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DIABETIC NEPHROPATHY KNOWLEDGE AND AWARENESS ASSESSMENT AMONG DIABETIC PATIENTS IN SAUDI ARABIA

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Abstract

Background: Diabetes, a persistent metabolic disorder impacting a vast global population, poses substantial public health hurdles and contributes significantly to morbidity and mortality, Among the complications associated with diabetes are retinopathy, nephropathy, and peripheral neuropath, Diabetic nephropathy, a serious consequence of diabetes affecting 45% of individuals with type 1 and type 2 diabetes, Knowledge and awareness of Diabetic nephropathy risk factors symptoms and complications can enhance the mortality and morbidity of the disease. **Objective:** To assess knowledge and awareness level of diabetic nephropathy risk factor, symptoms and complications among Diabetic patient in KSA. **Methodology:** This cross-sectional study was conducted from July 2024 - December 2024 in Saudi Arabia. The research was conducted on individuals in Saudi Arabia who have been diagnosed with diabetes, with participants recruited in 2024 from those who were completing the questionnaire. the inclusion criteria for this study were as follows: All Saudi males and females over 18 years. non-Saudi's, less than 18 years were excluded from this study.The minimum target sample size is 384 was calculated using a formula based on prevalence estimation, 95% confidence level, and 5% acceptable error.

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Results: The study assessed diabetic nephropathy knowledge and awareness among 416 diabetic patients in Saudi Arabia. Participants averaged 43.5 years old, with a majority being female (58.2%) and well-educated (45% held at least a bachelor's degree). Notably, 94.7% recognized the potential for preventing diabetic nephropathy, and 97.4% understood the importance of early detection. However, 25% were unaware that untreated diabetic nephropathy could lead to anemia. Awareness of risk factors was high, with 82% acknowledging hereditary links. Importantly, 69.3% favored screening at diagnosis, highlighting a proactive approach to managing diabetes complications. Knowledge significantly correlated with gender, occupational status, and region. **Conclusion:** This study provides valuable insights into the knowledge and awareness of diabetic nephropathy among diabetic patients in Saudi Arabia. While a significant proportion of participants demonstrated awareness of the condition and its risk factors, gaps in knowledge and follow-up care were identified

Keywords: Knowledge, Awareness, Diabetic nephropathy, Saudi Arabia.

Introduction:

Diabetes, a persistent metabolic disorder impacting a vast global population, poses substantial public health hurdles and contributes significantly to morbidity and mortality [1]. Among the complications associated with diabetes are retinopathy, nephropathy, and peripheral neuropathy [2]. Diabetic nephropathy, a serious consequence of diabetes affecting 45% of individuals with type 1 and type 2 diabetes, stands as a primary driver of end-stage renal disease in Western nations and worldwide demands renal replacement therapy [3].

Worldwide prevalence calculations state that the number of individuals diagnosed with diabetes was 463 million in 2019 and is anticipated to rise up to 700 million by 2045. [4].

Over 500 million individuals globally has one of the chronic kidney disorders, which impacts approximately 10-13 percent of the general population [5] .

After a decade since being diagnosed with type 2 diabetes mellitus, approximately forty percent of those affected develop diabetic nephropathy, which is caused by microvascular complications associated with diabetes [6].

Knowledge and awareness of Diabetic nephropathy risk factors symptoms and complications can enhance the mortality and morbidity of the disease and our aim in this study to asses that A study conducted in hail region Saudi Arabia showed that 85.7% agreed that developing high HbA1c levels over an extended period of time can cause more serious issues [7]. We are conducting this study due to insufficient number of researches related to our topic, especially in Saudi Arabia.

Objectives:

The main objective of this study is to assess knowledge and awareness level of diabetic nephropathy risk factors, symptoms and complications among diabetic patient in Saudi Arabia.

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Materials and Methods:

Study design:
A cross-sectional study conducted between July 2024 and December 2024, based on online self-structured questionnaire. The research was conducted on individuals in Saudi Arabia who have been diagnosed with diabetes, with participants recruited in 2024 from those who were completing the questionnaire.

