

Knowledge of and practice related to foot care among diabetic patients in primary health care center at Ministry of Health, Taif, Saudi Arabia

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Abstract

Background: Despite the continuous efforts aimed at prevention in the studied primary health care centers, there was a notable increase in amputation rate, which has a significant negative impact on survival of diabetic patients. Sufficient awareness of diabetic patients about foot care as well as its proper practice, is essential in preventing diabetic foot problems and amputation.

Objectives: To assess the knowledge and practice of foot care among diabetic patients attending primary healthcare centers.

Patients and methods: A cross sectional study was conducted in Taif city, among adult diabetic patients attending the primary health care centers, belonging to the Ministry of Health during the proposed study period from February to May 2022. An Arabic self-administered questionnaire including four sections (sociodemographic factors, patients' knowledge about self-care of diabetic foot, patients' practices regarding self-care of diabetic foot and the barriers for not routinely checking for diabetic neuropathy at diabetic foot clinic) was utilized for data collection

Results: A total of 385 diabetic patients were included in the study. Their ages ranged between 14 and 75 years with an arithmetic mean of 40.6 and standard deviation of 13.2 years. Females represented 60.5% of them. Almost two-thirds of the participants (64.4%) were type 2 diabetic patients. Almost one quarter of diabetic patients (26.4%) expressed a good level of knowledge regarding foot care; particularly older patients ($p=0.033$), those living in urban areas ($p=0.002$), the employed ($p=0.007$), type 2 diabetics ($p=0.029$) and patients who obtained their information about foot care from internet/social media or health staff ($p=0.004$). Good foot care-related practice was reported among 42.1% of the diabetic patients; particularly Saudi patients ($p=0.029$), higher educated ($p=0.016$), employed ($p=0.032$), those with higher family income ($p=0.048$) and those who had their information about foot care from health staff ($p<0.001$).

Conclusion: A relative suboptimal level of both knowledge and practice related to foot care was observed. Educational programs including practical sessions, preferably through using videos regarding the best practice of foot care are highly recommended for diabetic patients.

Keywords: Knowledge, practice, foot, diabetic, PHC, Taif

List of abbreviations

DM Diabetes mellitus

IDF International Diabetes Federation

HbA1c Glycated hemoglobin

DF Diabetic foot

SPSS Statistical Package for Social Sciences

Introduction

Currently, diabetes mellitus (DM) is one of the highest global health emergencies of the 21st century as stated by the International Diabetes Federation (IDF)(1). It is estimated that 415 million adults aged 20-79 exist with diabetes worldwide and this will increase to 642 million in 2040, if no efforts are taken to overcome the situation (2). The Kingdom of Saudi Arabia (KSA) has one of the world's highest prevalence rates of type 2 diabetes (1). The Arabian Gulf wealth has led to better living conditions, thereby causing an increase in urbanization, major changes in nutrition, decreased physical activity, and further dependency on migrant workers (3). In Saudi Arabia, the prevalence of DM in adults in 2016 was 25% (4). Alsenany and Al Saif (2015) suggested that more than 44% of individuals aged 55 or older had severe to uncontrolled diabetes with long-term complications (5).

Diabetes has life altering consequences that forces individuals to add some responsibility of self-care as they are required to maintain controlled levels of glycated hemoglobin (HbA1c) (6). Up to 50% of diabetics in the US failed to control their blood sugar and developed various complications (7).

Diabetic patients have greater vulnerability to many types of complications, both short and long-term, which often lead to their early death (8). These complications are classified into two categories; macrovascular, which includes stroke, coronary and peripheral arterial disease, and microvascular, which is associated with other DM-induced long-term complications such as neuropathy, retinopathy, nephropathy, diabetic foot, and cardiovascular diseases (9).

Diabetes mellitus has specific harmful effects on the feet as ulceration of lower limbs and feet occur in about 15% of diabetic patients (10). Studies in the Arab world showed a prevalence of neuropathy ranging between 38–94% in diabetic foot (DF) cases and the prevalence of peripheral vascular disease ranged between 50–78.7% (11). Studies in Saudi Arabia about DF and its complication are numerous and indicate significant impact (12–15).

Despite the continuous efforts aimed at prevention, there has been a notable increase in amputation rate (16). Amputation has a significant negative impact on survival (17).

Sufficient awareness of diabetic patients about foot care is an essential line in preventing DF problems and amputation (18). Proper practices of foot health care are important for reducing the incidence of foot ulcers and complication (19). Studies indicate that patients' education regarding proper foot care practices could play a vital role in reducing diabetes related foot ulceration and amputations (20). Also, foot care practices reduce common foot problems such as corns and callosities and facilitate healing of foot ulcers (21). There are limited Saudi studies investigating the knowledge and practices regarding foot care among diabetic patients. A previous study done in Riyadh, Saudi

Arabia in 2020 found sufficient knowledge among 65% of diabetic patients with no gender difference (22). In Asser Region, Al-Jarallah et al., 2020 found low knowledge and attitude scores. Previous training and/or attending workshop on diabetic foot care was significantly associated with higher knowledge and attitude scores (23).

This study aimed to assess the knowledge and practice of foot care among diabetic patients attending primary healthcare centers and associated socio-demographic and clinical-related factors.

