Awareness of diabetic nephropathy in patients with type 2 diabetes mellitus: the Indian scenario

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ABSTRACT

Introduction: Diabetic nephropathy is an important complication of diabetes mellitus leading to significant morbidity and mortality.
Objectives: To study the awareness of diabetic nephropathy in patients with type 2 diabetes mellitus (T2DM) and the factors influencing patient awareness of diabetic nephropathy.
Patients and Methods: Four hundred subjects, aged above 18 years with T2DM as per American Diabetes Association (ADA) criteria, were selected. Patient awareness regarding diabetic nephropathy was assessed as per a prefixed questionnaire.
Results: Awareness of basic information concerning diabetes was present in more than 60% of patients. No significant differences were seen between awareness scores of male and female ($P = 0.385$), rural and urban ($P = 0.120$) and literate and illiterate ($P = 0.567$) diabetic patients. Awareness scores were higher in diabetic patients exceeding 50 years of age ($P = 0.004$) and patients having diabetes for more than 10 years ($P < 0.0001$), controlled diabetes ($P = 0.026$) and diabetic nephropathy ($P < 0.0001$). Awareness of diabetic nephropathy was independently associated with duration of diabetes ($P = 0.010$) and diabetic nephropathy ($P = 0.011$) but not with age ($P = 0.754$) and control of diabetes ($P = 0.229$).
Conclusion: A substantial proportion of diabetic patients are still unaware of the basic facts about diabetes and diabetic nephropathy. Awareness of diabetic nephropathy depended upon duration of diabetes and presence of diabetic nephropathy and requires promotion during early stages of diabetes to improve control of diabetes and prevent diabetic nephropathy.

Implication for health policy/practice/research/medical education:
In a study on 400 diabetic patients, we found awareness of diabetic nephropathy was marginally higher in patients staying in urban areas and in literate patients. Better awareness of diabetic nephropathy was seen in older patients and patients with diabetes for a long duration, controlled diabetes and diabetic nephropathy but only duration of diabetes and diabetic nephropathy had an independent association with awareness of diabetic nephropathy.
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Introduction

The prevalence of diabetes is rapidly increasing all over the world at an alarming rate (1) with 347 million diabetics present worldwide (2). As per WHO estimates, diabetes will become the seventh leading cause of death in 2030 (3). Based on the compilation of studies from different parts of the world, the estimated number of people with diabetes worldwide is expected to rise to 642 million by 2040 (4). India is the world leader with the largest proportion of diabetic patients and is distinguished as the "diabetes capital of the world". According to the international diabetes federation, the number of patients with diabetes in India is likely to rise to 69.9 million by 2025 unless urgent preventive measures are adopted (5).

Diabetes mellitus (types 1 and 2), is the foremost cause of incident and prevalent chronic kidney disease (CKD) and accounts for approximately 30% to 40% CKD and up to 45% of end-stage renal disease (6). In the past 2 decades, there has been a steady rise in the incidence of end-stage renal disease among patients with diabetes, mostly those with type 2 diabetes as per the reports of the US renal data system. Type 2 diabetes mellitus (T2DM) accounts for about 40% of all the prevailing end-stage renal disease cases and nearly half of all new cases in the United States (7).

Diabetic nephropathy is a principal cause of morbidity and has an association with increased cardiovascular mortality in T2DM. There is definite evidence that risks

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of nephropathy and of other diabetic complications are lowered by a strict control of hyperglycemia (8).

Diabetic awareness lacks among health professionals across Asia. Many of them do not record the height/weight and body mass index (BMI) of their patients (9). The ability to manage diabetes can be impeded by the patient's lack of knowledge about diabetes care and is important as the patient's self-management ability is related to a better control of diabetes. Most of the patients with CKD, particularly those in the early stages, may not be aware of their disease (10). Several studies have shown that low awareness of the disease is common among CKD patients in the American society. Some reports of CKD identification and/or awareness, especially from outside the United States show that worldwide, both health providers and populace do not pay enough attention to increase CKD identification (11).

