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Knowledge, Attitude and Perceived Practice of Diabetic Foot Care Among Physicians in Primary Health Care Centers in Khobar, Dammam and Qatif in Saudi Arabia: 2019, A Cross - Sectional Study

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Abstract: ***Aims:*** *To evaluate knowledge, attitude and perceived practice of DF care among physicians working in MOH in PHCCs in the Eastern Province of KSA.* ***Methods:*** *A cross - sectional study was conducted on 342 physicians working in PHCCs of MOH in Khobar, Dammam and Qatif cities in Eastern Province of KSA. Data was collected from physicians through an electronic self - administered questionnaire. The questionnaire consists of 4 parts; demographic data, knowledge, attitude, and practice.* ***Results:*** *The present study shows that (35%) of the participants had poor knowledge. Only 4.2% of the sample had the correct knowledge concerning very high - risk categorization of DF. The majority of participants agree that DF assessment could predict future risk for DFU (87.9%), while 28.3% of physicians perceived treating a DFU as too risky to manage in PHCCs. More than half of the sample (55.8%) did not select personally the wound dressing type. Nearly 38 % of physicians refer more than 50% of DFU patients to higher centers.* ***Conclusion:*** *Considered number of participants exhibits a poor level of knowledge regarding DF care. More than half of DFU were referred by 38% of physicians. Insufficient PHCCs facilities and advanced cases were the most common reasons of referral to secondary care.* ***Highlights:*** *Diabetic foot is one of the major microvascular complications of diabetes that causes morbidity and premature mortality. DM prevalence in KSA is considered to be the second highest prevalence compared to other countries. DF ulcers were associated more with advanced age, lower body mass index, and longer DM duration.*

Keywords: Diabetic Foot, Diabetes Mellitus, Ulcer, Amputation, Saudi Arabia

Abbreviations

ADA (American Diabetes Association), BMJ (British Medical Journal), CI (Confidence Interval), DF (Diabetic foot), DFU (Diabetic Foot Ulcer), DM (Diabetes Mellitus), FM (Family Medicine), GP (General Practitioner), KSA (Kingdom of Saudi Arabia), IDF (International Diabetes Federation), MOH (Ministry Of Health), PHC (Primary Health Care), PHCC (Primary Health Care Center), WHO (World Health Organization), SPSS (Statistical Package for the Social Sciences)

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1.Introduction

Diabetes mellitus (DM) is a pandemic chronic disease that has a major economic burden and negative impact on health globally. It is a chronic metabolic disease associated with altered glucose metabolism as well as macrovascular and microvascular complications. This includes preventable diabetic foot problems that are common complications in these patients. (1)

Diabetes prevalence in the Kingdom of Saudi Arabia (KSA) is increasing at an alarming rate among different age groups. Our kingdom has one of the highest diabetes prevalence levels globally. In gulf countries, DM prevalence in KSA is considered to be the second highest prevalence compared to others. Kuwait has the highest prevalence of DM followed by KSA 14.7%, 14.4% respectively. (2, 3)

Diabetic foot (DF) is one of the major microvascular complications of diabetes that causes morbidity and premature mortality in which a foot is affected by ulceration that is associated with neuropathy and/or peripheral arterial disease of the lower limb in a diabetic patient. (4, 5)

The prevalence of diabetic foot ulcers (DFUs) was estimated to be 6.3% (95%CI: 5.4 - 7.3%) globally. It was found to be higher in males (4.5%, 95%CI: 3.7 - 5.2%) than females (3.5%, 95%CI: 2.8 - 4.2%), and more common in type 2 diabetic patients (6.4%, 95%CI: 4.6 - 8.1%) than type 1 diabetics (5.5%, 95%CI: 3.2 - 7.7%). Moreover, DFUs were associated more with advanced age, lower body mass index, and longer DM duration. Patients with DFUs tend to have existing comorbidities like hypertension, diabetic retinopathy, and smoking history than patients without DFUs. (6)

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According to one study, a systematic review done in 2017 in five Arab countries including KSA, Bahrain, Iraq, Jordon and Egypt, the prevalence of DFUs in KSA was estimated to be 11.85% which was the highest. Another study found that the incidence of DFUs in KSA was 1.8% between 2009 - 2010. (7)

