Knowledge of Saudi type 2 diabetic patients about diabetic peripheral neuropathy and its risk factors in Abha City, Saudi Arabia

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Received: November 2022 Accepted: December 2022; Published: December 30, 2022.
Citation: Ali A. Al-Mousa Al-Qahtani et al. Knowledge of Saudi type 2 diabetic patients about diabetic peripheral neuropathy and its risk factors in Abha City, Saudi Arabia. World Family Medicine. December 2022 - January 2023 Part 2; 21(1):224-233
DOI: 10.5742/MEWFM.2023.95251586

Abstract

Objectives: To assess the level of knowledge about diabetic peripheral neuropathy (DPN) and its risk factors among diabetics in Abha City, Saudi Arabia.

Subjects and Methods: A cross-sectional study was conducted from March to July 2022 in primary health care (PHC) centers, Abha City, Saudi Arabia. Data were collected using an Arabic Language interview questionnaire, which included patients' demographics, to awareness and knowledge items about DPN and its risk factors in addition to screening for neuropathic symptoms of DPN using the history part of the validated Michigan Neuropathy Screening Instrument (MNSI).

Results: This study included 300 type 2 diabetic patients. Age of 74.7% of participants was (41-60 years). Males constituted 56.7%. The largest proportion of patients were house wives or unemployed (41.3%). More than half of the participants were school –educated (59.7%), while 18.7% were university educated. Almost half of participants (46.6%) reported disease duration between 6-9 years, while for that of 29.2% it was 2-5 years, and for 24.3% was 10 years or more. HbA1c was <7% in 46% of participants. Only 18.3% of participants were aware of DPN. Two-thirds of participants had poor knowledge level about DPN. The most frequently experienced neuropathic symptoms were feeling weak all over most of the time (62.7%), having an open foot sore (59.7%), having muscle lower limb cramps (48.7%) and experiencing burning lower limb pain (45.7%). Prevalence of DPN according to the history part of the MNSI was 9.3% of type 2 diabetic patients had DPN. Participants' knowledge levels were significantly higher among those with DPN (p=0.045). However, their knowledge levels did not differ significantly according to their personal or clinical characteristics.

Conclusions: Most type 2 diabetic patients in Abha City have poor knowledge about DPN and its risk factors. However, prevalence of DPN among them is relatively low.

Key words: Diabetes mellitus, diabetic peripheral neuropathy, knowledge, Saudi Arabia.

Introduction

Diabetes mellitus is a chronic metabolic disease, characterized by high levels of blood glucose. In the 21st century, it is considered a pandemic and the primary cause of mortality and morbidity (1). It may affect any organ in the body, including the heart, eyes, kidneys, and nervous system. The risks for complications increase with disease duration. By ten years after diagnosis, at least 50% of type 2 diabetic patients develop some form of neuropathy, mainly peripheral neuropathy, known as diabetic peripheral neuropathy (DPN) (2).

Zakin et al. (3) stated that DPN is one of the most common long-term complications of diabetes. It refers to the occurrence of symptoms associated with peripheral neurological dysfunction in people with diabetes while excluding other causes. It affects all peripheral nerves, including pain fibers, motor neurons, and the autonomic nervous system, and is the second most common cause of post-traumatic nerve injury. Its complications include two types of pain and sensory abnormalities, the most severe of which is diabetic peripheral neuralgia. It is the main initiating factor for foot ulceration, Charcot neuroarthropathy, and lower-extremity amputation (4).

Kamalarathnam and Varadarajan (5) stressed that early detection of DPN using an objective screening test followed by its appropriate management is important since up to 50% of the patients may be asymptomatic. Screening for DPN enables early detection and management and helps prevent morbidities, like foot ulcerations, amputation, etc. therefore, it is recommended to screen for diabetic neuropathy at diagnosis and then every year afterwards. The Michigan Neuropathy Screening Instrument (10) is commonly used to screen for DPN in outpatient settings by primary health care (PHC) providers (6).

Several studies from different parts in the world revealed that prevalence of diabetic peripheral neuropathy (DPN) was very high and ranged from 36.6%, in the U.S. to 20% in the Middle-Eastern region (7). Among Saudi patients, after more than 10-years of diabetes, prevalence of DPN was reported to be as high as 82% (8).

Bahhary et al. (9) stressed that diabetic patients can play a vital role in early identification and reporting of DPN if they are aware about it. However, data on awareness and knowledge about diabetic nephropathy in Saudi Arabia remain scarce. Therefore, this study aimed to assess the level of knowledge about DPN and its risk factors among type 2 diabetics in Abha City, Saudi Arabia.