Subjects and Methods

Study design, setting and time frame: A cross sectional study was done in Taif city, Saudi Arabia between February to May 2022.

Study population: The inclusion criteria were Adult diabetic patients attending the primary health care centers, belonging to the Ministry of Health in Taif during the proposed study period from February to May 2022, in addition to patients with diagnosed DMT2 or type 1 diabetes mellitus (DMT I) for more than 6 months, who had ever developed foot ulcerations, were aged over 14 years, with good mental status, and psychological status and Arabic speakers. The exclusion criteria were patients with physical disabilities, gestational diabetes, diabetic patients on insulin pump, patients who refused to sign informed consent, non-Arabic speakers, those diagnosed with DMT2 or type 1 diabetes mellitus (DMT I) for less than 6 months and those aged less than 14 years old.

Sample size

The sample size was calculated using the Cochran's formula for estimating sample size equation as follows (24):

$$N = \frac{Z_{\alpha/2}^2 \times p \times (1-p)}{D^2}$$

where: n=Minimum sample size, $Z_{\alpha/2}$ = the critical value of the Normal distribution at $\alpha/2$ (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), P= Prevalence of sufficient knowledge about diabetic foot care: It is estimated as 65% based on a recent Saudi study carried out in Riyadh (22) D= Degree of precision. So, the calculated minimum sample size was:

$$1. \quad n = \frac{(1.96)^2 \times 0.65 \times 0.35}{(0.05)^2} = 350$$

The sample was increased by approximately 10% to compensate for possible no or incomplete response, thus it was 385 diabetic patients.

Sampling technique: Following a simple random sampling technique, four PHCCs were randomly selected. A total of 96 diabetic patients attending these PHCCs during data collection period were selected by systematic random technique according to number of patients visiting each center daily and were invited to participate in the study by filling in the study questionnaire.

Study instrument: An Arabic self-administered questionnaire was utilized for data collection. It was done according to recommendations of the American College of Foot and Ankle Surgeons and Diabetes UK and has been previously adopted in recent studies carried out in Riyadh (25) and Makkah (26). Permission to use the questionnaire was obtained through personal communication with authors in Makkah.

The questionnaire consisted of four sections; Section 1 contained questions about sociodemographic factors and Section 2 contained questions about patients' knowledge about self-care of diabetic foot (11 items). Section 3 contained questions about patients' practices regarding self-care of diabetic foot and Section 4 contained the barriers for not routinely checking for diabetic neuropathy at a diabetic foot clinic. For each correct answer 1 point was given and for an incorrect answer, "0" was given.

The maximum score for knowledge was 11, <60% was categorized as poor level of knowledge, 60–80% was categorized as medium level of knowledge, and >80 was categorized as a good level of knowledge. The third part included 11 questions about foot-care practice. Correct practice was assigned a score of "1" while incorrect practice was assigned a score of "0". Total score was computed (ranged between 0 and 11) and its percentage was estimated. Patients who scored <60% were categorized as poor practice, 60–80% were categorized as satisfactory practice, and >80 were categorized as good practice (26).

Data collection: The researchers visited the PHC centers after getting approvals. They explained the purpose of the study to all physicians and patients chosen for the study and did not ask for their names to ensure confidentiality. Self-administered questionnaires were distributed to selected patients while waiting for physicians' appointment and collected after half an hour. The data collection was implemented during regular daytime working hours. One to two weeks was spent in each PHC center involved in the study. A trained male colleague/nurse helped in data collection from male patients.

Statistical analysis: The data were entered and analyzed by Statistical Package of Social Science SPSS, version 27. The descriptive statistics such as frequencies, and percentages were calculated to summarize nominal and ordinal data, while mean and standard deviation were adopted to describe numerical variables. Chi-squared test was used to evaluate the association between the determinants and the outcome variables. Any p-value <0.05 was considered statistically significant.

Ethical considerations: Written permission from MOH Program of Family Medicine, and from all PHCCs directors Taif Region was obtained.

Results

A total of 385 diabetic patients were included in the study. Their sociodemographic characteristics are summarized in Table 1. Their age ranged between 14 and 75 years with an arithmetic mean of 40.6 and standard deviation of 13.2 years. Females represented 60.5% of patients. More than half of them (53.2%) were married and the majority (96.9) were Saudi nationals and living in urban areas (89.6%). More than half were bachelor holders (57.3%), employed (53.5%) and having family income that ranged between 5000 and 15000 Saudi Riyals/month (59%).

Type of diabetes: As seen in Figure 1, almost two-thirds of the participants (64.4%) were type 2 diabetic patients whereas the remaining 35.6% were type 1 diabetic patients.

Source of information about diabetic foot care: The commonest reported sources of information about foot care among the participants were health staff (67%), internet/social media (46.2%) and friends/relatives (37.9%). (Figure 2).

Having risk factors for diabetic foot: History of having risk factors for diabetic foot was reported by 44.4% of patients; mainly decrease vision/retinopathy (28.1%) and neuropathy (14.8%). (Table 2).

Knowledge of diabetic foot care: Table 3 summarizes the responses of the diabetic patients to 11 knowledge statements regarding foot care. The majority of them knew correctly that diabetic patients should take medication regularly because they are liable to get DM complications (96.9%), should look after their feet because wounds and infection may not heal quickly (93.2%) and should look after their feet because they may not feel a minor injury to their feet (91.2%). On the other hand, only 29.4% of them knew that they should be seen immediately by the physician, if they find redness/bleeding between toes and a minority of them (17.9%) knew that they should be immediately seen by the physicians if they have a corn/hard skin lesion even once.

