

Knowledge and practice about the foot care and the prevalence of the neuropathy among a sample of type 2 diabetic patients in Erbil, Iraq

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ABSTRACT

Context: Patients with diabetes need to receive medical care from collaborative, integrated teams with expertise in diabetes. They must also assume an active role in their care. One aspect of health education for diabetic patients is foot care, therefore identifying patients foot care knowledge and practice is central in diabetes management. **Aims:** To know level of foot care, to assess peripheral neuropathy and association between them. **Settings and Design:** Cross sectional study in Rizgary Teaching Hospital and Layla Qasim diabetic center in Erbil, Iraq. **Subjects and Methods:** A sample of 250 patients aged ≥ 18 years with type 2 diabetes were interviewed to complete a questionnaire about foot care. Then a Michigan Neuropathy Screening Instrument was used as screening tool to detect neuropathy. **Statistical Analysis Used:** Statistical Package for Social Sciences version 25 used with a statistical significance level of < 0.05 . The results presented as rates, frequencies, percentages in tables and analyzed using Chi-square test. **Results:** The mean age of the sample was 53.75 ± 12.08 years. The mean knowledge and practice scores were $6.1 \pm SD 2.6$ and $5.8 \pm SD 2.1$, respectively. The majority of participants were of poor knowledge score and moderate practice score (38% and 40%, respectively). The percentage of neuropathy was 31.20%. The neuropathy was highest among those who had low knowledge score ($P < 0.05$). **Conclusions:** The mean knowledge and practice scores were moderate, knowledge had significant influence on practice. Peripheral neuropathy was significantly higher among those with low knowledge score.

Keywords: Erbil city, family medicine, foot care Knowledge, foot care practice, neuropathy

Introduction

Diabetes is a life long illness characterized by increased blood glucose levels and reduction in tissue repair that requires continuing medical care to prevent acute complications and to reduce the risk of long-term complications. Failure to achieve optimal glycemic control can cause damage to the body's small and large vessels and nerves affect the functioning of many body organs and interfere with body metabolism. Globally, type 2 Diabetes mellitus (T2DM) is increasing in its prevalence.^[1] It is associated with significant morbidity, mortality, and increasing health care cost. The WHO has predicted that in the year 2025,

the number of people with diabetes will have doubled and that out of 300 million people with diabetes, 90% of them are T2DM and 76% will be living in the low-income group.^[2] According to International Diabetes Federation, the number of diabetes already reached 451 million in 2017 and estimated that in 2045, 693 million people will have diabetes.^[3]

Major complications of T2DM include diabetic foot and diabetic peripheral neuropathy (DPN); that constitutes an increasing public health problem with increasing admission rate, cost, amputation risk, and mortality in diabetic patients.^[4] Approximately, 27% of the direct medical cost of diabetes may be attributed to DPN.^[5] Diabetic patients have a 15–25% lifetime risk

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Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_163_18

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How to cite this article: Saber HJ, Daoud AS. Knowledge and practice about the foot care and the prevalence of the neuropathy among a sample of type 2 diabetic patients in Erbil, Iraq. J Family Med Prim Care 2018;7:967-74.

of developing a diabetic foot ulcer^[6,7] and one out of 6 patients will have a lower-limb amputation, with an associated increase in mortality ranging from 47% to 70%.^[6] The symptoms of DPN show a discrepancy; between patients however, initially it begins with sensory loss that makes diabetic patients more liable to foot ulcers and increasing risk of leg amputation.^[8]