Inclusion and Exclusion Criteria:
The inclusion criteria for this study were as follows: All Saudi males and females over 18 years. non-Saudi's, less than 18 years were excluded from this study.

Sample size:
Calculation of sample size was done to ensure the minimum number of respondents needed to be a representative sample for the whole population. The sample size was determined using Raosoft sample size calculator. Keeping an indicator percentage of 0.50, margin of error of 5% and confidence interval (CI) of 95%, the calculated sample size was 384.

Method for data collection and instrument (*Data collection Technique and Tools)*:
Structured questionnaire was used as study tool. This tool was developed after consulting relevant studies conducted in Saudi Arabia and elsewhere the final version of the questionnaire consisted of questions classifieds into main five sections. Section one contained socioeconomic background characteristics questions. The second section includes information about DM like duration of the disease and type of DM and risk factors of nephropathy. The third part asked questions on symptoms of DM and nephropathy while the fourth include questions on DM and nephropathy complications while the Fifth include questions about time of screen. Collected the information using online questionnaire.

Scoring system:
This study assessed the knowledge and awareness of diabetic nephropathy among diabetic patients in Saudi Arabia using 25 statements, categorized into three sections: demographics, knowledge, and awareness, with the distribution being 6 statements for demographics, 19 for knowledge, and 9 for awareness. For scoring, one point was awarded for each correct answer, while zero points were given for incorrect answers or "I don't know" responses. Likert scales, including Dichotomous, Three-Point, and Quality Scales, were utilized. The maximum possible score was 37, divided according to the original Bloom's cut-off points as follows: 80.0%-100.0% indicating **high** knowledge and awareness, 60.0%-79.9% indicating **moderate** knowledge and awareness, and below 60.0% indicating **low** knowledge and awareness. Participants were divided into three groups based on their scores.
Knowledge scores ranged from 0 to 19 points, classified into three levels: scores of 11 or below (≤ 11) indicating **low** knowledge, scores between 12 and 15 (10-15) indicating **moderate** knowledge, and scores of 16 or above (≥ 16) indicating **high** knowledge.

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Pilot study

To test the simplicity and feasibility of the questionnaire, 35 individuals were asked to fill it out. Modifications were made to the questionnaire according to their feedback, such as clarifying ambiguous questions and improving the response options for certain items. The data collected through the pilot study were excluded from the final data of the research.

Analyzes and entry method:

Data was gathered and entered into the computer using the "Microsoft Office Excel Software" (2016) for Windows software. After then, the data was moved to version 20 of the Statistical-Package for Social-Science Software (SPSS). for statistical analysis to be performed.

To test the simplicity and feasibility of the questionnaire, 35 individuals were asked to fill it out. Modifications were made to the questionnaire according to their feedback, such as clarifying ambiguous questions and improving the response options for certain items. The data collected through the pilot study were excluded from the final data of the research.

Results:

Table (1) displays various demographic parameters of the participants with a total number of (416). Participants are 43.5 years old on average (std = 16.1), implying a relatively mature population. The different brackets have their age distribution fairly evenly split, with 26% of participants aged 45–55. The sample being skewed towards females (58.2 percent), this may suggest that there are directions in which gender specific insights and interventions are possible. The educational attainment is also quite high, 45% have at least a bachelors degree and 13.8% more has one or more master degrees. Trends in marital status reveal the married people accounted for 66.1%, which matches the social dynamics of the group in general. Employment status is varied, but combined the percentage of employees and retirees (59.4%) strong shows a lot of people in ongoing or settled phases of their careers. In the last, the participants reside mostly in the Western part (42.8%), and this could be cue with localized views in the results of the study.