Almost one quarter of diabetic patients (26.4%) expressed a good level of knowledge regarding foot care as illustrated in Figure 3.

Older patients were more likely to express either a medium level (41.7±12.7 years) or good level (41.2±13 years) of knowledge about foot care than relatively younger patients (37.2±14.4 years), p=0.033. Also, patients living in urban areas were more likely to have higher, medium or good knowledge about diabetic foot compared to those living in rural areas (55.3% and 27% vs. 27.8% and 22.2%, respectively), p=0.002. Employed patients were more likely to have higher, medium or good knowledge about diabetic foot compared to unemployed patients (58.3%

and 27.2% vs. 46.9% and 25.7%, respectively), $p=0.007$. Type 2 diabetic patients were more likely to have higher, medium or good knowledge about diabetic foot compared to type 1 diabetic patients (54.9% and 28.6% vs. 49.7% and 22.6%, respectively), $p=0.029$. Patients who obtained their information about foot care from internet/social media or health staff were more likely to express a good level of knowledge about foot care compared to those who obtained their information from books/journals/others (34.4% and 32.2% vs. 15.8%, respectively), $p=0.004$. (Table 4).

Diabetic foot care-related practice: The majority of the patients wash their feet with warm water (95.3%), trim their toenails straight across (88.3%), measure their feet size when last they bought footwear (84.4%), inspect their feet regularly (83.6%) and wash their feet regularly (81.8%). On the other hand, only 32.2% received advice when they last bought footwear. (Table 5)

Figure 4 shows that 42.1% of the diabetic patients expressed good foot care-related practice. Saudi patients were more likely to express good level of foot care-related practice than non-Saudi patients (43.2% vs. 8.3%), $p=0.029$. The highest rate of good level of practice was observed among Bachelor holders (47.5%) whereas the lowest level was observed among those who are just able to read and write (23.1%), $p=0.016$. Employed patients were more likely to have higher good practice of foot care compared to unemployed patients (48.1% vs. 29.1%), $p=0.032$. Patients with the highest family income (>25000 SR/month) had the highest rate of good practice related to foot care (48.3%) while those with the lowest family income (<5000 SR/month) had the lowest rate of good practice (29.1%), $p=0.048$. Patients who received their information about foot care from health staff were more likely to express a good level of practice related to foot care compared to those who obtained their information from friends and relatives (60.3% vs. 24.2%), $p<0.001$. (Table 6).

Association between knowledge and practice of foot care: As shown in Table 7, more than half (53.9%) of patients with a good level of knowledge about diabetic foot care expressed a good level of practice in this regard, ($p<0.001$).

Table 1: Sociodemographic characteristics of patients (n=385)

Variable	Frequency	Percentage
Sex		
Male	152	39.5
Female	233	60.5
Age in years		
Range	14-75	
Mean±SD	40.6±13.2	
Marital status		
Single	103	26.8
Married	205	53.2
Divorced	46	11.9
Widowed	31	8.1
Nationality		
Saudi	373	96.9
Non-Saudi	12	3.1
Place of residence		
Urban	345	89.6
Rural	18	4.7
Semi-rural	22	5.7
Education		
Illiterate	18	4.7
Able to read and write	13	3.4
Primary-high school	110	28.6
Bachelor/Diploma	221	57.3
Master/PhD	23	6.0
Employment status		
Employed	206	53.5
Unemployed	179	46.5
Family income (SR/month)		
<5000	55	14.3
5000-15000	227	59.0
15001-25000	74	19.2
>25000	29	7.5

