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Original Research Article

Clinical Profile of Type 2 Diabetes Mellitus Patients with Diabetic Nephropathy in a Tertiary Care Centre - A Study From Rural Population of Uttar Pradesh

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ABSTRACT

Background: *Diabetic nephropathy (DN) is one of the major causes of morbidity and mortality among patients with diabetes worldwide. Data on DN patients in India are scarce.*

Objectives: *The aim of this study was to determine the clinical profile of patients with DN and its associated factors in Rural India.*

Materials and Methods: *A cross-sectional observational study was conducted among 130 DN patients in OPD and admitted in Uttar Pradesh rural institute of medical sciences (UPRIMS&R) , Saifai , Etawah from Jan 2016 to July 2017. Patients of type 2 Diabetes as per WHO criteria who had nephropathy were included. A Detailed history was taken and clinical examination was done. Urine routine and microscopic examination and biochemical investigations were done. Patients were subjected to ultrasound of kidneys*

Results: *The mean age of the patients was 56.50 ± 14.2 years. The mean BMI was 25.9 ± 2.3 kg/m2 and mean systolic and diastolic BP were 136 ± 12.8 and 84 ± 10.5 mmHg, respectively. The mean HbA1c was 9.7 ± 2.9 and mean serum creatinine was 4.2 ± 2.1 mg/dl. Mean duration of diabetes was 9.5 ± 5.6 yrs. All patients were on an antidiabetic treatment plan and the therapeutic regimens were classified as insulin injection only (60%); oral hypoglycemic agent (OHA) only (32.3%); and diet and exercise therapy (7.7%). Almost all of the patients suffered co-morbidity, including retinopathy (83.07 %), cardiovascular disease (35.4 %), and neuropathy (86.15 %)*

Conclusion: *There is a high prevalence of nephropathy in ambulatory type 2 diabetes patients. Over 20% of type 2 diabetes patients with CKD are at a high or very high risk of adverse cardiovascular outcomes. Hypertension is an important modifiable risk factor for patients with CKD. Risk stratification of patients is important and should be part of routine care to facilitate interventions to mitigate adverse outcomes.*

Keywords: *Diabetes, Diabetic nephropathy, HbA1c, Rural India.*

INTRODUCTION

According to world diabetes atlas close to one-fifth of all adults with diabetes in the world live in the South-East Asia Region. Current estimates indicate that 8.2% of the adult population, or 72.1 million people, have diabetes, 65.1 million of whom live in India. The number of people with diabetes in the Region will increase to 123 million by 2035 – 10.1% of the adult population. A further 24.3 million people have IGT, and this will increase to 38.8 million by 2035. India has the second highest prevalence of diabetes among adults at 9.1%.in the south East Asian region. About 1.1 million people die from diabetes related illnesses in India every year.[1]

Diabetes is traditionally known as a "silent disease," exhibiting no symptoms until it progresses to severe target organ damage. Case detection, therefore, requires active and opportunistic screening efforts. However, Symptoms of marked hyperglycemia may include polyuria, polydipsia, and weight loss, sometimes with polyphagia but even where diagnosed, inadequate glycemic controlresults in seriously disabling or life-threatening complications. As a result, diabetes is the leading cause kidney failure worldwide and is responsible for approximately 6 per cent of total global mortality.[2]

Evidence suggests that type 2 diabetes starts at a younger age among Asian people compared to Caucasians and that genetic factors and lifestyle risk factors are more common in Asian people.[3] Also, as compared with Caucasians,South Asians have a 3-fold greater risk of developing DN and an almost 40-fold greater risk of developing DN,possibly due to a higher prevalence of insulin resistance in the latter.[3,4] A population-based study in India (CURES) demonstrated that the prevalence of overt nephropathy was 2.2% (95% CI 1.51-2.91), microalbuminuria was 26.9%; common risk factors for DN and microalbuminuria were duration of diabetes and levels of HbA1c, and systolic blood pressure (BP).[5,6]

Assuming that 65 million people in India have Diabetes, this translates to 18 million with nephropathy. Thus the burden due to nephropathy is very high in India due to sheer number of people with diabetes. Diabetic nephropathy is a progressive kidney disease caused by angiopathy of capillaries in the kidney glomeruli, characterised by albumi-nuria which progresses from normoalbuminuria to microalbuminuria to macroalbuminuria ultimately leading to End stage renal disease.

MATERIALS AND METHODS

Study design and population

We carried out a cross-sectional study in the medicine department of UPRIMS&R hospital from Jan 2016 to July 2017. The outpatient department (OPD) of UPRIMS&R hospital caters service to a large number of patients every day including new and old cases of diabetes.The inclusion criteria were male and female patients aged 25 years and above, clinically diagnosed with DN, and willing to participate voluntarily and provide written informed consent. The Exclusion criteria included 1) Type 1 diabetes mellitus; 2) Connective tissue disorder like Systemic lupus erythematosus, Systemic sclerosis, rheumatoid arthritis, etc. 3) Renal artery stenosis; 4) Hypertensive nephropathy; 5) Obstructive ne-phropathy; 6) Drug or toxin induced nephropathy.