Methodology

A cross-sectional study design was followed at PHC centers in Abha City, Saudi Arabia during the period between March and July 2022.

The minimum sample size needed was calculated according to the Raosoft Sample Size Calculator (10) website to be 285 patients, with 5% error margin, 95% confidence level, and 75% response distribution. However, the sample size was increased to 300 to compensate for possible non-response or any missing data.

A simple random sampling technique was followed to select five PHC centers within Abha City. The Chronic Diseases clinics in selected PHC centers were visited by the researchers to interview and examine all attending Saudi type 2 diabetic patients on the day of our visit. To fulfill the required sample size, 60 type 2 diabetic patients were included from each selected PHC center.

Inclusion criteria: Saudi type 2 diabetics, with disease duration > 2 years.
Exclusion criteria: Non-Saudi diabetic patients who have been diagnosed since less than two years.

For data collection, the researchers used an interview questionnaire that has been used by the study of Bahhary et al. (9). It included the following parts:

- **Personal characteristics:** age, sex, job, marital state, education level, smoking status, and body mass index.
- **Present history of diabetes:** Duration of diabetes, types of received medications, and HbA1c.
- **Knowledge about DPN and its risk factors**: Eight multiple choice questions that assess patients' awareness on DPN and its risk factors were included. A correct answer was assigned a score of (1), while an incorrect response was assigned a score of (0). According to participants' percentage of correct responses, their knowledge was classified into two categories, either "Poor" for those who attained <50%, or "Good" for those who attained ≥50%.
- **Screening for neuropathic symptoms of DPN:** This was done using the validated MNSI (10). It consists of two parts, a history questionnaire followed by physical assessment. MNSI history questionnaire consists of 15 (Yes/No) questions on symptoms, such as numbness, burning sensation, temperature perception, and history of open sores or amputation. The higher the score, the worse is the level of neuropathic symptoms. A score of $\geq$4 was considered as positive for having significant DPN (6).

The Statistical Package for Social Sciences (IBM, SPSS version 28.0) was used for data entry and analysis. Descriptive statistics were calculated using frequency and percentage for qualitative variables, or mean and standard deviation for quantitative variables. Chi square test was used to test significance of differences in participants' knowledge according to their diabetes control.

Results

A total of 300 type 2 diabetic patients were enrolled in the present study. Table (1) shows that age of 74.7% of participants was (41-60 years). Males constituted 56.7%. The largest proportion of patients were housewives or unemployed (41.3%), followed by governmentally employed participants (36.3%). More than half of participants were school educated (59.7%), while 18.7% were university educated and 21.7% were illiterate. Almost three-quarters of participants (74%) were non-smokers, while 11.3% were current smokers and 14.7% were ex-smokers. Almost half of participants (48.7%) were overweight, while 31.3% were obese. Almost half of participants (46.6%) reported a disease duration between 6-9 years, while for that of 29.2% it was 2-5 years, and for 24.3% it was 10 years or more. HbA1c was <7% in 46% of participants.

Table (2) shows that only 18.3% of participants were aware of DPN. Burning and tingling were the most frequently stated DPN symptoms (74% and 63.3%, respectively), while throbbing, and not feeling pain or hot/cold feet were the least stated (17.7% and 11%, respectively). High blood glucose levels were the most frequently stated risk factor for DPN (86%), while the least stated was high blood pressure and elevated triglycerides (28.3% and 31%, respectively). Foot ulcers and missing minor cuts and sores were the most frequently stated complications of DPN (75.7% and 77%, respectively), while amputation was the least frequently stated (63.7%). Most participants (54.3%) stated that DPN can be diagnosed with special tests, while all participants stated that DPN can be prevented by proper foot care and strict blood glucose control, and 47.3% stated that there are certain medications that decrease DPN pain.

Figure (1) demonstrates that 67% of participants had poor knowledge level about DPN.

Table (3) shows that the most frequently experienced neuropathic symptoms were feeling weak all over most of the time (62.7%), having an open foot sore (59.7%), having muscle lower limb cramps (48.7%) and experiencing burning lower limb pain (45.7%).

Figure (2) shows that 9.3% of type 2 diabetic patients had DPN.

Table (4) shows that participants' knowledge levels were significantly higher among those with DPN (p=0.045). However, their knowledge levels did not differ significantly according to their personal or clinical characteristics.