Figure 1: Distribution of the participants according to the type of diabetes

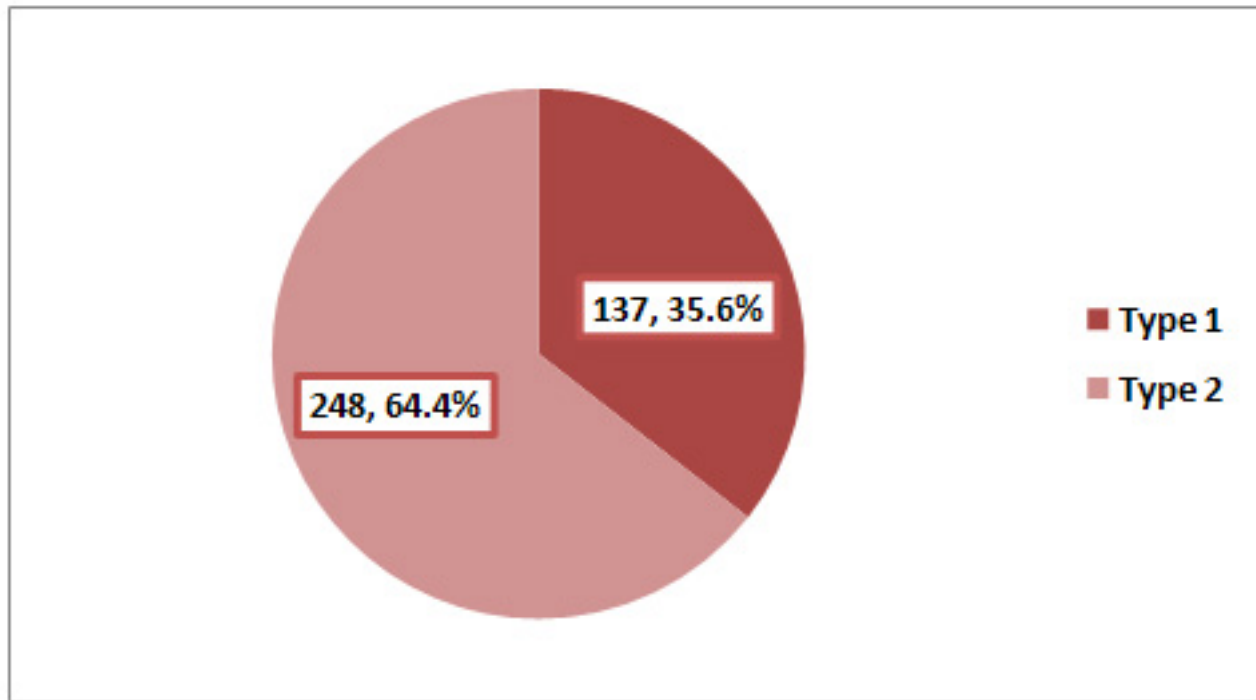


Figure 2: Source of information about diabetic foot care among the participants (Not mutually exclusive Sum exceed 100%)

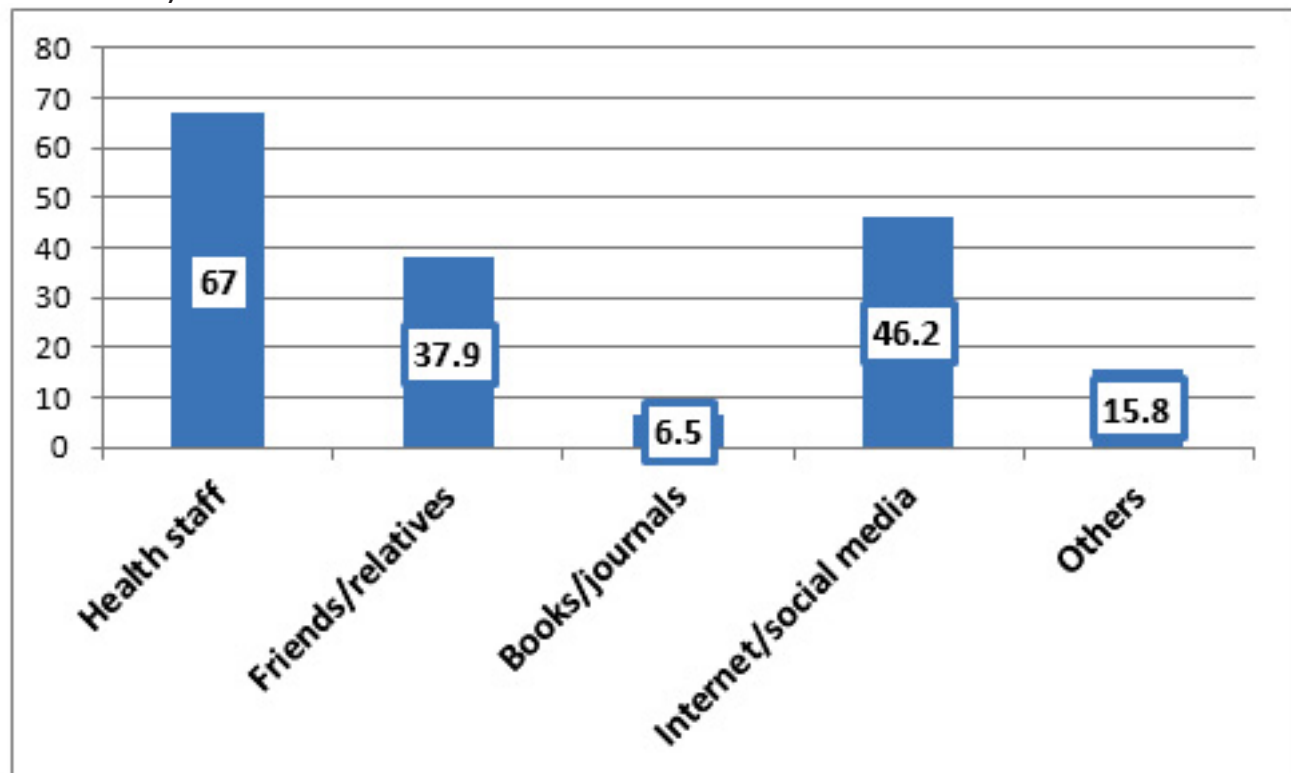


Table 2: History of risk factors for diabetic foot among the participants

	Frequency	Percentage
No	214	55.6
Yes	171*	44.4*
Neuropathy	57	14.8
Decreased vision/retinopathy	108	28.1
Angiopathy	37	9.6
Dorsal feet pulse	9	2.3

*Not mutually exclusive. Sum exceeds 100%)