Most DFUs (60–80%) will heal, while 10–15% of them will remain active, and 5–24% can be complicated with lower limb amputation within 6–18 months after the first assessment. A longer duration for healing is needed for neuro - ischemic ulcers that are more likely to end with limb amputation while a period of 20 weeks is usually sufficient for most neuropathic ulcers to heal. (8) Infected DFUs are responsible for 60% of non - traumatic lower limb amputations. (9)

In the absence of effective assessment and management, DFUs have the potential to deteriorate rapidly. Reports from previous studies showed that early identification of high risk patients for DF complications and management of their risk factors could prevent lower extremity amputations and foot ulcerations. (10, 11)

Family physicians and those working in primary care services are the frontline of health care system and they play a critical role in prevention, early diagnosis, and proper management of DF cases. To the knowledge of the researcher there were no studies explore the perception of knowledge and practice of DF care among physicians in KSA. Therefore, the current study aims to determine the level of knowledge, attitude and practice of physicians working in primary care regarding DFU preventive care. (12, 13)

2.Methods

2.1 Study design, settings, time and participants

A cross - sectional study was conducted in PHCCs of MOH in Khobar, Dammam and Qatif cities in Eastern Province of KSA from Nov.2019 till Nov.2020. All physicians working in major cities in Eastern province in Khobar, Dammam and Qatif PHCCs of MOH were included in the study. Since, they have a higher number of PHCCs when compared with other cities in Eastern province of KSA. Dentists, Radiologists, and any physicians with only administrative work were excluded from this study. The total numbers of the physicians were 342.

2.2 Data collection method and tool

Data was collected from physicians through an electronic self - administered questionnaire distributed through smart phone social program. The questionnaire was adopted and modified from a similar study done in four European countries (Perception of DFUs among GPs in four European countries: knowledge, skills, and urgency). (14) The Questionnaire was modified based on ADA, IDF, and BMJ guidelines and recommendations about foot care in diabetics. It was reviewed by 7 consultants from different specialties who are expert in diabetic foot cases. Reliability of the tool was tested after performing pilot study as questionnaire was distributed to 30 physicians. The results of pilot study were excluded from the final research results. Cronbach's alpha was calculated to be 0.6 for the knowledge part, 0.747 and 0.504 for the first and the second attitude's parts respectively and 0.855 for the practice part.

The questionnaire consists of 4 parts:

1. Demographic data part: age, gender, nationality, job title, working sector, years of experience, number of diabetic patients seen per week, training about DM foot
2. Knowledge part (20 question): knowledge about risk factors, foot deformities, frequency of examination, diagnosis and management
3. Attitude part (14 questions): general attitude and attitude towards treating DF cases.
4. Practice part: including diagnosis of DF cases, selecting dressing type, referral to higher centers

Study variables:

- Dependent variables:

PHC physicians' level of knowledge towards DF care, PHC physicians' attitude towards DF care, and PHC physicians' practice towards DF care.

- Independent variables:

Sociodemographic data including age, gender, educational level, workplace, number of clinics per week, number of diabetic patients seen per week, number of DFU cases seen per week, working period, and including different variables to assess knowledge, attitude, and perceived practice of DF care.

Coding and Scoring of the knowledge part:

Correct answer=1, incorrect answer=0

Total knowledge score was 20, knowledge was considered good if the score was more than 10.

Coding and Scoring of the attitude part:

3 Likert scale was used (Agree, neutral, disagree)

Agree=3, neutral=2 and disagree=1

2.3 Data Management and Analysis Plan:

After completing the electronic questionnaire, data was transferred into a personal computer and analyzed using SPSS software version 23. Continuous data was presented as mean and standard deviation while categorical data were analyzed and displayed as frequencies and percentages. Student's t test, ANOVA and chi square test were used when appropriate. The results were considered significant at $p < 0.05$.

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2.4 Ethical Consideration:

Approval of the study was conducted from IRB committee in family medicine academy in Eastern Province and public health administration of MOH was requested prior to implementation of the study. The researchers had no conflict of interest.

Consent was taken before enrolment of any participant. Confidentiality of data was insured throughout all stages of study. Participation in this study was voluntary and participants had the right to withdraw from the study at any time.

