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Research Article

Awareness of Diabetic Patients about Diabetic Nephropathy, Khartoum/Sudan 2022

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Abstract

Introduction: Diabetic nephropathy (DN) is one of the most common and complication of diabetes. Good glycemic control and increasing the awareness of diabetic complications will reduce the risk of DN and other diabetic complications. This study aimed to assess the awareness of DN among diabetic patients in Sudan.

Methods: Descriptive cross-sectional facility based study was conducted on total of 226 diabetic patients during the period June 2021 to March 2022. Results were summarized as percentages and frequencies for all variables. Chi-squared test (χ^2) was used for analysis of factors associated with awareness of DN, and any P value less than 0.05 was considered statistically significant.

Results: The study included 226 type 2 diabetic patients. They follow their diabetes with internal medicine physician (114, 50.4%), general doctor (60, 26.5%) and family physician (29, 12.8%). Most of the participants use oral hypoglycemic drugs (105, 46.5%) and have controlled diabetes (151, 66.8%). Most of the participants (181, 80.1%) were aware with diabetic nephropathy. Only (25, 11.1%) of the participants were diagnosed with diabetic nephropathy, (14/25, 56.0%) were treated with medical treatment and the rest of (11/25, 44.0%) treated with dialysis. (189, 83.6%) of the respondents received education by about diabetic nephropathy by their doctor.

Conclusion: There is good awareness (80.1%) and low prevalence of DN (11.1%). Patients' education raises DN awareness. Increasing awareness of DN by the practicing doctors and encouraging of regular follow up is thought to impact positively in control of diabetes. Health insurance coverage encourage regular follow up of DM and facilitate prevention and early detection of the complications.

Keywords: *Diabetes; Diabetic Nephropathy; Awareness; Complications; Health Insurance; Poverty; Health Insurance; Filling System; Sudan*

Abbreviations

AAU: Alzaiem Alazharti University; CKD: Chronic Kidney Diseases; DKD: Diabetic Kidney Disease; DM: Diabetic Mellites; DN: Diabetic Nephropathy; SPSS: Statistical Package for Social Sciences

Introduction

Diabetic nephropathy (DN) also called diabetic kidney disease (DKD) is one of the most common and severe complications of diabetes mellitus (DM). It associated with high morbidity and mortality rates [1,2]. Is identified by elevated albumin excretion in the urine, as well as lower glomerular filtration rate [3].

Risk factors of DN include hyperglycemia, hypertension, albuminuria, duration of DM, dyslipidemia, obesity and smoking. Age, sex, ethnicity and family history of DM are considered as non-modifiable risk factors of DN [4].

Worldwide, chronic kidney diseases (CKD) rise from 29th to 18th on the list of cause of death [5]. In Sudan, DN is third most common reason for dialysis [6], and 90% of DN cases are type 2 DM [7].

Treatment of DKD is costly to both patients and the health care system [8-10]. The treatment consumes more than 2 - 3% of annual health cost in high income countries. The burden of CKD treatment is higher in developing countries due to other risk factors that are associated with poverty including low education, infections and harmful occupations [11]. Despite the widespread of the disease, the awareness of the DN is still low [12,13].

Diabetic patients need to be regularly checked and followed in order to screen, early diagnose and to prevent or delay the complications [14], especially the CKD which is usually remain asymptomatic till progression to advanced levels [9,10].

In Africa, the high prevalence of diabetic complications is due to lack of screening, late presentation, poor glycemic control and inadequate management of complications at an early stage [15]. Therefore, good glycemic control and increasing the awareness will reduce the risk of DN and other diabetic complications [16,17]. This study aimed to assess the awareness of DN among diabetic patients in Sudan.

Methods

Study design and population

Descriptive cross-sectional facility-based study was conducted during the period from June 2021 to March 2022 in Abdullah Khalil diabetic primary health care center, Ahmed Gasim teaching hospital and Bahri teaching hospital, Khartoum/Sudan. A total of 226 diabetic patients were included in the study. All adult diabetic patients aged 18 years and more were included in the study. Pre coded structured questionnaire was used to collect required information about the demographic characteristics of the respondents, duration since DM diagnosis and awareness of DN. Pilot study was done before data collection. This helped in rewording some questions to be more understandable to the respondents.

Statistical analysis

Analysis of the data was conducted using the Statistical Package for Social Sciences SPSS@ for windows) version 25. Each question variable in the questionnaire was coded. Results were summarized as percentages and frequencies for all variables. Chi-squared test (χ^2) was used for analysis of factors associated with awareness of DN. P value was obtained, and any P value less than 0.05 was considered statistically significant.