Table 3: Patients` responses to diabetic foot care knowledge statements

Knowledge statements	Correct answer		
	Right response	N	%
DM patients should take medication regularly because they are liable to get DM complication	Yes	373	96.9
DM patients should look after their feet because they may not feel a minor injury to their feet	Yes	351	91.2
DM patients should look after their feet because wounds and infection may not heal quickly	Yes	359	93.2
DM patients should look after their feet because they may get a foot ulcer	Yes	346	89.9
DM patients should not smoke because smoking causes poor circulation affecting the feet	Yes	264	68.6
How often do you think you should inspect your feet?	Daily	169	43.9
If you found redness/bleeding between your toes what is the first thing you do?	To be seen immediately by physician	113	29.4
Even if you have never had a corn/ hard skin lesion, what would you do if you had one	To be seen immediately by physician	69	17.9
How often do you think your feet should be washed per day	Five times	245	63.6
What temperature of water do you think you should wash your feet in	Moderate temperature	283	73.5
How often do you think you should inspect the inside of your footwear for objects or torn lining	Once daily/every time footwear put on	322	83.6

Figure 3: Level of diabetic patients` knowledge regarding foot care

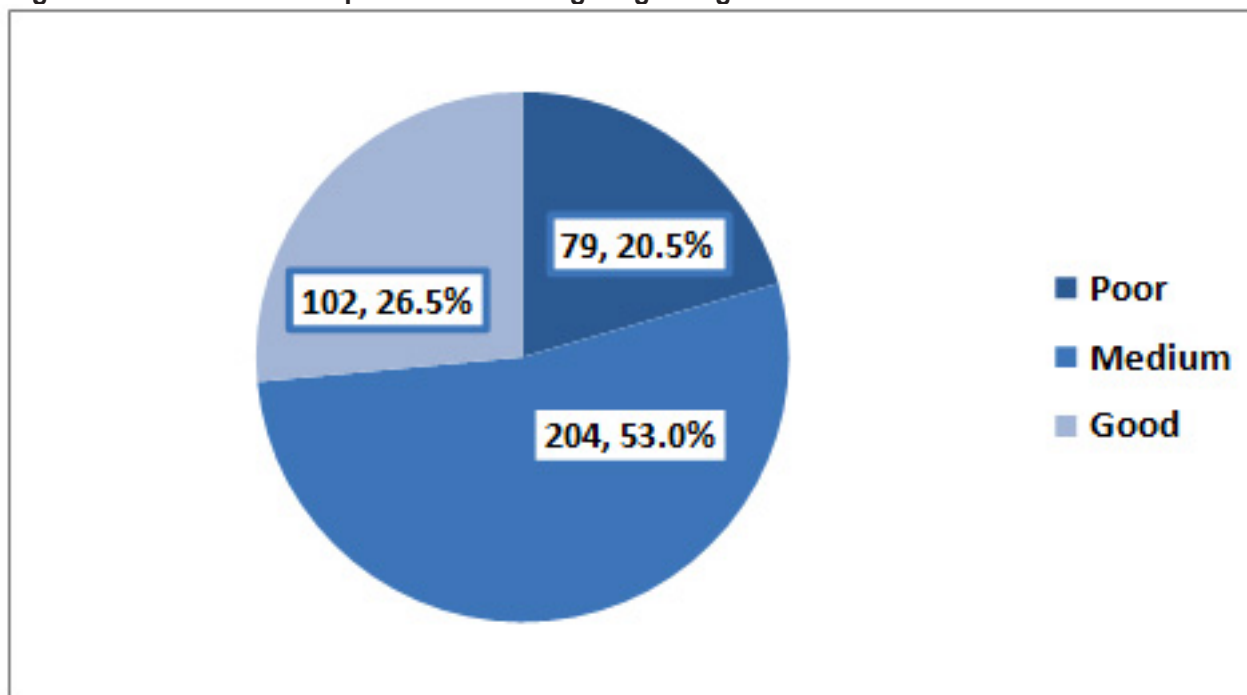


Table 4: Factors associated with knowledge of the participants about diabetic foot care