Table 1: Participants' characteristics

Variable	Count	Percent (%)
Age Group		
18 - 24	121	32.4
25 - 29	23	6.2
30 - 39	31	8.3
40 - 49	129	34.6
50 and more	69	18.5
Gender		
Male	140	37.5
Female	233	62.5
Education		
Educated	372	99.7
Not educated	1	0.3
Employment		
Employed	195	52.3
Not employed	178	47.7
Previous emergency department visitations		
Yes	353	94.6
No	20	5.4
Time of the last emergency department visit		
Less than a month ago	68	18.2
During the last six months	110	29.5
Around one or two years ago	77	20.6
Three to four years ago	79	21.2
More than 10 years ago	16	4.3
More than 20 years ago	23	6.2

Table 2: Knowledge of diabetic patients regarding diabetic peripheral neuropathy (DPN) and its risk factors in Abha City

Knowledge items	Yes		No	
	No.	%	No.	%
Do you know what DPN is?	55	18.3	245	81.7
Exposure to high blood glucose levels over an extended period of time causes damage to peripheral nerves	127	42.3	173	57.7
Symptoms of DPN in the toes and feet:				
• Burning	222	74.0	78	26.0
• Tingling	190	63.3	110	36.7
• Sharp, shooting pain	123	41.0	177	59.0
• Pins and needles	123	41.0	177	59.0
• Throbbing	53	17.7	247	82.3
• Not feeling pain or hot/cold feet	33	11.0	267	89.0
Risk factors for DPN:				
• High blood glucose levels	258	86.0	42	14.0
• Elevated triglycerides	93	31.0	207	69.0
• Excess body weight	121	40.3	179	59.7
• Smoking	199	66.3	101	33.7
• High blood pressure	85	28.3	215	71.7
Complications of DPN:				
• Foot ulcers	227	75.7	73	24.3
• Not noticing minor cuts and sores	231	77.0	69	23.0
• Wounds infections and gangrene	205	68.3	95	31.7
• Amputation	191	63.7	109	36.3
Are there special tests to diagnose DPN?	163	54.3	137	45.7
How to prevent complications of DPN?				
• Proper foot care	300	100.0	0	0.0
• Strict blood glucose control	300	100.0	0	0.0
• Control risk factors	182	60.7	118	39.3
Are there certain medications that decrease DPN pain?	142	47.3	158	52.7

Table 3: History of peripheral neuropathy symptoms in diabetic patients

Questions	Yes		No	
	No.	%	No.	%
Are your legs and/or feet numb?	62	20.7	238	79.3
Do you ever have any burning pain in your legs and/or feet?	137	45.7	163	54.3
Are your feet too sensitive to touch?	20	6.7	280	93.3
Do you get muscle cramps in your legs and/or feet?	146	48.7	154	51.3
Do you ever have any prickling feelings in your legs or feet?	81	27.0	219	73.0
Does it hurt when the bed covers touch your skin?	30	10.0	270	90.0
When you get into a tub or shower, are you able to tell the hot water from the cold water?	287	95.7	13	4.3
Have you ever had an open sore on your foot?	179	59.7	121	40.3
Did your doctor tell you that you have diabetic neuropathy?	18	6.0	282	94.0
Do you feel weak all over most of the time?	188	62.7	112	37.3
Are your symptoms worse at night?	95	31.7	205	68.3
Do your legs hurt when you walk?	27	9.0	273	91.0
Are you able to sense your feet when you walk?	283	94.3	17	5.7
Is the skin on your feet so dry that it cracks open?	20	6.7	280	93.3
Have you ever had an amputation?	0	0.0	300	100.0