The practice of foot care measures such as daily foot washing and drying, daily foot examination, proper nail care, and footwear are important in regard to prevention and early detection of the expected complications. Patients with poor knowledge and practices about diabetic foot care have a higher incidence of diabetic foot complications.^[9] Studies suggest that increasing awareness about diabetic foot care practices may reduce diabetes related foot ulceration and amputations and facilitate healing of foot ulcers.^[1] Knowledge about the above mentioned foot care practices varies among studies. Several studies have shown that a majority of people have insufficient knowledge^[4,7,10-20] while some other studies show satisfactory results.^[9,21-25] The number of studies on knowledge and practices about foot care among diabetics in Middle East countries are very few. Besides, majority of patients are unaware about the importance of foot care and its consequences, such studies are very important footstep for prevention of diabetic foot complications.^[11,12,16,20,21,26] The objectives of the current study were to assess the patients' knowledge and practices regarding self-foot-care among a sample of diabetic patients in Erbil city, Iraq and the prevalence of DPN. The data gained from this study can aid health care providers and primary care providers to develop targeted self-management education programs for people with diabetes about healthy foot care measures such as daily wash, drying feet after washing to decrease occurrence of diabetic foot complication like foot ulcers.

Subjects and Methods

This is a cross-sectional study that carried out in Layla Qasim diabetic center and Rizgary Teaching Hospital between the period of 1st of April 2017 to the end of 28th of December 2017. The study was approved by the scientific and ethics committees at Kurdistan Board of Medical Specialties, Erbil, Iraq. A convenience method of sampling was used for recruiting 250 T2DM patients aged ≥ 18 years. All participants informed of the study objectives, recruited after providing verbal consent and at each consultation with a patient lasted 15 min.

A specially designed questionnaire was used to address all relevant variables and it includes 5 parts; the first part was socio-demographic data. The second part was to assess their knowledge by 11 questions for each correct answer 1 point was given and 0 point for incorrect answer, maximum possible score was 11, 0–6 (≤ 60) was considered as low score, 6 and 7 (60–80%) were considered as medium score, 8–11 (≥ 80) were considered good score. The third part included 11 questions about foot care practice, 0–6 (≤ 60) was considered as poor practice, 6 and 7 (60–80%) were considered as satisfactory practice, and 8–11 (≥ 80) were considered good practice.

Fourth and fifth parts were the first and second parts of Michigan Neuropathy Screening Instrument (MNSI), respectively, which is a well validated screening tool to detect neuropathy.^[27,28] It consists of two parts; a MNSI questionnaire and MNSI examination. The questionnaire consists of 15 questions, questions number 4 and 10 are to assess circulation and asthenia, respectively and were not included in the score so total maximum possible score is 13, a score ≥ 7 is considered as neuropathy. During MNSI examination, each foot was examined for presence of deformities, dry skin, calluses, infections, and fissures. The presence of any of these abnormalities was considered as a score of 1. Then, each foot was examined for ulcer and presence of any ulcer on them was considered as a score of 1. After that the ankle reflexes were examined, if the reflex was present a score of 0 was given, if it was absent the patient was asked to perform Jendrassic maneuver, if the reflex become present with this maneuver a score of 0.5 was given, and if the reflex was absent even with Jendrassic maneuver score of 1 was given. Then using a Tuning fork of 128 kHz vibration sensation in great toe was assessed. If the vibration was felt by the examiner on his/her finger for < 10 s longer than the patient felt on his/her great toe and that is normal a score of 0 was given, if the examiner felt the vibration for ≥ 10 s than the patient a score of 0.5 was given, and if the patient felt no vibration then a score of 1 was given. Finally, for assessing pressure sensation monofilament test was used in 10 points of each foot. If the patient was able to sense the monofilament at 8 points a score of 0 was given and that is normal, if the patient was unable to feel the monofilament at all a score of 1 was given, and if the patient felt the monofilament in (1–7) points a score of 0.5 was given. A total possible score in MNSI examination is 10 points and a score ≥ 2.5 was considered abnormal.^[27] A patient was considered to have neuropathy if he has a score of ≥ 7 in MNSI questionnaire part or he has a score of ≥ 2.5 in MNSI examination or both.

After completing the questionnaire and examination, participants asked to provide a blood sample in laboratory room under aseptic condition. HbA1c analyzed using diaSys one HbA1CFS (particle enhanced immunoturbidimetric test) that is a specific immunoassay for human HbA1c in these centers, their blood pressure and BMI also measured. Diabetes control is defined as HbA1c $< 7\%$.