Objectives
We studied the awareness of diabetic nephropathy in patients with T2DM and the factors affecting patient awareness of diabetic nephropathy.

Patients and Methods
The study was conducted in the Department of Medicine, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun, India from March 1, 2014 to February 28, 2015. Patients with T2DM attending medical out-patient department or admitted in the medical wards were selected for the study after obtaining written informed consent.

Study design
Type of the study: cross-sectional descriptive study with a sample size of 400 individuals. It was calculated on the basis of formula $n = z^2pq/d^2$, where n is desired sample size, p is expected prevalence of awareness of diabetic nephropathy in diabetic population, q is 1- p. z is 1.96 (standard error) and d is the level of statistical significance (0.05). Since percentage of patients aware of diabetic nephropathy among diabetic patients is unknown, a *P* value of 50% was used to maximize uncertainty. Sample size obtained was 384 which was increased to 400 to accommodate the drop outs.

Selection of subjects
Inclusion criteria were age above 18 years and patients with T2DM. Exclusion criteria were patients with type 1 diabetes mellitus and newly diagnosed patients with T2DM.

Study protocol
All eligible patients attending the medical OPD or admitted in the medical wards of the Himalayan Institute Hospital, Dehradun, India with T2DM were included in the study. Diagnosis of diabetes mellitus was made as per American Diabetes Association (ADA) criteria (12). ADA criteria

for the diagnosis of diabetes mellitus included one of the following; fasting plasma glucose ≥7.0 mmol/L (≥126 mg/dL), symptoms of diabetes plus a random plasma glucose concentration ≥ 11.1 mmol/L (≥200 mg/dL), 2-h plasma glucose ≥ 11.1 mmol/L (≥200 mg/dL) during a 75-g oral glucose tolerance test, HbA1c ≥ 6.5%.

Patients were subjected to detailed history plus clinical examination and following investigations were done: Complete blood count (CBC), fasting blood sugar, post-prandial blood sugar, glycosylated hemoglobin, blood urea nitrogen, serum creatinine, serum lipid profile, urine analysis, spot urine for protein–creatinine ratio, electrocardiography (ECG), X-ray chest (posteroanterior view), ultrasonography of abdomen and fundoscopy. Patient awareness and attitude regarding diabetic nephropathy were assessed as per questions specified in the questionnaire designed for checking patient awareness regarding diabetic nephropathy. A score of 1 was given to every correct answer and 0 for every incorrect response with a maximum score up to 25 in the questionnaire.

Ethical issues
Ethical clearance for the study was taken from the institutional ethical committee. All investigations/procedures carried out in this study involving human participants were in accordance with the 1975 Declaration of Helsinki and its later amendments.

Statistical analysis
The data collected were analyzed with SPSS software version 19.0. The data were expressed as mean ± standard deviation (SD) for continuous variables and as frequency or percentage for categorical variables. Student's *t* test was used for comparison of continuous data and chi-square test for testing the significance of difference between proportions. Logistic regression analysis was used for testing the independent association of various variables with awareness of diabetic nephropathy. Additionally, *P* values less than 0.05 were considered statistically significant.

Results
Baseline characteristics of the patients with T2DM are shown in Table 1. Mean age of the patients was 54.80 ± 12.87 years. The majority (88.0%) of the patients were below the age of 70 years. Male predominance was seen with male: female ratio of 2.8:1. The majority (65.5%) of the diabetic patients were from rural area. BMI range was from 15.05 to 34.7. About half of the patients had diabetes for 1 to 5 years (Table 1).