Table (1): Sociodemographic characteristics of participants (n=416)

Parameter		***No.***	***Percent (%)***
Age (Mean:43.5, STD:16.1)	28 or less	103	24.8
	29 to 44	102	24.5
	45 to 55	108	26.0
	56 or more	103	24.8
Gender	Female	242	58.2
	Male	174	41.8
Educational level	Primary school	17	4.1
	Middle school	23	5.5
	Secondary school	97	23.3
	Diploma	40	9.6

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	Bachelor's degree	187	45.0
	Master's degree or higher	32	7.7
	Uneducated	20	4.8
Marital status	Single	112	26.9
	Married	275	66.1
	Divorced	18	4.3
	Widowed	11	2.6
Occupational status	Student	64	15.4
	Employee	139	33.4
	Retired	108	26.0
	Non-employee	105	25.2
Residential region	Northern region	11	2.6
	Southern region	98	23.6
	Central region	29	7.0
	Eastern region	100	24.0
	Western region	178	42.8

As shown in figure 1, The data presented shows that a total sample of 416 participants have a significant distribution of duration of diabetes mellitus (DM). Notably, we find that 206 individuals (49.5% of the sample) have been diagnosed with DM for fewer than five years, which implies a recent onset for just over half of the cohort. However, 78 participants (about 18.7%) have been diagnosed with diabetes for six to ten years, indicating moderate tenure of the condition. Additionally, 132 persons, or approximately 31.7% of the sample, are long term diabetics (i.e., they have been managing diabetes > 10 years).

Figure (1): Illustrates duration of DM among participants.