Data were collected and then analyzed using Statistical Package for Social Sciences version 25, and the results were compared between patients with different variables, with a statistical significance level of < 0.05 . The results presented as rates, ratio, frequencies, percentages in tables and figures, and analyzed using Chi-square test.

Results

A total of 250 diabetic patients were included in this study. Mean age of the patients was ($53.7 \pm \text{SD } 12.08$) years. Majority of them (79%) belonged to the middle age group (40–70 years). Most of the respondents (71%) were living in Erbil city. Approximately, half of the respondents (52%) belonged to the

middle-income group. Table 1 shows demographic data of the selected patients.

The mean duration of the participants having diabetes in years was ($8 \pm SD 7.1$), their mean HbA1c was ($8 \pm SD 1.5$), and the majority of them (83.6%) stated that they take treatment regularly. Most of them (68.8%) were on oral anti-diabetic agents, Table 2 shows their disease description.

Table 1: Demographic characteristics of study population

	n (%)
Age	
<40	30 (12.0)
40-70	198 (79.2)
>70	22 (8.8)
Residency	
Rural	72 (28.8)
Urban	178 (71.2)
BMI	
Normal	66 (26.4)
Overweight	110 (44.0)
Obese	70 (28)
Morbid obesity	4 (1.6)
Smoking	
Smoker	34 (13.6)
Non-smoker	162 (64.8)
Ex-smoker	54 (21.6)
Socio-economic status	
Low income	54 (21.6)
Medium income	130 (52.0)
High income	66 (26.4)
Marital status	
Married	236 (94)
Single	8 (3)
Divorce	8 (3)

BMI: Body mass index

Table 2: Disease characteristics of study population

	n (%)
Family history of DM	
Yes	162 (64.8)
No	88 (35.2)
History of foot ulcer	
Yes	50 (20.0)
No	200 (79.6)
Duration of DM (years)	
<5	110 (44.0)
5-10	76 (30.4)
>10	64 (25.6)
Type of treatment	
Diet	8 (3.2)
OAD	172 (68.8)
Insulin	12 (4.8)
Both OAD and insulin	58 (23.2)
HbA1c (%)	
<7	42 (16.8)
≥7	208 (83.2)

DM: Diabetes mellitus; OAD: Oral anti-diabetic; HbA1c: Glycated hemoglobin

The mean knowledge score was ($6.1 \pm SD 2.6$) out of 11, Comparing subgroups of low, medium, and high scores, no significant differences observed [Table 3]. A good number of the participants scored good knowledge about washing foot daily (76%), inspecting foot daily (73.6%), and importance of stocking (71.2%). The lowest score in knowledge was in wearing slippers at home (31.2%). Mean score for practice was ($5.8 \pm SD 2.1$) out of 11, Almost all of them (95.2%) were washing their foot daily, (62.4%) were examining their foot daily, and (61.6%) were cutting their nail straight and across. The lowest scores for bad practice were in wearing slippers at home (23.2%), only (34.4%) were inspecting inside shoes before wearing it. Using moisturizer is not a usual practice both on feet and between the toes (29.6%) for each. In regard to type of footwear, (44%) were wearing round toe, and (33%) were wearing sandals. Table 3 shows knowledge and practice scores of the participants.

People in the rural area had poor knowledge and practice score ($P < 0.05$) compared to patients in urban areas. Most of the patients with mediums socio-economic status had low knowledge and practice score ($P < 0.05$). With regard to BMI, the majority of normal and obese had low score of knowledge ($P < 0.05$). The highest number of smokers were having high-knowledge score, while the highest number of non-smokers were having low-knowledge score ($P < 0.001$), and the highest number those with HbA1c ≥ 7 were having low-score of knowledge ($P < 0.001$). Tables 4 and 5 show association between patient characteristics with knowledge and practice, respectively.

Among those who were having low-knowledge score, majority were having low score of practice too, and few percent of those with high-knowledge score were having low-practice score ($P < 0.001$) [Table 6].