.We enrolled 142 patients for the study, six patients refused to complete the data collection, three patients were not eligible due to other comorbid complications, and three patients had missing data and were not included in the analysis.Finally,130 patients were included in the final analysis.

Convenience sampling was used as a sampling design. Data were collected through interviewer assisted face-to-face interview, review of patient clinical and biochemical records,anthropometric measurements and a clinical examination using a semi-structured questionnaire and checklist. The attending physician, nurse, and consultants were informed about the research objectives, procedures, and inclusion and exclusion criteria.

MEASUREMENTS

We collected data on sociodemographic indicators (age, sex), systolic and diastolic BP weight, height,body mass index (BMI). HbA1c, serum

creatinine, and urinary albumin were measured in the laboratory. The duration of diabetes, hypertension, patient's medication history and co-morbidities were obtained from clinical records. BP was measured twice (in the sitting position, after a 10 min rest) to the nearest 2 mmHg, using an mercury sphygmomanometer. Reported values are the average of the two readings. Hypertension was defined as systolic pressure ≥140 mmHg or diastolic pressure ≥90 mmHg or use on anti-hypertensive medication,according to the guidelines of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High BP.[7] Patients were weighed in light clothes, without shoes, and height was recorded using a clinical height scale. BMI was calculated as weight (kg) divided by squared height (m). Spot urine sample was collected at random to measure urinary albumin concentration. DN is classically defined as a progressive rise in urine albumin excretion in the absence of other renal diseases, which is often coupled with increasing BP, declining glomerular filtration and eventually ESRD.[8] Estimating glomerular filtration rate (eGFR) was calculated using the modified diet in renal disease equation by the USA National Kidney Foundation with a reference range of normal glomerular filtration rate (GRF) values in young individuals is from 80 to 130 mL/min, 1/1.73 m2, declining at ~10 mL/ min/decade after 50 years of age. DN was diagnosed based on the previous reports of the patients biochemical tests of urine albumin, serum creatinine, eGFR, BP, and clinical assessment.

An elevated ACR was confirmed in the absence of urinary tract infection with 2 additional first void specimens collected during the next 3 to 6 months.

Microalbuminuria is defined as an ACR between 30-300 mg/g.Macroalbuminuria is defined as an ACR > 300 mg/g. 2 of 3 samples should fall within the microalbuminuric or macroalbuminuric range to confirm classification.

CKD was attributed to diabetes if Macroalbum-inuria was present; or Microalbuminuria was present in the presence of diabetic retinopathy.

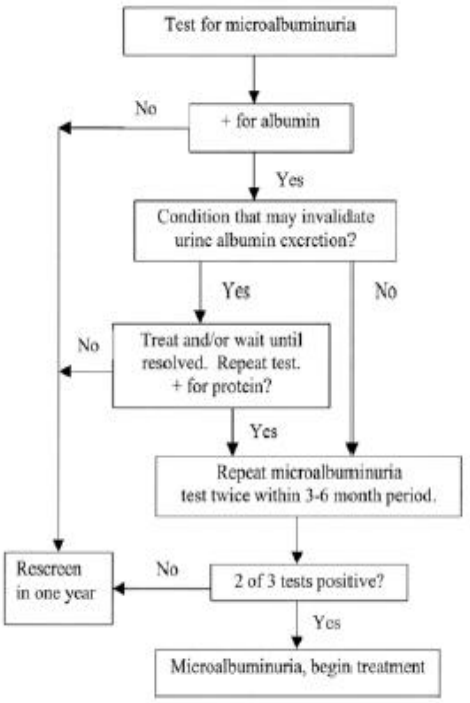

Figure 1`. Screening for microalbuminuria.[9]

GFR (mL/min)	CKD Stage*	Albuminuria		
		Normoalbuminuria	Microalbuminuria	Macroalbuminuria
>60	1 + 2	At risk†	Possible DKD	DKD
30-60	3	Unlikely DKD‡	Possible DKD	DKD
<30	4 + 5	Unlikely DKD‡	Unlikely DKD	DKD

Figure 2 Likelihood of DKD According to Staging by GFR and Level of Albuminuria[9]

DATA ANALYSIS

Results are presented as mean ± standard deviation (SD) for continuous variables, and as frequencies and percentages/ proportions for categorical variables. Descriptive statistics was used to identify the prevalence of DN among different subgroups. All statistical analyses were conducted with SPSS (Version 15.2; Chicago, IL, USA).

RESULTS AND ANALYSIS

A total of 130 patients with DN were studied, with mean ± SD age 56.50 ± 14.2 years. Most (55.4%) of the respondents were female and married (77 %).. A total of 70.7% participants had hypertension, and 43% had normal BP . [Table 1].