Polyuria, polydipsia and blurring of vision were the most common symptoms while absent ankle reflex and changes of diabetic retinopathy were the most common examination findings. Diabetic neuropathy and retinopathy were the most common diabetic complications followed by diabetic nephropathy (Table 2). The fasting blood sugar range was from 102 mg/dL to 403 mg/dL and that of post-prandial

Table 1. Baseline characteristics of patients with T2DM

Characteristics	No. of patients (%)/Mean± SD
Age group	
31–40 years	81 (20.25)
41–50 years	82 (20.50)
51–60 years	97 (24.25)
61–70 years	92 (23)
71–80 years	39 (9.75)
>80 years	9 (2.25)
Gender	
Males	295 (73.75)
Females	105 (26.25)
Residence	
Rural	262 (65.5)
Urban	138 (34.5)
Socioeconomic status	
High	54 (13.5)
Middle	119 (29.75)
Low	227 (56.75)
Dietary habits	
Vegetarian	288 (72)
Mixed diet eaters	112 (28)
Literacy status	
Literate	178 (44.5)
Matriculate	129 (32.25)
Graduate	41 (10.25)
Post-graduate	8 (2)
Illiterate	222 (55.5)
Smoker	167 (41.75)
Non-smoker	233 (58.25)
Alcoholic	97 (24.25)
Non-alcoholic	303 (75.75)
Tobacco chewer	40 (10)
Non-tobacco chewer	360 (90)
Height (cm)	165.07±7.73
Weight (kg)	65.03±11.82
BMI (kg/m²)	23.58±4.23
Duration of diabetes	
1–5 years	202 (50.5)
6–10 years	115 (28.75)
>10 years	83 (20.75)

T2DM, type 2 diabetes mellitus; BMI, body mass index.

Table 2. Clinical features, complications and laboratory parameters of patients with T2DM (n = 400)

Clinical features	No. of patients (%)/Mean± SD
Symptoms	
Polydipsia	220 (55.0)
Polyuria	282 (70.5)
Weight loss	120 (30.0)
Blurred vision	216 (54.0)
Tingling sensation	131 (32.75)
Joint pain	76 (19.0)
Fatigue	62 (15.5)
Obesity	25 (6.25)
Diarrhea	23 (5.75)
Constipation	57 (14.75)
Difficulty in walking	83 (20.75)
Signs	
Pallor	77 (19.25)
Pedal edema	48 (12.0)
Ankle reflex absent	151 (37.75)
Complications	
Diabetic nephropathy	74 (18.5)
Diabetic retinopathy	208 (52.0)
Diabetic neuropathy	249 (62.25)
Coronary artery disease	22 (5.5)
Peripheral vascular disease	39 (9.75)
History of cerebrovascular accidents	20 (5.0)
Parameter (unit)	
Hemoglobin (g/dL)	13.03±1.95
WBC count (cells/µL)	6822.98±1562.70
Platelet count (cells/µL)	258.69±59.31
FBS (mg/dL)	158.71±28.71
PPBS (mg/dL)	201.29±42.68
Serum creatinine (mg/dL)	1.39±0.93
Blood urea nitrogen (mg/dL)	31.97±13.13
Total serum cholesterol (mg/dL)	162.12±43.33
Serum HDL-C (mg/dL)	39.68±9.89
Serum LDL-C (mg/dL)	97.95±36.61
Serum triglyceride (mg/dL)	134.87±62.14
Glycosylated hemoglobin (%)	8.28±2.03
eGFR (mL/min/1.73m²)	78.8±43.7
Urinary protein creatinine ratio (mg/mg)	1.06±1.03
Urinary albumin	75 (18.75)

T2DM, type 2 diabetes mellitus; WBC, white blood cell; FBS, fasting blood sugar; PPBS, post-prandial blood sugar; HDL, high density lipoprotein; LDL, low density lipoprotein; eGFR, estimated glomerular filtration rate; Urinary albumin- the number (%) of diabetic patients having presence of albumin in urine.

blood sugar 103 mg/dL to 477 mg/dL. Controlled diabetes was seen in 59 patients and uncontrolled diabetes in 341 patients. Dyslipidemia was seen in 196 patients with high total serum cholesterol, high triglycerides, high LDL-C and low HDL-C either alone or in combination. Around 306 patients were on oral hypoglycemic drugs whereas 71 were on insulin, 8 on ayurvedic medicines and other patients on dietary management.