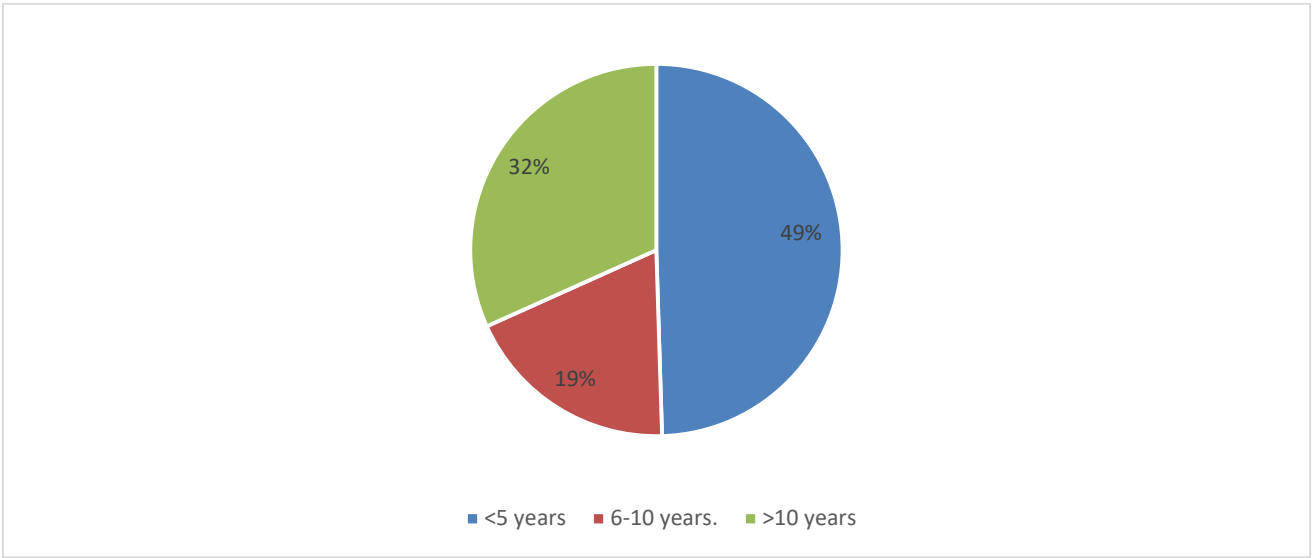

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Table 2 presents the data in the form which gives crucial knowledge of risk factors and symptoms of diabetic nephropathy to a sample of 416 patients who have been diagnosed with diabetes mellitus. The population has one in two people affected with Type 1 (48.8%) and Type 2 (51.2%) diabetes, divided almost equally. Almost all (86.1%) do not smoke, but the minority does (median seven cigarettes daily). It is important to note, however, that self-awareness of familial risk factors is high-- 82% identify that diabetes has a hereditary element. As expected, almost all (93%) of respondents confirmed that unhealthy lifestyles—poor diet and little physical activity; smoking, and alcohol consumption—together account for 93.5% of diabetes risk. At the same time, although only 20.2 percent had diabetic nephropathy, many reported important risk factors (65.1 percent poor glycaemic control, 59.4 percent obesity).

Table (2): Parameters related to knowledge of risk factors and symptoms of diabetic nephropathy (n=416).

Parameter		***No.***	***Percent (%)***
What type of diabetes mellitus are you diagnosed with?	Type 1	203	48.8
	Type 2	213	51.2
Duration of DM	<5 years	206	49.5
	6-10 years.	78	18.8
	>10 years	132	31.7
Do you smoke?	No	358	86.1
	Yes	58	13.9
If yes, number of cigarettes daily (Median:7) (n=58)	1 to 4 cigarettes	20	34.5
	5 to 10 cigarettes	18	31.0
	11 or more	20	34.5
Is it true that if your family members have/had diabetes, you have higher chance of getting it too?	No	75	18.0
	Yes	341	82.0
Does unhealthy diet and lack of physical activity increase the risk of diabetes?	No	27	6.5
	Yes	389	93.5
Does smoking and alcohol intake worsen kidney disease in people with diabetes?	No	29	7.0
	Yes	387	93.0
Have you been diagnosed with diabetic nephropathy?	No	332	79.8
	Yes	84	20.2
Risk Factors of diabetic nephropathy *	Gender	95	22.8
	Genetics	246	59.1
	Smoking	191	45.9
	Duration of diabetes	220	52.9
	Poor glycemic control	271	65.1
	Hyperlipidemia	217	52.2

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	Hypertension	195	46.9
	Obesity	247	59.4
Which of the following are signs and symptoms of diabetic nephropathy? *	Sleep Problem	178	42.8
	Swelling on lower limbs	252	60.6
	Dry and itchy skin	177	42.5
	Frequent urination	268	64.4
	Bloody urine	174	41.8
	Foaming urine	187	44.9
	Swelling around the eyes	165	39.7
	Lack of appetite	168	40.4
	Muscle cramps	138	33.2

Results may overlap

As shown in figure (2), The presented data suggest recommended timing for the implementation of the screening for diabetic nephropathy in patients with type 2 diabetes using a total of 416 person observations. Specifically, 69.3 percent (289 out of 416) Favor screening at the diagnosis, a strong consensus for early detection as a key strategy to control complications of diabetes. In contrast, 100 (24.0%) propose to screen five years following diagnosis, and 27 (6.5%) do not recommend screening beyond ten years.

Figure (2): Illustrates best time to start screening for diabetic nephropathy in type 2 diabetic patients among participants.