The percentage of neuropathy was (31.2%) among participants within this percentage majority were living in rural areas, were among low socio-economic status, and were with obesity and smokers ($P < 0.05$) [Table 7].

There was significant association between knowledge and neuropathy; in a way that neuropathy was lowest among people with satisfactory knowledge score. However, there were no significant association between practice and neuropathy [Table 8].

Discussion

Although it was considered that DPN will develop years after diagnosis of diabetes and after long improper glycemic control, but now there is evidence that DPN develops early during the first 12 month after diagnosis of diabetes.^[29] Studies suggest 10% of diabetics have DPN at time of diagnosis.^[30] In our study, the prevalence of DPN was (31.2%) that is in accordance with many studies in Middle East, for example: Jordan (39.5%), Saudi Arabia (45%), UAE (25.6%), and Iran (32%).^[28,30-32] While the prevalence of neuropathy may be much lower in European

Table 3: Participants knowledge and practice score

	n (%)	Mean±SD
Knowledge score		
Low score	96 (38.4)	6.1±2.6
Medium score	72 (28.8)	
High score	82 (32.8)	
Practice score		
Low score	96 (38.4)	5.9±2.1
Medium score	100 (40.0)	
High score	54 (21.6)	

SD: Standard deviation

Table 4: Impact of patient characteristics on knowledge

	Low, n (%)	Satisfactory, n (%)	High, n (%)	P
Age				
<40	12 (40.0)	6 (20.0)	12 (40.0)	0.17
40-70	76 (40.0)	52 (27.4)	62 (32.6)	
>70	8 (26.7)	14 (46.7)	8 (26.7)	
Residency				
Rural	40 (55.6)	18 (25.0)	14 (19.4)	0.001
Urban	56 (31.5)	54 (30.3)	68 (38.2)	
Marital status				
Married	92 (39.0)	68 (28.8)	76 (32.2)	0.86
Single	2 (25.0)	2 (25.0)	4 (50.0)	
Widow	2 (33.3)	2 (33.3)	2 (33.3)	
Socio-economic status				
Low	18 (33.3)	10 (18.5)	26 (48.1)	0.01
Medium	62 (47.7)	44 (33.8)	24 (18.5)	
High	16 (24.2)	18 (27.3)	32 (48.5)	
BMI				
Normal	32 (48.5)	12 (18.2)	22 (33.3)	0.001
Over-weight	32 (29.1)	34 (30.9)	44 (40.0)	
Obese	32 (45.7)	24 (34.3)	14 (20.0)	
Morbid obese	0 (0.0)	2 (50.0)	2 (50.0)	
Smoking				
Smoker	10 (29.4)	10 (29.4)	14 (41.2)	0.01
Nonsmoker	60 (37.0)	56 (34.6)	46 (28.4)	
Ex-smoker	26 (48.1)	6 (11.1)	22 (40.7)	
Family history of DM				
Yes	58 (35.8)	50 (30.9)	54 (33.3)	0.46
No	38 (43.2)	22 (25.0)	28 (31.8)	
HbA1c				
<7	18 (33.3)	24 (44.4)	12 (22.2)	0.001
≥7	78 (39.8)	48 (24.5)	70 (35.7)	
Duration of diabetes (years)				
<5	48 (43.6)	26 (23.6)	36 (23.6)	0.09
5-10	26 (34.2)	30 (39.5)	20 (39.5)	
>10	22 (34.4)	16 (25.0)	26 (25.0)	

BMI: Body mass index; DM: Diabetes mellitus; HbA1c: Glycated hemoglobin

countries for example in Denmark is (12.8%).^[33] Variation in prevalence in studies may be because of the diagnostic test that is used and the studied sample, definitive diagnostic test of peripheral neuropathy is nerve conduction test that is not applicable for research purpose because of its availability and cost. Instead, we use screening instruments for example in our