Awareness regarding basic information concerning diabetes was present in more than 60% of the patients. Awareness regarding importance of diet was seen in more than half of the patients. Knowledge of antidiabetic medications was poor in diabetic patients. The majority of patients were keen to know more about diabetes but only approximately one-fourth of patients were aware of the importance of need for annual health check-ups.

Awareness regarding diabetic nephropathy was seen in approximately one-third of patients though more than half of the patients were informed by the treating physician regarding possibility of diabetic nephropathy and fall-outs in diabetes (Table 3).

Accordingly, no significant differences were seen between awareness scores of diabetic patients as per gender (male versus female), place of residence (rural versus urban), literacy status (literate versus illiterate), obesity status (obese versus non-obese) (P > 0.05 each). Awareness scores were significantly higher in diabetic patients above

Table 3. Awareness of diabetes and diabetic nephropathy among patients with T2DM

Question	No. of patients (%) Awareness		P value
	Present	Absent	
What is diabetes?	395 (98.75)	5 (1.25)	<0.001
Regarding normal blood sugar levels	381(95.25)	19 (4.75)	<0.001
What are FBS and PPBS?	335 (83.75)	65 (16.25)	<0.001
Symptoms of diabetes	260 (65.0)	140 (35.0)	<0.001
Importance of diabetic diet	226 (56.5)	174 (43.5)	0.009
Diabetic complications	171(42.75)	229 (57.25)	0.003
Diabetes can affect kidneys	151(37.75)	249 (62.25)	<0.001
Kidney function status	130 (32.5)	270 (67.5)	<0.001
Importance of control of T2DM in preventing DN	164 (41.0)	236 (59.0)	0.003
Increased frequency of micturition in DN	250 (62.5)	150 (37.5)	<0.001
Waking up for micturition during night in DN	175 (43.75)	225 (56.25)	0.012
Association of frequent episodes of UTI with uncontrolled T2DM	313 (78.25)	87 (21.75)	<0.001
Significance of bubbles in urine	106 (26.5)	294 (73.5)	<0.001
Proteinuria in DN	53 (13.25)	347 (86.75)	<0.001
Willingness to go for renal function tests when asked by physicians	320 (80.0)	80 (20.0)	<0.001
Importance of need for annual health checkup for complications of T2DM	111(27.75)	289 (72.25)	<0.001
Importance of hypoglycemia occurring in DN on same dose of medications as before	114 (28.5)	286 (71.5)	<0.001
Knowledge of antidiabetic medications	33 (8.25)	367 (91.75)	<0.001
Role of Hypertension in DN	43 (10.75)	357 (89.25)	<0.001
Effect of smoking on DN	140 (35)	260 (65)	<0.001
Keenness to know more about DN	382 (95.5)	18 (4.5)	<0.001
Whether informed by medical professional regarding DN	235 (58.75)	165 (41.25)	0.005
Possible requirement of dialysis in DN	144 (36)	256 (64)	<0.001
Possibility of renal transplant in DN	67 (16.75)	333 (83.25)	<0.001
Renal transplant better than HD in severe DN	29 (7.25)	371 (92.75)	<0.001

T2DM, type 2 diabetes mellitus; FBS, fasting blood sugar; PPBS, post-prandial blood sugar; DN, diabetic nephropathy; HD, hemodialysis.