Figure 1: Participants' knowledge levels about DPN

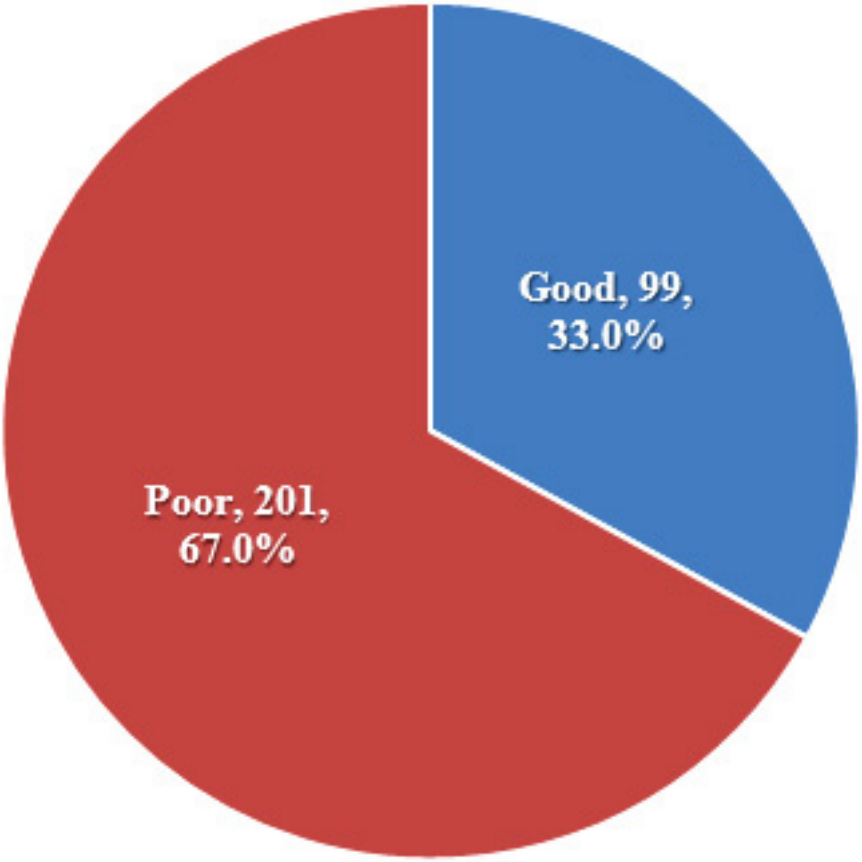

Figure 2: Prevalence of diabetic peripheral neuropathy among participants

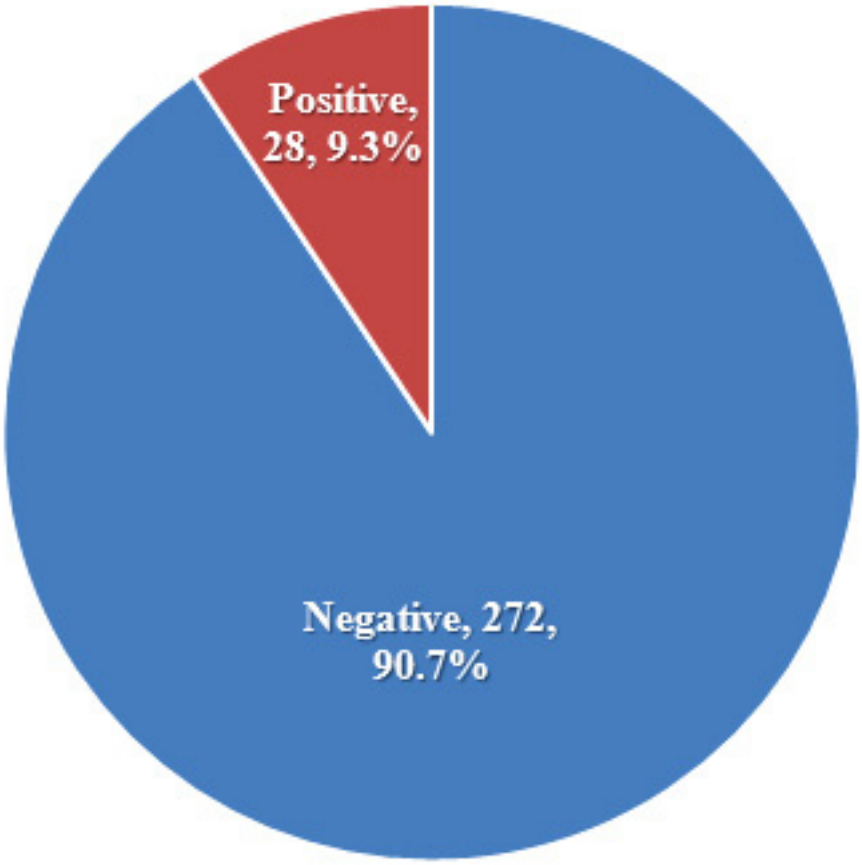

Table 4: The association between participants' diabetes control and their awareness Level regarding diabetic peripheral neuropathy