Table 5: Association of patient characteristics with foot care practice

	Low, n (%)	Moderate, n (%)	High, n (%)	P
Age				
<40	14 (46.7)	12 (40.0)	4 (13.3)	0.01
40-70	74 (38.9)	68 (35.8)	48 (25.3)	
>70	8 (26.7)	20 (66.7)	2 (6.7)	
Residency				
Rural	34 (47.2)	32 (44.4)	6 (8.3)	0.005
Urban	62 (34.8)	68 (38.2)	48 (27.0)	
Marital status				
Married	92 (39.0)	94 (39.8)	50 (21.2)	0.88
Single	2 (25.0)	4 (50.0)	2 (25.0)	
Widow	2 (33.3)	2 (33.3)	2 (33.3)	
Socio-economic status				
Low	16 (29.6)	22 (40.7)	16 (29.6)	0.001
Medium	64 (49.2)	54 (41.5)	12 (9.2)	
High	16 (24.2)	24 (36.4)	26 (39.4)	
BMI				
Normal	24 (36.4)	30 (45.5)	12 (18.2)	0.53
Over-weight	44 (40.0)	40 (36.4)	26 (23.6)	
Obese	26 (37.1)	30 (42.9)	14 (20.0)	
Morbid obese	2 (50.0)	0 (0.0)	2 (50.0)	
Smoking				
Smoker	10 (29.4)	14 (41.2)	10 (29.4)	0.26
Non-smoker	60 (37.0)	70 (43.2)	32 (19.8)	
Ex-smoker	26 (48.1)	16 (29.6)	12 (22.2)	
Family history of DM				
Yes	64 (39.5)	70 (43.2)	28 (17.3)	0.07
No	32 (36.4)	30 (34.1)	26 (29.5)	
HbA1c				
<7	16 (29.6)	24 (44.4)	14 (44.4)	0.31
≥7	80 (40.8)	76 (38.8)	40 (38.8)	
Duration of diabetes (years)				
<5	52 (47.3)	34 (30.9)	24 (21.8)	0.01
5-10	24 (31.6)	40 (52.6)	12 (15.8)	
>10	20 (31.3)	26 (40.6)	18 (28.1)	

BMI: Body mass index; DM: Diabetes mellitus; HbA1c: Glycated hemoglobin

Table 6: Association between knowledge score and practice score

Knowledge	Practice			P
	Low, n (%)	Moderate, n (%)	High, n (%)	
Low	64 (66.7)	26 (27.1)	6 (6.30)	0.001
Satisfactory	24 (33.3)	40 (55.6)	8 (11.1)	
High	8 (9.8)	34 (41.5)	40 (48.8)	

study MNSI, each screening instrument has different sensitivity and specificity, and this is well demonstrated in a study by Xiong *et al.* in China who correlated different clinical scoring instruments of neuropathy with nerve conduction study.^[34] The second reason that is affecting prevalence of neuropathy is the studied sample, some studies include patients from primary health care centers, some take patients in special diabetic centers and this might increase the prevalence as compared to the population. By comparing prevalence of neuropathy to possible related factors in

Table 7: Association between patient characteristics with neuropathy prevalence

	Neuropathy, n (%)	Normal, n (%)	P
Age			
<40	4 (13.3)	26 (86.7)	0.07
40-70	64 (33.7)	126 (66.3)	
>70	10 (33.3)	20 (66.7)	
Residency			
Rural	30 (41.7)	42 (58.3)	0.02
Urban	48 (27.0)	130 (73.0)	
Marital status			
Married	76 (32.2)	160 (67.8)	0.22
Single	2 (25.0)	6 (75.0)	
Widow	0 (0.0)	6 (100.0)	
Socio-economic status			
Low	26 (48.1)	28 (51.9)	0.001
Medium	44 (33.8)	86 (66.2)	
High	8 (12.1)	58 (87.9)	
BMI			
Normal	24 (36.4)	42 (63.6)	0.009
Over-weight	24 (21.8)	86 (78.2)	
Obese	30 (42.9)	40 (57.1)	
Morbid obese	0 (0.0)	4 (100.0)	
Smoking			
Smoker	14 (41.2)	20 (58.8)	0.001
Nonsmoker	34 (21.0)	128 (79.0)	
Ex-smoker	30 (55.6)	24 (44.4)	
Family history of DM			
Yes	44 (27.2)	118 (72.8)	0.06
No	34 (38.6)	54 (61.4)	
HbA1c			
<7	14 (25.9)	40 (74.1)	0.34
≥7	64 (32.7)	132 (67.3)	
Duration of diabetes (years)			
<5	20 (18.20)	90 (81.80)	0.001
5-10	22 (28.90)	54 (71.10)	
>10	36 (56.30)	28 (43.80)	