50 years of age ($P=0.004$) and those having diabetes of more than 10 years' duration ($P<0.0001$). The controlled diabetic patients had higher awareness scores than the uncontrolled ones ($P=0.026$). Diabetic nephropathy was present in 74 (18.5%) patients. Awareness score was significantly more in patients with diabetic nephropathy than in patients without diabetic nephropathy ($P<0.0001$). The mean awareness scores were 13 ± 6.54 in patients with CKD stage one, 11.6 ± 6.84 in stage two, 15.29 ± 3.55 in stage three, 13.63 ± 6.38 in stage four and 15.25 ± 3.97 in end-stage renal disease. No significant differences were seen between awareness scores of diabetic patients with early and advanced stages of diabetic nephropathy ($P=0.968$) (Table 4).

The variables of age of the diabetic patients, duration of disease, control of diabetes and diabetic nephropathy showing significant differences between awareness scores of diabetic patients in various subgroups on univariate analysis were entered into logistic regression model for determining the factors having an independent association with awareness of diabetic nephropathy among diabetic patients by multivariate analysis. Awareness of diabetic nephropathy was considered to be present in patients having awareness scores above the median value and

absent in those with scores below the median value. Duration of diabetes ($P=0.010$) and diabetic nephropathy ($P=0.011$) were found to have an independent association with awareness of diabetic nephropathy while age ($P=0.754$) and control of diabetes ($P=0.229$) were not independently associated with awareness of diabetic nephropathy (Table 5).

Discussion

The pattern of age distribution among diabetic patients demonstrated that the maximum number of patients were present in the age group of 51-60 years i.e. 97 (24.25%) patients and the least in >80 years' age group with 9 (2.25%) patients. A similar study by Whaley-Connell et al (13) showed maximum patients (38.3%) in the age group of 46-60 years. The mean age of patients in our study was 54.80 ± 12.87 years. This finding is in accordance with the study done by Chow et al (14) in which the mean age of the respondents was 48.9 ± 15.0 years. Most of our patients were less than 70 years of age which may be due to less survival rate of patients with diabetes in elderly patients due to complications caused by uncontrolled diabetes. The gender distribution revealed a male preponderance in all age groups. The male population constituted a 73.75%

Table 4. Comparison of awareness scores as per various parameters in patients with T2DM

Parameters	No. of patients (%)	Scores (Mean ±SD)	P value
Age groups			
<50 years	163 (40.75)	10.98±4.64	0.004
>50 years	237 (59.25)	12.07±4.96	
Gender			
Males	295 (73.75)	11.76±5.05	0.385
Females	105 (26.25)	11.29±4.30	
Residence			
Urban	138 (34.5)	12.4±4.885	0.120
Rural	262 (65.5)	11.45±4.852	
Obesity			
Absent	375 (93.75)	11.29±4.30	0.905
Present	25 (6.25)	11.75±5.76	
Duration of diabetes			
1–10 years	317 (79.25)	11.15±4.67	<0.0001
>10 years	83 (20.75)	14.41±5.01	
Control of diabetes			
Controlled	59 (14.75)	12.95±4.967	0.026
Uncontrolled	341 (85.25)	11.43±4.809	
Literacy			
Literate	178 (44.5)	11.8±5.04	0.567
Illiterate	222 (55.5)	11.52±4.72	
Diabetic nephropathy			
Present	74 (18.5)	14.17±5.37	<0.0001
Absent	326 (81.5)	11.07±4.56	
Stages of DN			
I–III	28 (37.84)	14.14±4.96	0.968
IV–V	46 (62.16)	14.19±5.66	

T2DM, type 2 diabetes mellitus; DN, diabetic nephropathy.

of total patients exhibiting a trend similar to another study which had 66% males among the patients (15) while Chin et al (16) showed male predominance to the tune of 55.5% in their series. Similar observations were made in Pakistan by Ulvi et al (9) who noted male predominance with 63.67% of the males among total patients in their series. This observation may be because of excessive stresses and strains faced by males in day to day life in our country as mostly they are the bread earners and most of the females particularly the married ones are the housewives and are not exposed to stresses involved in earning livelihood.