Results

The study included 226 type 2 diabetic patients. More than half of the participants were females (120, 53.1%). Regarding the education of the participants, most of them were educated till the primary and the secondary school, amounting for (81, 35.8%) and (72, 31.9%) respectively. Most of the participants were in the age groups (51 - 60 years) and (41 - 50 years) amounting for (61, 27.0%) and (56, 24.8%) respectively. Table 1 shows demographic characteristics of the participants.

Variables	Frequency	Percent (%)
Gender		
Male	106	46.9
Female	120	53.1
Educational level		
Primary School	81	35.8
Secondary School	72	31.9
University	33	14.6
Post Grads Studies	9	4.0
Illiterate	31	13.7
Age groups		
19-30	10	4.4
31-40	30	13.3
41-50	56	24.8
51-60	61	27.0
61-70	51	22.6
71 and more	18	8.0
Marital status		
Single	11	4.9
Married	175	77.4
Widow	29	12.8
Divorced	11	4.9
Working status		
Working	110	48.7
Not Working	116	51.3
Income level		
High	3	1.3
Medium	166	73.5
Low	57	25.2
Smoking status		
Smoker	46	20.4
Nonsmoker	180	79.6

Table 1: *Demographic characteristics of the participants, (n = 226).*

Most of the participants have no other co-morbidities and chronic diseases (104, 46.0%), (82, 36.3%) were hypertensive, (8, 3.3%) were diagnosed with hypertension and ischemic heart disease, as shown in figure 1.

More than half of the participants (114, 50.4%) treat and follow their diabetes with internal medicine physician, (60, 26.5%) follow with a general doctor, (29, 12.8%) follow with a family physician. Most of the participants are treated with oral hypoglycemic drugs (105, 46.5%), (83, 36.7%) treated with insulin and (18, 8.0%) control their diabetes with diet and exercise. Most of the participants attend governmental hospitals and primary health care centers in order to follow their diabetes, amounting for (109, 48.2%) and (61, 27.0%)

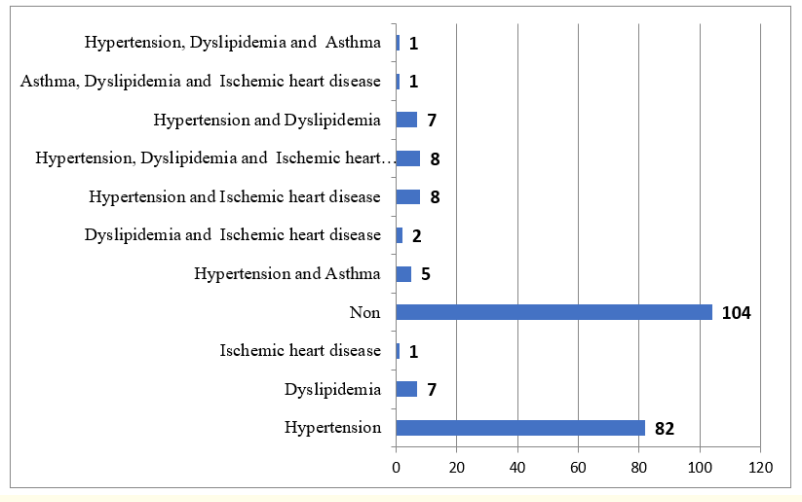

Figure 1: *Distribution of the participants according to their other co-morbidities and chronic diseases, (n =226).*

respectively. Most of the participants (151, 66.8%) reported that their diabetes is controlled. The participants reported that they attend the health facility when they experience health problem (91, 48.2%) or when referred by a physician (19, 8.4%) or to renew the medications (11, 4.9%). (64, 28.3%) of the participants visit the doctor monthly to follow their diabetes, as shown in table 2.

Variables	Frequency	Percent (%)
Treatment of DM is by		
General doctor	60	26.5
Family physician	29	12.8
Internal medicine physician	114	50.4
Endocrinologist	19	8.4
Internal medicine physician and the Endocrinologist	4	1.8
Type of DM treatment		
Diet control and exercise	18	8.0
Oral hypoglycemic drugs	105	46.5
Insulin	83	36.7
Both oral hypoglycemic drugs and insulin	10	4.4
Diet control, oral hypoglycemic drugs and insulin	9	4.0
Non	1	0.4
Place of DM treatment and follow up		
Primary health care center	61	27.0
Governmental hospital	109	48.2
Private clinic/ hospital	49	21.7
Both Primary health care center and governmental hospital	3	1.3

Non	4	1.8
Does your DM is controlled?		
Controlled	151	66.8
Not controlled	75	33.2
Cause of the doctor visit		
To renew the medications	11	4.9
When experience health problem	91	40.3
When referred by physician	19	8.4
Monthly	64	28.3
Every 2 months	11	4.9
Every 3 months	21	9.3
Yearly	9	4.0

Table 2: *Distribution of the participants according to their DM details, (n = 226).*

Regarding the duration since diagnosed with DM, (62, 27.4%) were diagnosed since (1 - 5 years) and (55, 24.3%) were diagnosed since (6 - 10 years), as shown in figure 2.