BMI: Body mass index; DM: Diabetes mellitus; HbA1c: Glycated hemoglobin

Table 8: Association between neuropathy with knowledge and practice score

	Neuropathy, n (%)	Normal, n (%)	P
Knowledge			
Low	38 (39.6)	58 (60.4)	0.001
Satisfactory	8 (11.1)	64 (88.9)	
High	32 (39.0)	50 (61.0)	
Practice			
Low	36 (37.5)	60 (62.5)	0.11
Moderate	24 (24.0)	76 (76.0)	
High	18 (33.3)	36 (66.7)	

our study, we did not find association between diabetic neuropathy with variables including; age, family history of DM, and HbA1c, while duration of diabetes, residency, socio-economic state, BMI, and smoking had significant association, in which the percentage of neuropathy was higher among patients living in rural areas,

those with low socio-economic state, those who are obese and smokers. Our results are in agreement with other previous studies in determining the risk factors for neuropathy, and duration of diabetes is strongly related to neuropathy among almost all previous studies.^[28,30,32,35-37] Glycemic control is another a strong risk factor among many of the previous studies.^[35-37] The lack of association between DPN and HbA1c in the current study could be explained by the confounding effect of duration of diabetes where the intensity of glycemic control is affected by the duration of diabetes. Moreover, the anti-hyperglycemic medications could play a role in attenuation of the impact of glycemic control on the development and progression of diabetic neuropathy. In the meantime, our finding does not mean that proper glycemic control has no influence on the development of chronic DM complications as neuropathy. That is, in accordance with a study by Khawaja *et al.* in Jordan^[28] and another study by Al-Kaabi *et al.* in Bahrain^[32] that correlated the variables to each part of MNSI history and examination separately, in the MNSI – signs part the author did not find association between HbA1c and neuropathy.^[32] Age is another risk factor in the majority of the studies.^[30,32,33,35,36] Al-Mahroos, Al-Roomi, and Gedebjerg *et al.* stated that smoking is related to neuropathy,^[33,36] while Al-Kaabi *et al.* found no association between smoking and both parts of MNSI.^[32] Although dyslipidemia and BMI had no association with neuropathy according to Börü *et al.*, Al-Kaabi *et al.*, and Gedebjerg *et al.*^[32,33,35], but they are linked to neuropathy, and the mechanisms for this nerve damage include fat deposition, extracellular protein glycation, mitochondrial dysfunction, oxidative stress, and activation of counter-regulatory signaling pathways leading to chronic metabolic inflammation.^[32] Very few studies mention that male gender is a risk factor for neuropathy,^[30,33] but most of the other studies agree on that gender has no relation with neuropathy.^[28,35-37]

Studies further proved that neuropathy is strongly associated with foot ulcers.^[36] Those with sever DPN are 24 times more liable to develop foot ulcers.^[7] This shows the importance of good foot care practice among all diabetic patients especially those who have DPN to prevent foot ulcer. Remarkably, we found that poor knowledge about foot care was a significant factor of DPN. The rate of DPN was highest among those with low-score knowledge ($P < 0.05$). This is in line with a two study in Ethiopia by Gebrekirstos *et al.* and Mariam *et al.* and a study in Kenya by Nyamu *et al.* who all observed higher prevalence of diabetic foot ulcer in diabetics with poor knowledge and poor self-care practice.^[38-40] In our study, the rate of DPN was highest among those with low-score practice. Although association was not significant ($P = 0.11$), possible explanation for this might be because of recall bias, which the participants did not give correct information.