We observed that 138 (34.5%) patients were residents of urban area and they had a better mean awareness score (12.4) as compared to the residents of rural areas (11.45), although this was not significant statistically. The observed difference may be due to better availability of education and health facilities in the urban areas. It also implies that more educational centers and hospitals are required in our rural areas for imparting better education and raising health awareness.

In our study we found that the smokers were seen in large proportion (41.75%) despite the fact that they were suffering from diabetes, similar to results of another study where total smokers were 42% (15). Only 35% of our patients identified correctly the effect/risk of smoking

on the diabetic nephropathy similar to observations of another study, where only 21.8% of the patients had knowledge about the risk or effect of smoking on the kidneys (17). It suggests that most of the diabetic patients are unaware of the risk factors for the diabetic nephropathy and appropriate measures should be taken by physicians to educate their patients about the modifiable risk factors. We found that only 130 (32.50%) patients knew about their kidney function status and similar trend was observed by White et al (18) in Australia that only 39.7% of the respondents remembered the last time they had a renal function test. This shows the lack of knowledge and interest of patients about their own disease and its complications which needs to be improved.

We observed that there were not many patients (151 patients, 37.75%) who responded correctly to the question regarding the effect of diabetes on kidneys. In other questions concerning the symptomatology and manifestations of diabetic nephropathy, generally less than 50% respondents came out with correct answers. In a study from Benin, 57.50% diabetic patients were aware that diabetes mellitus could be complicated by renal impairment while 75.63% diabetics did not know that it was possible to diagnose diabetic nephropathy at an early stage (19). However, a study done in Iran by Roomizadeh et al (17) found that only 10.6% of the total patients identified diabetes as one of the main risk factors for CKD while only 10.4% responded correctly to the questions concerning the symptomatology and manifestations of diabetic nephropathy. These observations suggest that many Indians are not adequately informed about the symptoms and manifestations of the diabetic nephropathy and we need to evaluate this more extensively and proper measures should be taken to improve the awareness of public regarding this issue. We observed that 235 (58.75%) patients had been informed by the medical professionals about diabetic nephropathy and its symptoms but only 53 (13.25%) patients knew that the presence of proteins in urine was a sign of kidney disease. Similar kind of trend was observed in a study in the United States by Plantinga et al (20) where 64% of medical professionals informed their patients about diabetic nephropathy and its symptoms/complications but only 7% of the total patients knew that proteins in urine were a sign of kidney disease. It is apparent that a sizeable number of physicians try to educate their patients about diabetic nephropathy though much needs to be done to achieve the desired impact on patients.

We noted that formally educated patients had better awareness with maximum awareness among the post-graduates with score of 16.5 followed by graduates with a score of 12.49 and illiterates with a score of 11.52, although the differences between awareness scores of literate and illiterate diabetic patients were not found to be statistically significant (P=0.567). Similar results were also found by White et al (18) who found that those with

tertiary or secondary education had a better awareness of diabetic nephropathy than those who had not completed their secondary education ($P < 0.001$). Similar kind of pattern was observed in a study conducted by Ulvi et al (9) which showed that people who had formal education had a higher level of awareness (46.2%) compared to people with no formal education (37%), although this difference was not statistically significant ($P = 0.46$). Our observations suggest that with increasing level of education, the patient's awareness about the diabetes mellitus and its complications increased although the results were statistically not significant. Still there was a lot of difference in the mean scores of post-graduates and illiterates. Moreover, currently the educational status of the general public is not very good in our country and requires much to be done to improve the situation. It can help in early identification of diabetes by the patients and starting treatment at an early stage which can lead to better management of diabetes and prevent its complications. As per duration of diabetes mellitus, a significantly higher awareness score observed in patients with diabetes for more than 10 years could be due to patient education over years and also because of increase in patient's health concern once the kidneys started failing.