3.Results

The total number of physicians participated in the study was 240 physicians with a response rate 70.2%.

The majority of participants (69.6%) were aged between 25 - 35 years and more than half were female (52.9%). Saudi physicians constituted 94.2% of studied sample. Most of participants were General practitioners (GPs) and they account for 57.9% in comparison to FM residents, specialists, consultants and others which account for 22.9%, 11.7%, 6.7%, and 0.8% respectively. The study involved 3 sectors. Participants from Dammam were 41.7%, Qatif were 33.3% and Khobar were 25.0%. Forty percentage (40%) of the studied sample have 1 - 5 years of experience, and majority (75.4%) were practicing physicians with no administrative responsibilities. Regarding number of diabetic patients seen per week, only 2.1 % of physicians stated that they did not encounter diabetic patient during their current weekly practice while highest percentage of physicians (30.4%) encountered >30 patients per week. Nearly, half of participants (52.9%) encounter DFU sporadically at a rate of 1 - 10 DFU cases per year while 2.5% of participants face >30 DFU cases per year. About two third of studied sample (66.7%) mentioned they received training about diabetic foot in which both self - reading and undergraduate training were found to be the commonest ways of received training 42.5% and 37.9% respectively.

Table 1: Knowledge of physicians working in MOH PHCCs in Eastern province regarding DF care

	Correct Answer	Incorrect answer
	N (%)	N (%)
Knowledge about Risk factors	233 (97.1)	7 (2.9)
Knowledge about foot deformities	169 (70.4)	71 (29.6)
Half of patient with diabetic peripheral neuropathy can be asymptomatic	185 (77.1)	55 (22.9)
very high - risk categorization of DF	10 (4.2)	230 (95.8)
Mild risk categorization of DF	77 (32.1)	163 (67.9)
Frequency of examination in high - risk DF	138 (57.5)	102 (42.5)
The most sensitive examination tool for DF	73 (30.4)	167 (69.6)
The monofilament test should be combined with at least one other test to detect peripheral neuropathy.	179 (74.6)	61 (25.4)
1st sensation to be lost in DF	86 (35.8)	154 (64.2)
Vascular assessment of DF patient	219 (91.3)	21 (8.8)
Number of areas to be tested by monofilament	98 (40.8)	142 (59.2)
Management of Charcot foot in diabetic patient.	146 (60.8)	94 (39.2)
Management of simple foot fungal infection in diabetic patient.	135 (56.3)	105 (43.8)
Duloxetine and pregabalin as first line drugs for treatment of neuropathic pain	128 (53.3)	112 (46.7)
Type of dressing indicated in infected DF wound	60 (25.0)	180 (75.0)
Dressing of diabetic patient with infected smelly wound	97 (40.4)	143 (59.6)
Knowledge about DF moisturization.	139 (57.9)	101 (42.1)
Characteristics of DF wear	175 (72.9)	65 (27.1)
Deep soft tissue or bone infection as indications of immediate referral	223 (92.9)	17 (7.1)
Limb ischemia or gangrene as indications of immediate referral	230 (95.8)	10 (4.2)
Level of knowledge	Good 156 (65%)	Poor 84 (35%)
Mean ± SD	11.7 ± 3.3	

This table indicates that (35%) of the sample had poor knowledge. Only 4.2% and 32.1% of the sample had correct knowledge concerning very high and mild risk categorization of DF respectively. Type of dressing indicated in infected DF wound was answered correctly by 25% of participants. Only 35.8% of physicians had correct knowledge regarding the first sensation to be lost in DF and just 40.8% correctly answered the question regarding number of areas to be tested by monofilament.

However, majority of participants had correct knowledge regarding risk factors (97.1%) for DFU and recognize immediate indications for referral like limb ischemia or gangrene (95.8%), or the presence of deep soft tissue or bone infections (92.9%).

