202.9 ± 51.5. There were 19 (35.1%) patients in the good glycemic control group (fasting blood glucose <120 mg/dl), 25 (46.3%) patients in the fair glycemic control group (fasting blood glucose 121 to 140 mg/dl) and 10 (18.5%) patients in the poor glycemic control group (fasting blood glucose >140 mg/dl).

In the microalbuminuric group, the fasting blood sugar (in mg/dl) ranged from 120 to 260, with a mean of 138.4 ± 37.8, and the post prandial blood sugar (in mg/dl) ranged from 146 to 340, with a mean of 216.7 ± 81.5. There were 6 (15.8%) patients in the good glycemic control group (fasting blood glucose <120 mg/dl), 15 (39.5%) patients in the fair glycemic control group (fasting blood glucose 121 to 140 mg/dl) and 17 (44.7%) patients in the poor glycemic control group (fasting blood glucose >140 mg/dl).

In the macroalbuminuric group, the fasting blood sugar (in mg/dl) ranged from 126 to 296, with a mean of 146.9 ± 23.3, and the post prandial blood sugar (in mg/dl) ranged from 180 to 390, with a mean of 238.8 ± 64.2. There were 2 (13.3%) patients in the good glycemic control group (fasting blood glucose <120 mg/dl), 6 (40%) patients in the fair glycemic control group (fasting blood glucose 121 to 140 mg/dl) and 7 (46.7%) patients in the poor glycemic control group (fasting blood glucose >140 mg/dl).

In the End stage renal disease (ESRD) group, the fasting blood sugar (in mg/dl) ranged from 130 to 280, with a mean of 148 ± 22.9, and the post prandial blood sugar (in mg/dl) ranged from 180 to 390, with a mean of 244 ± 71.2. There was 1 (10%) patient in the good glycemic control group (fasting blood glucose <120 mg/dl), 4 (40%) patients in the fair glycemic control group (fasting blood glucose 121 to 140 mg/dl) and 5 (50%) patients in the poor glycemic control group (fasting blood glucose >140 mg/dl).

The prevalence of microalbuminuria, macroalbuminuria and End stage renal disease (ESRD) were significantly higher among those who

had poor glycemic control (t-test, p<0.05) when compared to normoalbuminuria. Also macroalbuminuria and End stage renal disease (ESRD) groups had significant higher blood glucose level when compared to microalbuminuria group. However, there was no significant difference between macroalbuminuria and End stage renal disease (ESRD) groups (t-test, p<0.05).

There was statistically significant correlation between glycemic control status and the prevalence of diabetic nephropathy as shown in [Table 3].

Table 4: 24 hour urinary protein excretion.

24 hour urinary protein excretion (mg)	Total cases (n=117) (%)	Normo-Albuminuria (n=54) (%)	Micro-Albuminuria (n=38) (%)	Macro-Albuminuria (n=15) (%)	End stage renal disease (ESRD) (n=10) (%)
<150	56 (47.8)	54 (100)	2 (5.3)	0 (0)	0 (0)
150-500	36 (30.8)	0 (0)	36 (94.7)	0 (0)	0 (0)
>500	25 (21.4)	0 (0)	0 (0)	15 (100)	10 (100)

DISCUSSION

In the present study 117 cases of type 2 diabetes admitted in the medical wards of Civil Hospital, Aizawl have been taken up for study to find out the prevalence of microalbuminuria, overt proteinuria and end stage renal disease (ESRD). An attempt has been made to correlate diabetic nephropathy to factors like age, sex, duration of diabetes and glycemic status.

Age of patients ranged from 27 to 84 years. Maximum numbers of patients (31.6%) were in the age group of 50-59 years. Most of the normoalbuminuric patients (31.5%) were in the age group of 50-59 years. In the microalbuminuric group, maximum numbers of patients (44.7%) were in the age group of 60-69 years whereas in the macroalbuminuric and ESRD groups maximum numbers of patients (40% and 30%) were equally distributed between the age group of 50-59 years and 60-69 years [Table 1]. The age the patients who had microalbuminuria, macroalbuminuria and ESRD were significantly higher when compared to patients who had normoalbuminuria. But there were no significant age differences between patients who had microalbuminuria, macroalbuminuria and ESRD. Similar findings were reported by John L et al.[8] In a study of 1267 diabetic patients Olivarius N de F et al found prevalence of microalbuminuria to be related to age.[9]

The duration of diabetes ranged from 1-22 years. The duration of diabetes in normoalbuminuric, microalbuminuric, macroalbuminuric and ESRD groups were 6.3 ± 5.4 years, 8.5 ± 3.8 years, 14 ± 8.1 years and 15 ± 7.9 years respectively. When compared to normoalbuminuria, the duration was significantly longer in microalbuminuria, macroalbuminuria and ESRD groups. Again when compared to microalbuminuria, the duration was significantly longer in macroalbuminuria and ESRD groups. However, there was no significant difference between macroalbuminuria and ESRD groups [Table 2]. Mogensen CE observed that overt proteinuria develops about 15-20 years after diagnosis of diabetes in 30 - 40% of patients.[10] Hirata et al reported 57% proteinuria in patients with diabetes for longer than 10 years compared to 40% for patients with diabetes for less than 10 years.[11] In the present study not only proteinuria, but also microalbuminuria has been found to be associated with longer duration of diabetes.