	Level of knowledge about diabetic foot care			p-value
	Poor N=79 N (%)	Medium N=204 N (%)	Good N=102 N (%)	
Sex				
Male (n=152)	29 (19.1)	85 (55.9)	38 (25.0)	0.646*
Female (n=233)	50 (21.5)	119 (51.1)	64 (27.5)	
Age in years				
Mean±SD	37.2±14.4	41.7±12.7	41.2±13	0.033†
Marital status				
Single (n=103)	24 (23.3)	50 (48.5)	29 (28.2)	0.771*
Married (n=205)	38 (18.5)	112 (54.6)	55 (26.8)	
Divorced (n=46)	9 (19.6)	24 (52.2)	13 (28.3)	
Widowed (n=31)	8 (25.8)	18 (58.1)	5 (16.1)	
Nationality				
Saudi (n=373)	75 (20.1)	199 (53.4)	99 (26.5)	0.522*
Non-Saudi (n=12)	4 (33.3)	5 (41.7)	3 (25.0)	
Place of residence				
Urban (n=345)	61 (17.7)	191 (55.3)	93 (27.0)	0.002*
Rural (n=18)	9 (50.0)	5 (27.8)	4 (22.2)	
Semi-rural (n=22)	9 (40.9)	8 (36.4)	5 (22.7)	
Education				
Illiterate (n=18)	3 (16.7)	10 (55.6)	5 (27.8)	0.141*
Able to read and write (n=13)	5 (38.5)	6 (46.1)	2 (15.4)	
Primary-high school (n=110)	30 (27.3)	48 (43.6)	32 (29.1)	
Bachelor /Diploma (n=221)	35 (15.8)	130 (58.8)	56 (25.3)	
Master/PhD (n=23)	6 (26.1)	10 (43.5)	7 (30.4)	
Employment status				
Employed (n=206)	30 (14.6)	120 (58.3)	56 (27.2)	0.007*
Unemployed (n=179)	49 (27.4)	84 (46.9)	46 (25.7)	
Family income (SR/month)				
<5000 (n=55)	19 (34.5)	27 (49.1)	9 (16.4)	0.156*
5000-15000 (n=227)	42 (18.5)	120 (52.9)	65 (28.6)	
15001-25000 (n=74)	13 (17.6)	42 (56.7)	19 (25.7)	
>25000 (n=29)	5 (17.2)	15 (51.8)	9 (31.0)	
Type of diabetes				
Type 1 (n=137)	38 (27.7)	68 (49.7)	31 (22.6)	0.029*
Type 2 (n=248)	41 (16.5)	136 (54.9)	71 (28.6)	
Main source of information				
Health staff (n=121)	8 (6.6)	74 (61.2)	39 (32.2)	0.004*
Friends/relatives (n=33)	10 (30.3)	16 (48.5)	7 (21.2)	
Internet/social media (n=32)	7 (21.9)	14 (43.8)	11 (34.4)	
Books/journals/Others (n=19)	5 (26.3)	11 (57.9)	3 (15.8)	
Two sources (n=105)	25 (23.8)	53 (50.5)	27 (25.7)	
More than two sources (n=75)	24 (32.0)	36 (48.0)	15 (20.0)	
Having risk factors for diabetic foot				
No (n=214)	39 (18.2)	116 (54.2)	59 (27.6)	0.453*
Yes (n=171)	40 (23.4)	88 (51.5)	43 (25.1)	

*Chi-square test

†ANOVA test

Table 5: Patients` responses to practice of diabetic foot care statements

	Correct answer		
	Right response	N	%
Do you inspect feet regularly?	Yes	322	83.6
Do you wash feet regularly?	Yes	315	81.8
Do you wash feet with warm water?	Yes	367	95.3
Do you trim toe nails straight across?	Yes	340	88.3
Did you measure your feet size when last you bought footwear?	Yes	325	84.4
Did you receive advice when last you bought footwear?	Yes	124	32.2
Did you ever inspect inside of footwear?	Yes	255	66.2
Do you regularly walk barefoot?	No	266	69.1
Do you clean nails with sharp instrument?	No	270	70.1
Do you add irritants to water before feet cleaning?	No	245	63.6
Do you wear elasticated hosiery?	No	254	66.0

Figure 4: Level of diabetic foot care-related practice among the participants

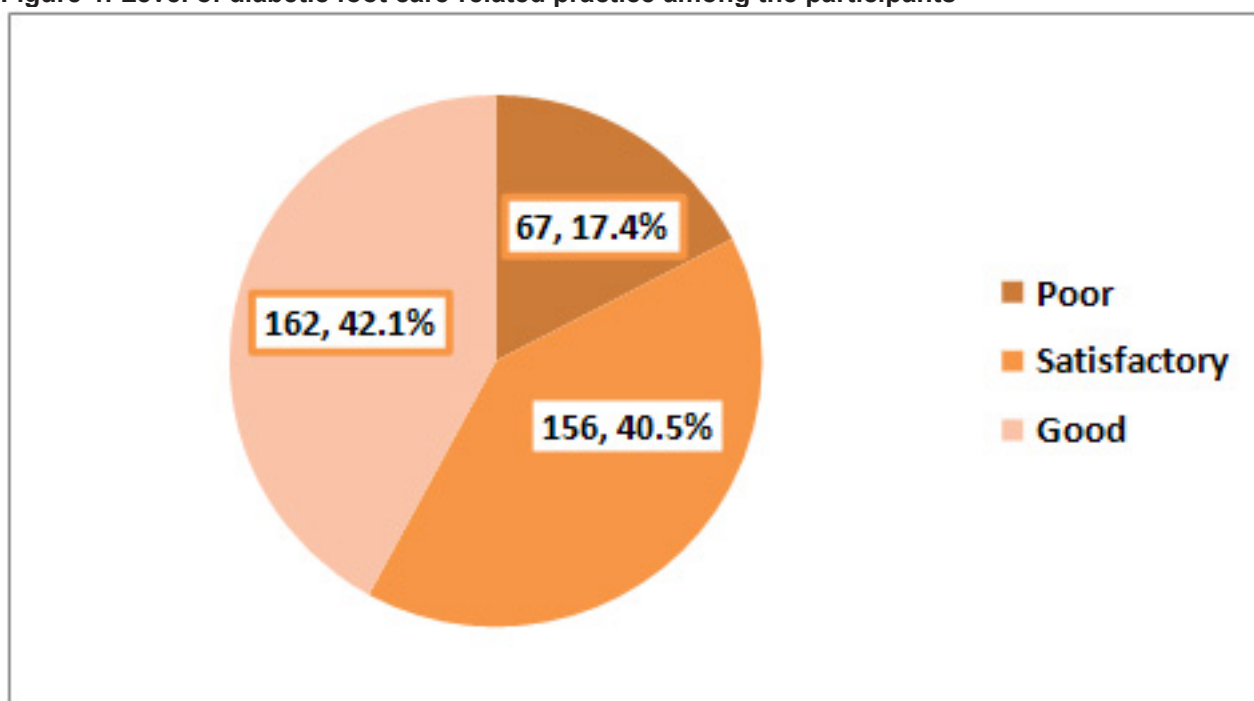


Table 6: Factors associated with diabetes foot care-related practice among the participants