The overall mean practice score in our study was (5.9 ± 2.1 SD). The majority was of moderate practice score. It was significantly higher among age group (40–70 years), urban people, higher socio-economic status, obese, those with family history of DM, and those with longer duration of DM ($P < 0.05$). Our results

were consistent with a study by Al-Asmary *et al.* in Saudi Arabia in which practice score was also moderate, and it was associated with age, gender, illiterate, unemployed, and smoking.^[12] There is very little data showing good foot care practice in diabetic patients. In a study in India, they found 67% were having good foot care practice score.^[9] Many studies in different countries show that foot care practice are neglected by diabetic patients.^[4,7,10,15,17,18,20,21,24,41,42] In study by Kim and Hongsrangon in Thailand, it was associated with gender, socio-economic state, family history of diabetes, and marital status.^[41]

Better foot care practice can be achieved by better knowledge about foot care practices among diabetic patients, and our study showed a significant association between them, in which the practice score was higher among patients with higher knowledge score ($P < 0.05$). This finding is in agreement with previous studies done in South Africa by Ralineba *et al.*, Sri Lanka by Jeewanta and Bangladesh by Saleh *et al.* that all showed significant association between knowledge and practice scores.^[15,24,42] In contrary, in the study in Thailand by Kim and Hongsrangon found no association between knowledge and practice. Although they found significant relation between knowledge and attitude, then attitude was having significant effect on practice.^[41]

The overall mean knowledge score was (6.1 ± 2.6 SD), the most correct measure that the patients were knowing was (washing their feet daily) 76%, which we believe that owing to religious practice, because they have to wash their feet every time before praying. The next important measures aware about were daily foot inspection, buying the correct size shoes, and importance of stocking. The most neglected practice was drying their feet after washing it, only 30% of them were drying their feet. Our results were in agreement with Kim *et al.*'s study in Thailand in which the knowledge score was average.^[41] In Al-Asmary *et al.*'s study in Saudi Arabia, knowledge score was also satisfactory.^[12] There are many studies that show good knowledge score.^[9,21-25,43] Daily washing feet had a high percentage in two studies in Saudi Arabia and Pakistan by Al-Hariri *et al.* and Hasnain and Sheikh, respectively, because of the same our reason, part of an Islamic ritual.^[21,43] In contrary, there are studies that showed low-knowledge score.^[4,10,14,15,17,20] In a study in Malaysia by Muhammad-Lutfi *et al.*, the majority were unaware that foot should be washed by a warm water, the temperature should be checked before washing feet, and using moisturizer on feet is good.^[17] In another study in Iran by Kafaie *et al.*, the majority were not knowing that not washing their feet daily, no daily foot inspection, cutting nail using a blade, and not using moisturizer on feet are bad to their health. However, their knowledge significantly improved after an education program.^[20] Education and duration of diabetes were among factors that had significant influence on knowledge by studies in Tanzania by Chiwanga and Njelekela, India by George *et al.*, and Saudi Arabia by Al-Asmary *et al.*^[7,9,12]

In our study, residency had a significant impact on knowledge score, in which people in urban were having much higher rate of

knowledge score. Knowledge score was high among both those with low socio-economic state and high socio-economic state. It was high among over weight patients, smokers, and those with improper glycemic control ($P < 0.05$), majority of both high and low socio-economic status (48%) were having high-knowledge score, and this might be explained by that people in both these groups are more careful about their health, the rate of diseases is higher among low group which makes them know more about the disease, and people in high group are usually more careful because they read more about diseases in social media and internet.

Our findings show the importance of increasing awareness of diabetic patients about proper foot care practice to reduce incidence of complications. This can be done through educating patient about these important practices. This can mainly be done by primary care physicians and family physicians, who can have a big role in this education.

Acknowledgment

We would like to thank the staff of diabetes clinic in both Rizgary Teaching hospital and Layala Qasem diabetes center for their effort. The study has not received any funding from any organization

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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