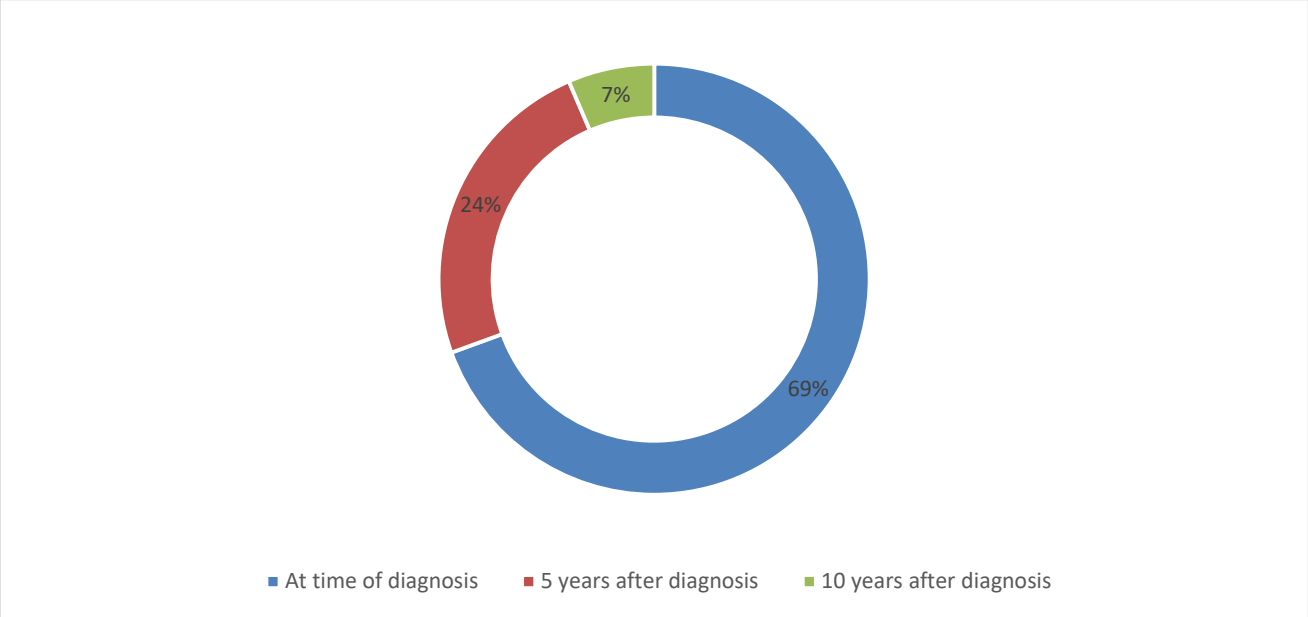

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Table 3 presents data about the 416 participants' awareness and screening for diabetic nephropathy and its complications. For example, it is also notable (and of course, encouraging) that a striking 94.7% of respondents recognized the possibility of preventing diabetic nephropathy, suggesting deep awareness of being proactive about creating healthy living conditions. In addition, a very large percentage, 97.4 per cent, realized the importance of early detection to slow progress of the disease, a ringing endorsement of the gravity of the condition. Surprisingly, 25 percent of participants were unaware that, without treatment, diabetic nephropathy can lead to anemia, a critical diagnosis that could be alleviated with targeted educational interventions. Moreover, strong insights come out in screening practice, as 70.7% cited it as a screening method, however we have a vast proportion (42.1%) that never followed up with a nephrologist after the initial result.

Table (3): participants' knowledge of complications and time of screen (n=416).

Parameter		***No.***	***Percent (%)***
It is possible to prevent diabetic nephropathy?	False	22	5.3
	True	394	94.7
Early detection of diabetic nephropathy is important to slow its progress?	False	11	2.6
	True	405	97.4
Diabetic nephropathy can lead to kidney failure if not treated?	False	21	5.0
	True	395	95.0
Diabetic nephropathy can lead to hypertension if not treated?	False	51	12.3
	True	365	87.7
Diabetic nephropathy can lead to anemia if not treated?	False	104	25.0
	True	312	75.0
Diabetic nephropathy can lead to dialysis or kidney transplant. if not treated?	False	23	5.5
	True	393	94.5
Which of the following is used to screen for diabetic nephropathy? *	Blood test (eGFR)	294	70.7
	Urine test (Urine Albumin)	271	65.1
	Kidney Imaging (US/MRI)	242	58.2
When is it recommended to start to screen for diabetic nephropathy in patients with type 1 diabetes?	At time of diagnosis	263	63.2
	5 years after diagnosis	120	28.8
	10 years after diagnosis	33	7.9

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When is it recommended to start to screen for diabetic nephropathy in patients with type 2 diabetes?	At time of diagnosis	289	69.5
	5 years after diagnosis	100	24.0
	10 years after diagnosis	27	6.5
How often do you follow up with a nephrologist?	Never	175	42.1
	Once a year	109	26.2
	Twice a year	62	14.9
	More than twice a year	70	16.8