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Table 2: Attitude of physicians working in MOH PHCCs in Eastern province regarding DF care

Statement	Agree	Neutral	Disagree
	No. (%)	No. (%)	No. (%)
Neuropathic pain can impact quality of life, limit mobility, and contribute to depression and social dysfunction	191 (79.6)	18 (7.5)	31 (12.9)
Diabetic foot assessment could predict future risk for DFU	211 (87.9)	23 (9.6)	6 (2.5)
I have an important role in prevention, early diagnosis, and management of DF	182 (75.8)	27 (11.3)	31 (12.9)
Intense education and foot care knowledge should be provided to all diabetic patient to reduce foot complications	199 (82.9)	9 (3.8)	32 (13.3)
I need to get additional training on managing DF problems	182 (75.8)	22 (9.2)	36 (15.0)
I have sufficient knowledge about indications of referral of DF	74 (30.8)	95 (39.6)	71 (29.6)
Treating a DFU is:			
• Sometimes an emergency	192 (80.0)	20 (8.3)	28 (11.7)
• Too risky to manage in PHCCs	68 (28.3)	98 (40.8)	74 (30.8)
• Difficult	104 (43.3)	108 (45.0)	28 (11.7)
• Requires regular training	174 (72.5)	33 (13.8)	33 (13.8)
• Requires a multidisciplinary team/intervention	194 (80.8)	20 (8.3)	26 (10.8)
• Has well established clear guidelines	85 (35.4)	102 (42.5)	53 (22.1)
• Time consuming	97 (40.4)	85 (35.4)	58 (24.2)

This table shows that majority of participants agree that DF assessment could predict future risk for DFU (87.9%) and Intense education and foot care knowledge should be provided to all diabetic patient to reduce foot complications (82.9%). Most respondents (80.8%) consider treating a DFU will require a multidisciplinary team/intervention and can be an emergency in certain cases (80.0%). On the other hand, 28.3% of physicians perceived treating a DFU as too risky to manage in PHCCs. Moreover, about 30% of physicians dissatisfied with their knowledge about indications of referral of diabetic foot.

Table 3: Practice of physicians working in MOH PHCCs in Eastern province regarding DF care

Statement	No. (%)
The diagnosis of most DF cases that you managed was made:	
• By myself based on complaint by the patient or his / her relative	174 (72.5)
• By myself following an incidental discovery during routine examination	131 (54.6)
• By myself after the patient was referred to me by a nurse	70 (29.2)
• I did not personally make the diagnosis	63 (26.3)
• I didn't encounter any cases of DFU in my practice	18 (7.5)
Do you personally select the wound dressing type? • Yes • No	 106 (44.2) 134 (55.8)
On average, how much percentage of DFU patients do you refer to higher centers:	
• < 25 %	78 (32.5)
• 25 - 50 %	72 (30.0)
• >50 - 75%	58 (24.2)
• >75%	32 (13.3)
If you decided to refer patient with DFU, it is mostly because of?	
• Lack of knowledge	62 (25.8)
• Lack of training	112 (46.7)
• Lack of confidence	76 (31.7)
• Insufficient facilities	168 (70.0)
• Advance cases	168 (70.0)
• Others	10 (4.2)
On average, at what time you decide to refer your patient to hospital:	
• In 1st week of presentation	119 (49.6)
• Between 1st week and 1st month of presentation	76 (31.7)
• Between 1st month and 3rd month of presentation	33 (13.8)
• After 3rd month of presentation	12 (5.0)

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Statement	No. (%)
The diagnosis of most DF cases that you managed was made:	
• By myself based on complaint by the patient or his / her relative	174 (72.5)
• By myself following an incidental discovery during routine examination	131 (54.6)
• By myself after the patient was referred to me by a nurse	70 (29.2)
• I did not personally make the diagnosis	63 (26.3)
• I didn't encounter any cases of DFU in my practice	18 (7.5)
Do you personally select the wound dressing type? • Yes • No	 106 (44.2) 134 (55.8)
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• < 25 %	78 (32.5)
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• >50 - 75%	58 (24.2)
• >75%	32 (13.3)
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• Lack of knowledge	62 (25.8)
• Lack of training	112 (46.7)
• Lack of confidence	76 (31.7)
• Insufficient facilities	168 (70.0)
• Advance cases	168 (70.0)
• Others	10 (4.2)
On average, at what time you decide to refer your patient to hospital:	
• In 1st week of presentation	119 (49.6)
• Between 1st week and 1st month of presentation	76 (31.7)
• Between 1st month and 3rd month of presentation	33 (13.8)
• After 3rd month of presentation	12 (5.0)

Table 3 shows that most of the physicians (72.5%) diagnose most DF cases by themselves based on complaint by the patient or his/her relative. More than half of the sample (55.8%) did not select personally the wound dressing type. Nearly 38% of physicians refer more than 50% of DFU patients to higher centers and the major causes for referral (70.0%) were mostly because of insufficient facilities or cases complexity. About half of the physicians (49.6%) decided to refer the patient to hospital within 1st week of presentation.