Table 1: Sociodemographic characteristics of patients with Diabetic Nephropathy

	Frequency(N)	Proportion(%)
Age category	n = 130	
30-50 years	26	20
50-70 years	61	46.9
70 years and above	43	33.1
Gender		
Male	58	44.6
Female	72	55.4
Marital status		
Single	12	9.3
Married	100	76.9
Divorced	3	2.3
Widowed	15	11.5
Hypertension	92	70.7

The mean BMI was 25.9 ± 2.3 kg/m2 and mean systolic and diastolic BP were 136 ± 12.8 and 84 ± 10.5 mmHg, respectively. The mean HbA1c was 9.7 ± 2.9 and mean serum creatinine was 4.2 ± 2.1 mg/dl.Mean duration of diabetes was 9.5 ± 5.6 yrs. All patients were on an antidiabetic treatment plan and the therapeutic regimens were classified as insulin injection only (60%); oral hypoglycemic agent (OHA) only (32.3%); and diet and exercise therapy (7.7%). Almost all of the patients suffered co-morbidity, including retinopathy (83.07 %), cardiovascular disease (35.4 %), and neuropathy (86.15 %) [Table 2].

Table 2: Anthropometric and clinical measurements of patients with DN

Anthropometric and clinical measurements	
BMI	25.9 ± 2.3
Systolic BP	136 ± 12.8
Diastolic BP	84 ± 10.5
Serum creatinine	4.2 ± 2.1
HbA1c	9.7 ± 2.9
Duration of diabetes	9.5 ± 5.6
Current therapeutic regimen	
Insulin OHA Diet and exercise	78 (60 %) 42 (32.3 %) 10 (7.7 %)
Other complications of diabetes	
Retinopathy	108 (83.07 %)
Cardiovascular disease	46 (35.4 %)
Neuropathy	112 (86.15 %)
None	11 (8.5 %)

Table 3: Staging of patients with DN

	Number	Percent
stage 1(albuminuria)	30	23.07
stage 2 (albuminuria)	41	31.5
stage 3	22	16.92
stage 4	12	9.23
stage 5	25	19.28
Total	130	100

58.5% of the patients had albuminuria of 0.5-1.5 g/g, followed by 37.7% at 200-500 mg/g and 3.8% at 2-5 g/g. 19.28 % had ESRD and required maintainance haemodialysis.

DISCUSSION

This study provides an evidence base for the current clinical status of DN patients in a tertiary hospital in rural India. The population of patients with type 2 diabetes in India is rising.[1] This implies that the health sector in India will face an increasing burden of CKD attributable to diabetes in the coming years. This has major implications on the health sector in terms of efforts to prevent kidney failure and need for dialysis for those who may develop ESRD. This study set out to determine the pattern of nephropathy in type 2 diabetes patients.This study evaluated 130 patients overall. The population studied was predominantly female who comprised 55.4% of the participants with a male to female ratio of 1:1.24. This disparity may represent the health-seeking behavior of the patients attending this clinic, though the reasons for the skewed gender proportions of CKD are yet to be established.

This study is one of relatively few from rural India looking at the clinical status and management of DN. The relationship between BP and DN seems to be a complex one, with nephropathy leading to higher BP, and higher BP accelerating the course of nephropathy. Hypertension is the single most important cause of progression and point of successful intervention in DN.[10] Among Indo-Asians, the declining rate of renal function is accelerated, perhaps because of the differences in protective effects from antihypertensive drugs.[11,12,13] Most patients with DN were on insulin (60%) , were hypertensive (70.7 %) , had poor glycaemic control (mean HbA1c 9.7 %) and had other complications

and co morbidities (91.5%). In our population of patients with diabetes with nephropathy most patients were older than 50 years. This has potentially grave consequences in terms of adverse cardiovascular morbidity and mortality.

Currently, it is suggested that DN occurs as a result of the interaction between genetic and environmental factors.[14] This concept does not diminish the importance of the study of specific genetic polymorphisms, which might make it possible to identify groups at high risk of developing DN,thus providing novel therapeutic targets or individualized treatment strategies for both the prevention and treatment of this complication. This aspect was not included in our study, because of technical and financial limitations.

This study had a number of limitations. First, this was a hospital based study conducted in a tertiary hospital . Therefore, the results of this study might not truly represent the DN population. Second, since the BP was measured in the hospital setting, the white coat effect could not be ruled out. However, we conducted two measurements with 10 min intervals at resting conditions and considered the average of the two readings.

A nationally representative multicenter prospective cohort study would have provided better evidence on the prevalence of DN and is the needed to better understand the profile of DN.

Delay in diagnosis of diabetes in rural areas may be the reason for higher prevalence of complications. These findings underscore the need for intensifying diabetes education measures to the community at large and to diabetic subjects in particular. Imparting knowledge about diabetes to the community is the first step in prevention and early detection of the disease and prevention of its complications.

CONCLUSION

There is a high prevalence of nephropathy in ambulatory type 2 diabetes patients. Over 20% of type 2 diabetes patients with CKD are at a high or very high risk of adverse cardiovascular outcomes. Hypertension is an important modifiable risk factor for patients with CKD. Risk stratification of patients is important and should be part of routine care to facilitate interventions to mitigate adverse outcomes. Further research work with many more subjects is required for better understanding of clinical profile of type 2 diabetes mellitus patients having diabetic nephropathy.

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Ethical Issue: None

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