Results may overlap

Table 4 shows the data presented which provides deep insight into knowledge and understanding of diabetic nephropathy among a sample of the diabetic patients. In particular noteworthy, approximately 57.7% of participants had high knowledge, a notable proportion had knowledge of the complications of diabetes and the necessity for monitoring of renal health. However, the findings show that while a distressingly large 39.9 percent of respondents have only a marginally high level of knowledge, an alarming 2.4 percent have no knowledge.

Table (4): Shows diabetic nephropathy knowledge and awareness assessment among diabetic patients score results.

	Frequency	**Percent**
High knowledge level	240	57.7
Moderate knowledge	166	39.9
Low knowledge level	10	2.4
Total	416	100.0

Table (5) shows that diabetic nephropathy knowledge has statistically significant relation to gender (P value=0.013), occupational status (P value=0.031), residential region (P value=0.0001). It also shows statistically insignificant relation to age, nationality, educational level, marital status.

Table (5): Relation between diabetic nephropathy knowledge and sociodemographic characteristics.

Parameters		***Knowledge level***		***Total (N=416)***	***P value****
		High knowledge level	**Moderate or low knowledge**		
Gender	Female	152	90	242	0.013

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		63.3%	51.1%	58.2%	
	Male	88	86	174	
		36.7%	48.9%	41.8%	
Age	28 or less	56	47	103	0.361
		23.3%	26.7%	24.8%	
	29 to 44	58	44	102	
		24.2%	25.0%	24.5%	
	45 to 55	70	38	108	
		29.2%	21.6%	26.0%	
	56 or more	56	47	103	
		23.3%	26.7%	24.8%	
Nationality	Saudi	228	166	394	0.759
		95.0%	94.3%	94.7%	
	Non-Saudi	12	10	22	
		5.0%	5.7%	5.3%	
Educational level	Primary school	12	5	17	0.434
		5.0%	2.8%	4.1%	
	Middle school	14	9	23	
		5.8%	5.1%	5.5%	
	Secondary school	56	41	97	
		23.3%	23.3%	23.3%	
	Diploma	17	23	40	
		7.1%	13.1%	9.6%	
	Bachelor's degree	108	79	187	
		45.0%	44.9%	45.0%	
	Master's degree or higher	21	11	32	
		8.8%	6.3%	7.7%	
	Uneducated	12	8	20	
		5.0%	4.5%	4.8%	
Marital status	Single	62	50	112	0.618
		25.8%	28.4%	26.9%	
	Married	164	111	275	
		68.3%	63.1%	66.1%	
	Divorced	9	9	18	
		3.8%	5.1%	4.3%	
	Widowed	5	6	11	
		2.1%	3.4%	2.6%	
Occupational	Student	39	25	64	0.031

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status		16.3%	14.2%	15.4%	
	Employee	70	69	139	
		29.2%	39.2%	33.4%	
	Retired	59	49	108	
		24.6%	27.8%	26.0%	
	Non-employee	72	33	105	
		30.0%	18.8%	25.2%	
Residential region	Northern region	1	10	11	0.0001
		0.4%	5.7%	2.6%	
	Southern region	73	25	98	
		30.4%	14.2%	23.6%	
	Central region	8	21	29	
		3.3%	11.9%	7.0%	
	Eastern region	49	51	100	
		20.4%	29.0%	24.0%	
	Western region	109	69	178	
		45.4%	39.2%	42.8%	

P value was considered significant if ≤ 0.05.

Discussion:

The purpose of this present study was to access the knowledge and the awareness levels among diabetic patients toward diabetic nephropathy in Saudi Arabia. This is of special importance in light of the widely growing incidence of diabetes and its complications, especially diabetic nephropathy that affects a significant number of patients with diabetes. The results from this study dramatically expose important understandings that diabetic nephropathy afflicted patients have as well as some that are detract from, which need to be targets for the educational interventions.