	Level of practice related to diabetic foot care			p-value
	Poor N=67 N (%)	Satisfactory N=156 N (%)	Good N=162 N (%)	
Sex				
Male (n=152)	27 (17.8)	59 (38.8)	66 (43.4)	0.858*
Female (n=233)	40 (17.2)	97 (41.6)	96 (41.2)	
Age in years				
Mean±SD	42.5±13.6	40.1±13.1	40.4±13.2	0.451†
Marital status				
Single (n=103)	9 (8.7)	46 (44.7)	48 (46.6)	0.098*
Married (n=205)	38 (18.5)	80 (39.0)	87 (42.4)	
Divorced (n=46)	11 (23.9)	17 (37.0)	18 (39.1)	
Widowed (n=31)	9 (29.0)	13 (42.0)	9 (29.0)	
Nationality				
Saudi (n=373)	64 (17.2)	148 (39.7)	161 (43.2)	0.029*
Non-Saudi (n=12)	3 (25.0)	8 (66.7)	1 (8.3)	
Place of residence				
Urban (n=345)	57 (16.5)	140 (40.6)	148 (42.9)	0.443*
Rural (n=18)	6 (33.3)	7 (38.9)	5 (27.8)	
Semi-rural (n=22)	4 (18.2)	9 (40.9)	9 (40.9)	
Education				
Illiterate (n=18)	8 (44.4)	4 (22.2)	6 (33.4)	0.016*
Able to read and write (n=13)	4 (30.8)	6 (46.2)	3 (23.1)	
Primary-high school (n=110)	19 (17.3)	52 (47.3)	39 (35.5)	
Bachelor /Diploma (n=221)	34 (15.4)	82 (37.1)	105 (47.5)	
Master/PhD (n=23)	2 (8.7)	12 (52.2)	9 (39.1)	
Employment status				
Employed (n=206)	30 (14.6)	77 (37.4)	99 (48.1)	0.032*
Unemployed (n=179)	37 (20.7)	79 (44.2)	63 (29.1)	
Family income (SR/month)				
<5000 (n=55)	16 (29.1)	23 (41.8)	16 (29.1)	0.048*
5000-15000 (n=227)	41 (18.1)	85 (37.4)	101 (44.5)	
15001-25000 (n=74)	8 (10.8)	35 (47.3)	31 (41.9)	
>25000 (n=29)	2 (6.9)	13 (44.8)	14 (48.3)	
Type of diabetes				
Type 1 (n=137)	30 (21.9)	59 (43.1)	48 (35.0)	0.070*
Type 2 (n=248)	37 (14.9)	97 (39.1)	114 (46.0)	
Main source of information				
Health staff (n=121)	6 (5.0)	42 (34.7)	73 (60.3)	<0.001
Friends/relatives (n=33)	10 (30.3)	15 (45.5)	82 (24.2)	
Internet/social media (n=32)	7 (21.9)	16 (50.0)	9 (28.1)	
Others (n=19)	8 (42.1)	6 (31.6)	5 (26.3)	
Two sources (n=105)	23 (21.9)	46 (43.8)	36 (34.3)	
More than two sources (n=75)	13 (17.4)	31 (41.3)	31 (41.3)	
Having risk factors for diabetic foot				
No (n=214)	34 (15.9)	86 (40.2)	94 (43.9)	0.595*
Yes (n=171)	33 (19.3)	70 (40.9)	68 (39.8)	

*Chi-square test

†ANOVA test

Table 7: Association between knowledge about diabetic foot care and its practice among the participants

Level of knowledge about diabetic foot care	Level of diabetic foot care-related practice			p-value*
	Poor N=67 N (%)	Satisfactory N=156 N (%)	Good N=162 N (%)	
Poor (n=79)	36 (45.6)	32 (40.5)	11 (13.9)	<0.001
Medium (n=204)	23 (11.3)	85 (41.7)	96 (47.1)	
Good (n=102)	8 (7.8)	39 (38.2)	55 (53.9)	

* Chi-square test

Discussion

Having proper knowledge as well as sound practice concerning diabetic foot care is vital for diabetic patients in controlling the serious complications of diabetes such as the development of diabetic foot ulcers as well as amputation of the lower limbs (27,28,29).. Thus, we intended to explore both knowledge and practice related to foot care among diabetic patients attending the primary health care centers, belonging to the Ministry of Health in Taif city, Western Saudi Arabia.

In the present study, most of the patients (73.5%) could recognize that their feet should be washed daily by moderate temperature water. Lower figures (almost half) of patients were aware that they should perform proper foot hygiene in a previous study carried out in the United Kingdom (30).