Characteristics	Good (n = 99)		Poor (n =201)		P-value
	No.	%	No.	%	
HbA1c level					
• Controlled (≤7%)	50	36.2	88	63.9	
• Uncontrolled (>7%)	49	30.2	113	69.8	0.272
Age					
• ≤ 40 years	10	10.1	22	10.9	
• 41-60 years	72	72.7	152	75.6	0.687
• ≥ 61 years	17	17.2	27	13.4	
Gender					
• Male	55	55.6	115	57.2	
• Female	44	44.4	86	42.8	0.785
Job					
• Housewife/unemployed	39	39.4	85	42.3	
• Governmental	40	40.4	69	34.3	
• Private	11	11.1	31	15.4	0.617
• Other	9	9.1	16	8.0	
Education level					
• Illiterate	25	25.3	40	19.9	
• School	55	55.6	124	61.7	0.518
• University	19	19.2	37	18.4	
Smoking status					
• Current smoker	10	10.1	24	11.9	
• Non-smoker	13	13.1	31	15.4	0.745
• Ex-smoker	76	76.8	146	72.6	
Body mass index					
• Normal	22	22.2	38	18.9	
• Overweight	50	50.5	96	47.8	0.537
• Obese	27	27.3	67	33.3	
Duration of diabetes					
• 2 – 5 years	29	29.3	58	28.9	
• 6 – 9 years	47	47.5	93	46.3	0.952
• ≥ 10 years	23	23.2	50	24.9	
DPN					
• Present	14	50.0	14	50.0	
• Absent	85	31.3	187	68.8	0.045†

† Statistically significant

Discussion

Saudi Arabia is the second highest country in the Middle East and the seventh globally for rating diabetes according to the World Health Organization (WHO) (11). Diabetic peripheral neuropathy is a common complication in diabetic patients (12).

We aimed to assess knowledge of Saudi type 2 diabetic patients regarding DPN and its risk factors.

The present study revealed that 81.7% of participants were unaware about DPN, and only two-thirds of patients had poor knowledge about it. Type 2 diabetics' knowledge differed significantly according to presence of DPN, but did not differ significantly according to other studied participants' characteristics.

Our results are in accordance with those of Alhashim et al. (13) in Al-Ahsa, Saudi Arabia, who found that only 7.2% of patients had high knowledge level, whereas more than 54.6% were not aware of DPN. However, their patients' level of knowledge differed significantly between patients who received health education about DPN by their healthcare providers and those who did not.

These findings confirm that diabetic patients need to be informed about DPN, hence the role of health education is essential in increasing their level of knowledge about DPN.

Based on the history part of the MNSI, prevalence of DPN among our patients was 9.3%. The most frequently experienced symptoms were feeling weak all over most of the time, having an open foot sore, having muscle lower limb cramps or experiencing burning lower limb pain.

Higher prevalence of DPN was reported by several studies in Saudi Arabia. A study from primary care centers in Riyadh City showed that 35% of diabetic patients suffered from DPN (4). Another study reported a prevalence of 30.1% (14). A hospital-based study reported a high prevalence of DPN (69.2%) among type 2 diabetic patients (15). In Jeddah City, prevalence of DPN, based on a combination of neurological symptoms and reduced vibration perception was reported to be 19.9% (7).

A study on diabetic patients in the US and Europe reported that prevalence of DPN ranged from 6% to 51%, based on the population studied (16). In India, prevalence of DPN was reported to be 47%, and it was associated with a longer duration of diabetes (17).

These wide variations in prevalence rates of DPN reported by different studies may be explained by assessment of DPN prevalence depends on several factors, such as type of diabetes, study population, criteria for case definition, glycemic control and duration of diabetes. Ziegler et al. (18) noted that prevalence of DPN can be reduced by provision of high health care and strictly controlling blood sugar.

Wang et al. (7) reported that prevalence of DPN among diabetic patients was associated with their glycemic control, duration of diabetes, and abdominal obesity. Aljohani et al. (15) noted that the risk factors for DPN include high HbA1c, patient's age, and duration of diabetes. Similarly, Akbar et al. reported that factors including poor glycemic control, longer duration of diabetes, smoking, and older age were reported to be risk factors for DPN among Saudi patients with type 2 diabetes (19).

In conclusion, this study revealed that most type 2 diabetic patients in Abha City, Saudi Arabia, have poor knowledge about DPN and its risk factors. Since diabetic patients are at high risk of developing DPN, it is necessary to conduct intensive health education about diabetes and its complications to raise their awareness and improve their knowledge about it. Health education sessions should start at the time of diagnosis to minimize the associated complications among these patients, and to maintain regular clinical assessment to detect DPN. Moreover, family physicians should do annual screening for diabetic patients to manage DPN. In addition, diabetics should be trained to perform self-care for prevention of DPN.

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