On comparison with previous studies, it is evident that the participants in this study are relatively aware with regard to diabetic nephropathy. For example, 94.7 percent of the respondents agreed with the prevention of diabetic nephropathy, which is in the line with the results of a study that highlighted the role of patient education in the diabetic nephropathy management [8]. Additionally, the understanding about the important role of early detection in slowing disease progression that was recognized by 97.4% of the participants in this study is also what several guidelines have suggested, which advocates screenings and monitoring for diabetic patients to prevent nephropathy [9, 10]. That means although there's awareness, there's something lacking in full blown educational programming that drives home the importance of proactive health management of diabetic patients.

A gap in continuity of care was noted by the study, which found that 42.1 percent of participants had never spoken with a nephrologist after receiving initial screening results. This result also coalesces with ativations reported by Byun, that a substantial portion of diabetic patients did not get proper education on diabetes care, which consequently led to low rates of screening of complications, such as

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nephropathy [11]. Not taking care of the follow up could contribute to the technique of diabetic nephropathy progression, due to speedy interventions are essential to properly control condition. Moreover, analysis of the study showed that 57.7 percent of participants had high knowledge about diabetic nephropathy while 39.9 percent had little knowledge and 2.4 percent had no knowledge. It is evident that different levels of knowledge have created a gap, and this gap needs to be filled through special educational programs for people with little or no understanding.

A demographic analysis of the participants showed that diabetic nephropathy knowledge was statistically significant to gender, occupational status and residential region. This result is in agreement with previous studies that have found demographic factors to influence health literacy and awareness levels of diabetic patients (9; 12). As an example, demographic characteristics—such as education level and socioeconomic status—had significant bearing on awareness of diabetic complication awareness among Omani patients [13]. Perhaps such a skew toward a higher proportion of female participants in this study may be indicative of a gender specific education intervention that one could pursue, as there have been indications that women might behave differently when they seek health care than men [14].

Additionally, the findings of this study relating to the risk factors for diabetic nephropathy, including poor glycemic control and obesity, are concordant with results from other studies which demonstrate these factors to be important risk factors for nephropathy [9, 13]. Similarly, 82 percent of participants recognize the familial risk factors in the literature, citing genetic predisposition to diabetic nephropathy as described in the studies of Monti and Canani [14,15]. This familial awareness would allow us to leverage it and increase educational outreach to people with a family history of diabetes as they may be put at risk of developing nephropathy.

Several limitations of this study must be acknowledged though. As a result, the cross-sectional design precludes establishing causality between knowledge levels and the real incidence of diabetic nephropathy. In addition, there is the potential for bias from self-reported data where participants tend to overestimate their knowledge or awareness of diabetic nephropathy. Additionally, the study sample was biased to a certain population in Saudi Arabia, and might or might not be representative of diabetic patients in Saudi Arabia. Longitudinal studies are required for future research to understand more fully the dynamics of knowledge and awareness over time as it relates to health outcomes.

Conclusion:

Finally, this study delivers useful information regarding the diabetic patients' knowledge and awareness of diabetic nephropathy in Saudi Arabia. A substantial number of participants were aware of a condition and its risk factors and gaps in knowledge and follow up care were identified. Overall, these findings underscore an urgent need for targeted educational interventions to improve understanding and management of diabetic nephropathy and improve patient outcomes and reduce the burden of the serious complication of diabetes.

Acknowledgement:

We acknowledge all of the volunteers who provided samples for this research.

Ethical approval:

After fully explaining the study and emphasizing that participation is optional, each participant gave their informed consent. The information gathered was safely stored and utilized exclusively for study.

Funding:

This study was not supported by any outside sources.

Conflict of interests:

The authors declare no conflict of interest.

Informed consent:

Written informed consent was acquired from each individual study participant.

Data and materials availability:

All data associated with this study are present in the paper.

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