We observed higher awareness scores among controlled diabetics as compared to those among uncontrolled diabetics. It implies that those who had better control of diabetes had better awareness about diabetic nephropathy because they were more aware of their disease and paid more attention to their health status.

We found that the patients with diabetic nephropathy i.e. 74 (18.5%) patients had better awareness as compared to the patients without diabetic nephropathy. This trend may be because of better information obtained about the disease during frequent visits to physicians for various complications.

We noted that with increasing stage of CKD, the awareness also showed an increasing trend i.e. the mean scores were 13 ± 6.54 in CKD stage one; 11.6 ± 6.84 in stage two, 15.29 ± 3.55 in stage three, 13.63 ± 6.38 in stage four and 15.25 ± 3.97 in end-stage renal disease. A similar trend of awareness was also observed in the study conducted by Chin et al (16) which showed that with increasing CKD stage the awareness was increasing, for example 1.6% for stage 1 CKD, 1.5% for stage 2 CKD, 3.8% for stage 3 CKD, 22.2% for stage 4 CKD and 44.4% for end-stage kidney disease. Another study done by Hsu et al (11) showed that CKD awareness rates in Taiwan were low in the early stages of CKD i.e. 8.0% for people with stage 3, 25.0% for people with stage 4, and 71.4% for people with stage 5. However, awareness rates may not be accurate in the advanced CKD (stages 4 and 5) population in this study because of its small sample size. An increasing trend of awareness with increasing stages of diabetic nephropathy may be because of patients' observation of the frequent occurrence of the same symptoms in day to day life and

frequent visits to physicians and nephrologists for the disease. However, the observation that patients with CKD with stages one and two have very less knowledge as compared to the patients with more advanced stages of the disease leaves a room for hard work for improving their awareness status regarding diabetic nephropathy so that the progression of diabetic nephropathy can be prevented by taking appropriate measures. Our observation of awareness of diabetic nephropathy having independent association with duration of diabetes ($P = 0.010$) and diabetic nephropathy ($P = 0.011$) appears to be due to patient education about the disease expected to increase as a result of repeated medical consultations over years and increased health consciousness of the patients once the kidneys are affected by diabetes. It implies that there is general lack of awareness regarding diabetes and its complications in the initial phase of the disease.

The rate of end-stage kidney disease has been stabilized in some countries, (21-25) probably due to improvement in the awareness of primary care physicians regarding the prognostic importance of CKD, improved control of blood pressure and glycemia and the execution of protocols and clinical practice recommendations about the detection, prevention and treatment of CKD in the management of the diabetic patient. Detection of DM and diabetic-CKD at an early stage is crucial for reducing morbidity, mortality and the socio-economic impact of diabetes in the population (26). Hence, appropriate steps should be taken to promote such awareness at community level and among diabetic patients at an early stage of the disease so as to ensure a better control of diabetes and prevent diabetic complications.

Conclusion

A sizeable number of diabetic patients are still unaware regarding some of the basic facts about diabetes and diabetic nephropathy. Awareness was lacking regarding symptomatology, complications and treatment of diabetes/diabetic nephropathy.

Awareness of diabetic nephropathy was marginally higher in patients staying in urban areas and in literate patients. Better awareness of diabetic nephropathy was seen in older patients and patients with diabetes for long duration, controlled diabetes and diabetic nephropathy but only duration of diabetes and diabetic nephropathy had an independent association with awareness of diabetic nephropathy. As such, putting an emphasis on promotion of awareness and knowledge of general public as well as diabetic patients regarding diabetes and its complications is warranted at all levels to ensure a better control of diabetes and prevent or delay diabetic nephropathy.

Authors' contribution

RK and RMK conceived and designed the study. CB collected the patient data and prepared the initial manuscript. RK and RMK contributed to critical revision of the manuscript for important intellectual content. All authors analyzed and interpreted the data and approved the submitted manuscript.

Conflicts of interest

None

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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