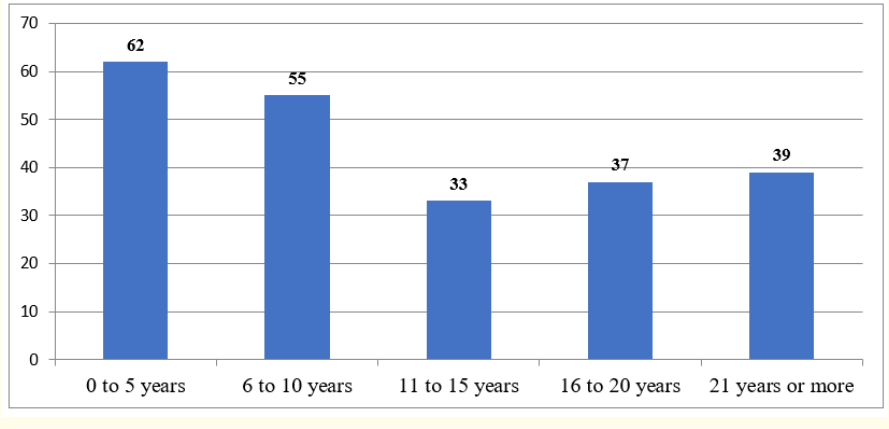

Figure 2: *Distribution of the participants according to the DM duration, (n = 226).*

Most of the participants (191, 84.5%) reported awareness of all the diabetes complications (Figure 3).

Investigation of awareness of diabetic patients about diabetic nephropathy revealed that (181, 80.1%) of the respondents aware that diabetes can affect the kidney. Only (25, 11.1%) of the participants were diagnosed with diabetic nephropathy, (14/25, 56.0%) were treated with medical treatment and the rest of (11/25, 44.0%) treated with dialysis (Table 3).

More than half of the respondents (120, 53.1%) reported that diabetic nephropathy develops because of uncontrolled diabetes. (189, 83.6%) of the respondents received education about diabetic nephropathy by their doctor. (67, 29.6%) of the participants developed other complications of diabetes rather than nephropathy, as shown in table 3.

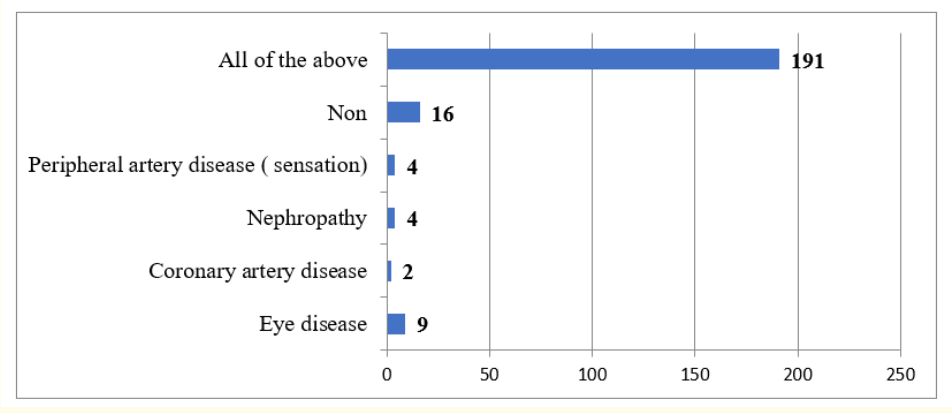

Figure 3: *Distribution of the participants according to their awareness of DM complications, (n = 226).*

Variables	Frequency	Percent (%)
Do you know diabetes can affect your kidney?		
Yes	181	80.1
No	45	19.9
Did you develop any kidney problems because of your diabetes?		
Yes	25	11.1
No	201	88.9
If yes which treatment did you receive for diabetic nephropathy? (n = 25)		
Medical treatment	14	56.0
Dialysis	11	44.0
Why some diabetic patients develop diabetic nephropathy?		
I don't know	21	9.3
Matter of luck	8	3.5
Long standing DM	21	9.3
Uncontrolled DM	120	53.1
Long standing and uncontrolled DM	56	24.8
Did your doctor advice or educate you about diabetic complications?		
Yes	189	83.6
No	37	16.4
Did you develop any other diabetic complications?		
Yes	67	29.6
No	159	70.4

Table 3: *Distribution of the participants according to their awareness of diabetic nephropathy, (n = 226).*

Cross tabulation between diabetic nephropathy awareness and the participants' diabetes details revealed significant association with awareness of diabetic complications and the education by the treating doctor, *p* value = 0.000 and 0.000 respectively. Diabetes control and duration of the diabetes revealed no significant association with diabetic nephropathy awareness, *p* value = 0.055 and 0.083 respectively (Table 4).