In a recent Saudi study, the majority of patients (85.4%) were unaware of the suitable temperature of water used to wash their feet, and furthermore, 60.1% were unaware of how often they should inspect their feet (31).

Fortunately, the majority of patients in this study knew that they should look after their feet because they may develop foot ulcers. In disagreement with this finding, most patients in another Saudi study were unaware of the importance of looking after their feet (32). However, a low proportion of patients could recognize that if they found redness/bleeding between toes, the first action that should be done is to be seen immediately by physicians and even if they had a corn/hard skin lesion, they should be seen immediately by physician. Similar findings have been reported by others in Saudi Arabia (32) and UK (30).

In disagreement with this, most diabetic patients in the Eastern Province Saudi Arabia sought immediate medical advice when they had any feet lesions (33).

Almost two-thirds (68.6%) of diabetic patients in the current study could recognize that diabetic patients should not smoke as smoking leads to poor blood circulation, which could seriously impact their feet. The same has been observed in a recent Saudi study carried out in Tabuk (32). However, in an older study carried out in the UK, about half of diabetic patients were unaware that smoking can seriously impact the circulation of the feet (30).

In the current study, more than half of diabetic patients expressed a medium level of knowledge about diabetic foot care whereas nearly a quarter of them (26.5%) expressed a good level and 20.5% had poor level of knowledge. In Tabuk (Saudi Arabia), most of the diabetic patients had a poor level of knowledge regarding foot care with only a minority having a good level of knowledge (32).

Higher rate of poor knowledge about foot care was reported in Iran (84.8%) (34). Comparable figures of poor knowledge about foot care have been reported by others in Iran (23.3%) (29), Nigeria (30.1%) (35), Saudi Arabia (26%) (31) and South Africa (32.4%) (36). In Ethiopia (2021), good knowledge was reported among 61.3% of patients (37).

The variations in patients' knowledge regarding foot care observed in the aforementioned studies could be explained by different demographic characteristics of patients in these studies, utilizing different instruments in knowledge evaluation or application of training programs by the health care professionals in some settings (38).

In the current study, older patients, those living in urban areas, employed patients, and type 2 diabetics were more knowledgeable regarding foot care. Different findings have been observed in other similar studies. In Tabuk (Saudi Arabia), only employment status was significantly associated with knowledge about foot care (32). In Iraq (2018) (39), obese subjects, smokers, those with inadequate glycemic control, patients living in urban area, and low or high socio-economic status patients were more knowledgeable about diabetic foot care. In Ethiopia (2021), only history of retinopathy was significantly associated with good knowledge (37).

In the present study, the main sources of information about foot care among diabetic patients were health staff and internet/social media. Furthermore, patients who obtained their information about foot care from internet/social media or health staff were more knowledgeable regarding foot care. This result supports the vital role that could be played by healthcare workers in improving the diabetic patients' knowledge about foot care.

In accordance with other Saudi studies carried out in Tabuk (32), and Dammam (33), most of the diabetic patients did not regularly walk barefoot, did not add irritants to water before foot washing, did not clean nails with sharp instruments and did not wear elasticated hosiery. However

instruments and did not wear elasticated hosiery. However better practice regarding inspection and washing feet with warm water regularly have been observed in the present study compared to the before mentioned studies.

In the present study, overall, 42.1% of the diabetic patients expressed good foot care-related practice compared to none in another Saudi study carried out in Tabuk (32), 39% among diabetic patients in Ethiopia (37) and 50.4% in a study carried out in Iran (40). Furthermore, only 17.4% expressed poor foot care-related practice. Higher rates were reported in other countries such as Malaysia (61.8%) (41).

Finding an association between level of foot care knowledge and that of foot care-related practice in the present study is confirmed by others (32, 36, 39, 40).

In the present study, factors associated with better foot care-related practice among diabetic patients were Saudi nationality, higher education, employment status, having higher family income and having information about foot care from health staff. In Ethiopia (2021), female gender, age between 21 and 50 years were more likely to express good practice while singles, those living in rural areas and those with no co-morbidities were more likely to express poor practice (37). In Iran (34), place of residence, marital status, and history of hospital admission due to diabetic foot were significantly associated with foot care good practice.

In Riyadh, Saudi Arabia (2020), there was significant difference between male and female patients concerning regular self-inspection of feet and daily moisture (22). In Pakistan (2018), education of the respondents had significant association with practices regarding foot care (42).

Limitations

Limitations of the present study include being a cross-sectional which provides only association and not causality; it is also lacking some important issues such as role of family support and glycemic control. Despite those limitations, it has a public health importance in exploring this important issue in our community which is characterized by high prevalence of diabetes complications.

Conclusion

Relative suboptimal levels of both knowledge and practice related to foot care were observed among diabetic patients attending primary health care centers in Taif city, Saudi Arabia. Older patients, those living in urban areas, employed, type 2 and patients who had their information about foot care from internet/social media or health staff were more knowledgeable. Saudi patients, higher educated patients, employed, those with higher family income and those who had their information about foot care from health staff were more likely to express better practice related to foot care. Educational programs at primary healthcare centers, as well as diabetic centers and hospitals in Taif for diabetic patients, should be implemented. These programs should focus on various aspects of diabetic foot care to increase their awareness of the problem.

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