In the normoalbuminuria group the fasting blood sugar (mg/dl) ranged from 112 to 220 with a mean of 130.7 ± 15.9 and the post-prandial blood sugar (mg/dl) ranged from 152 to 360 with a mean of 202.9 ± 51.5. In the microalbuminuric group the mean fasting sugar (mg/dl) was 138.4 ± 37.8 and the mean post-prandial sugar (mg/dl) 216.7 ± 81.5. In the macroalbuminuric group the mean fasting sugar (mg/dl) was 146.9 ± 23.3 and the mean post-prandial sugar (mg/dl) 238 ± 64.2. In the ESRD group the mean fasting sugar (mg/dl) was 148 ± 22.9 and the mean post-prandial sugar (mg/dl) 244 ± 71.2. The mean fasting blood sugar was significantly higher in microalbuminuria, macroalbuminuria and ESRD groups when compared to normoalbuminuria group. Also the mean fasting sugar levels were higher in macroalbuminuria and ESRD groups when compared to microalbuminuria group. But there was no significant difference between macroalbuminuria and ESRD groups. Ballard DJ et al reported relationship between blood glucose and prevalence of proteinuria.[12] Similar finding have been reported by Brunno G et al.[13] The present study also found increased glucose levels in microalbuminuria, macroalbuminuria and ESRD groups. But the glycemic control was poorer in macroalbuminuria and end stage renal disease patients [Table 3].

There were 38 (32.5%) cases showing urinary albumin excretion rate in the range of 20 to 200 g/min. They were termed to be having microalbuminuria. Out of 38 patients having microalbuminuria, 29 (76.3%) were males and 9 (23.7%) were females [Table 1]. Varying prevalence of microalbuminuria has been reported in type 2 diabetes mellitus. Naveen P et al reported the mean glycated hemoglobin, microalbuminuria and serum creatinine were the highest in Uncontrolled DM [(8.01±0.83), (121±49.89), (2.18±1.12)] when compared with Controlled DM [(6.49±0.37), (47.14±39.15), 0.85±0.32] respectively.[14] Vishwanathan M et al (1991) in their research work

found the prevalence of microalbuminuria to be 28.5% in south Indian type 2 diabetic patients.[15] But Ghai R et al found microalbuminuria in 25% of diabetics.[16] Goldschmid MG et al in a study of 578 patients in Atlanta, U.S.A. found the prevalence of microalbuminuria to be 25%.[16] Naveen P et al showed microalbuminuria was present in a total of 23 participants both from controlled diabetics & uncontrolled diabetic groups; this represented a 38.33% of occurrence of microalbuminuria in the diabetic population.[18] The present study recorded comparable prevalence of microalbuminuria, though slightly higher than some of the studies in the country.

Normal 24 hour urinary protein excretion (i.e. < 150 mg/day) was seen in 56 (47.9%) cases. All the patients having normoalbuminuria had normal values. But 2 patients (5.3%) having microalbuminuria had normal 24 hour urinary protein excretion. This discrepancy between microalbuminuria and 24 hour urinary protein excretion has also been reported by John L et al.[8] Diabetic patients have been termed to be having nephropathy if they are having overt proteinuria, i.e. more than 500 mg of urinary protein in 24 hours or if the urinary albumin excretion rate exceeds 200 µg/min Mogensen CE et al.[10] In the present study 25 patients (21.4%) are found to be having nephropathy. Out of these, 10 patients (40%) had developed end stage renal disease (ESRD) [Table 4]. Among the study population of 3010 diabetic cases attending the MV Hospital for diabetes, Chennai, Ramachandran A et al found prevalence of nephropathy to be 5.5%.[19] John L et al studied 538 diabetic cases and detected nephropathy in 8.9% of the patients.[8] Mohan V et al in a study of South Indian NIDDM patients reported nephropathy in 12.7% of the cases.[20] Goldschmid MG et al in an analysis of 578 patients in Atlanta, U.S.A. found 11% prevalence of nephropathy.[17] The prevalence of diabetic nephropathy in the present series (21.4%) is higher than most of the reports in India and abroad.

CONCLUSION

We conclude the prevalence of diabetic nephropathy in our findings was 21.4%, age of the patients who had microalbuminuria, macroalbuminuria and ESRD were significantly higher when compared to normoalbuminuric patients. The glycemic control was poorer in patients having microalbuminuria, macroalbuminuria and ESRD group as compared to patients having normoalbuminuria. There was significant correlation between microalbuminuria, macroalbuminuria and end stage renal disease with various parameters like age of the patients, duration of diabetes and glycemic control. Maximum numbers of patients were in the age group of 50-59 years. The duration of diabetes ranged from 1-22 years. The duration of diabetes was longer in patients having microalbuminuria, macroalbuminuria and ESRD.

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