Variables	Diabetic nephropathy awareness		P value
	Not aware	Aware	
Does your DM is controlled?			
Controlled	25	126	0.055
Not controlled	20	55	
Awareness of DM complications			
Eye disease	6	3	0.000
Coronary artery disease	0	2	
Nephropathy	1	3	
Peripheral artery disease (sensation)	4	0	
Non	12	4	
All of the above	22	169	
Did your doctor advice or educate you about diabetic complication?			
No	27	10	0.000
Yes	18	171	
DM duration			
0 to 5 years	15	47	0.083
6 to 10 years	6	49	
11 to 15 years	9	24	
16 to 20 years	4	33	
21 years or more	11	28	

Table 4: *Cross tabulation between diabetic nephropathy awareness and the participants diabetes details, (n = 226).*

Discussion

The study included 226 diabetic patients; most of them were females (53.1%). Similarly, a study done in Saudi Arabia reported that type 2 diabetes is common among females (62.5%) [18]. Results of the study revealed a good awareness of diabetic nephropathy (80.1%) among diabetic patients. This result is similar to a study done in Sudan as they reported that 57.9% of patients with diabetic foot were aware of diabetic nephropathy [6]. In India, Salman., *et al*. reported good awareness of DN (78.2%) [10]. Inconsistently, many other studies reported low awareness level of DN [5,16,19].

Despite of high prevalence of controlled DM among diabetic patients (66.8%), the prevalence of DN in our study is 11.1%. Regular follow up is noted among (28.3%) of the participants. Most of the participants (83.6%) received education about diabetic complications from their doctor. In 2012, a study done in Sudan by Rahamtalla., *et al*. reported low prevelance of DN (8.66%) [20]. Many other studies reported a higher prevalence rate of DN [21-23]. The prevalence of DN in Sudan may be underestimated due to lack of health care coverage in many of the rural and distant cites. Furthermore, poverty and lack of health insurance are the main causes of non-attendance and poor follow-up rates to health care facilities.

The prevalence of hypertension among the study participants was 36.3%. The prevalence of hypertension among diabetic patients is higher in other studies as reported by Khalid., *et al*. 51.4% of patients were hypertensive [24].

Awareness of DN in our study is affected by education by the treating doctor and awareness of all DM complications. Bansal., *et al*. reported in their study awareness of diabetes complication is associated with DN awareness (p value = 0.003) [16].

The study revealed that diabetes control and duration of diabetes revealed no significant association with DN awareness. This result is inconsistent with Fiseha., *et al.* study, as they reported significant association with DN awareness and DM control [2]. Shahwan., *et al.* and Unnikrishnan., *et al.* results were also inconsistent with our results, as they reported that duration of DM affects the awareness of DN [25,26]. These results can be justified by the fact that most of the diabetic patients in our study are educated till primary and secondary school only. Low education level affects the awareness and compliance of the patients.

Conclusion

High awareness of DN (80.1%) and low prevalence of DN (11.1%) among the study population are mainly due to doctors' education about diabetes complications (83.6%), high prevalence of controlled DM among diabetic patients (66.8%) and regular follow up of DM (28.3%). Health insurance coverage and presence of the filling system encourage regular follow up of DM and facilitate prevention and early detection of complications. Regular training programs for the doctors are important to update them with the guidelines and encourage them to educate their patients.

Ethical Clearance and Considerations

Ethical clearance was granted from Alzaiem Alazhari university (AAU). Permission from Abdullah Khalil diabetic primary health care center, Ahmed Gasim teaching hospital and Bahri teaching hospital were obtained. Written consent was taken from each participant with assurance of confidentiality and rights.

Competing Interests

The authors declared that they had no competing interests.

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Authors' Contributions

H.S.A.: Designed and participated in research implementation, conducted the data analysis, and drafted the manuscript.

A.F: Participated in research implementation, data collection and manuscript preparation.

AF. Af: Participated in research implementation and data collection.

H.S. and M.A.A.: Reviewed and edited the manuscript.

All authors approved the final version of the manuscript prior to submission.

Availability of Data and Material

The data are available at any time if requested from the corresponding author.

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