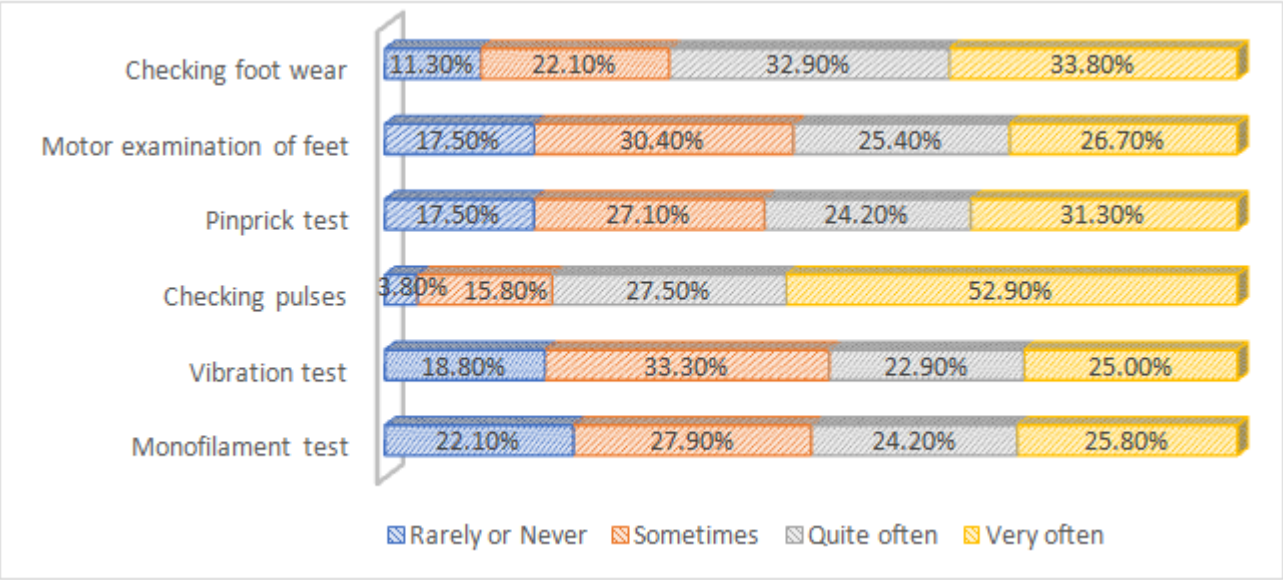

Figure 1 illustrates that about 22% and 18.8% of respondents rarely or never conduct monofilament and vibration test respectively, while the majority (80.4 %) often check pedal and posterior tibial pulses.

Table 4 presents the association between socio - demographic data and knowledge. It shows that the mean score of knowledge of FM specialists about DFU was significantly higher compared to GPs and FM residents ($P<0.05$). Similarly, physicians with 5 - 10 years of experience or those who received training regarding DF had significantly higher mean knowledge score compared to those physicians who are new to practice or didn't receive any training ($p<0.05$).

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Table 4: Association between socio - demographic data and knowledge

Socio - demographic Data	Knowledge	
	Mean ± SD	P value
Age: (years)		
• 25 - 35	11.9±3.2	0.061
• >35 - 45	11.6±3.2	
• >45 - 55	10.1±3.6	
• >55	8.0±2.8	
Gender:		
• Male	11.6±3.3	0.629
• Female	11.8±3.3	
Nationality:		
• Saudi	11.7±3.3	0.541
• Non - Saudi	11.1±2.8	
Job Title:		
• GP	10.7±3.2[a]	0.000*
• FM resident	12.3±2.7[b]	
• FM specialist	14.3±2.6	
• FM consultant	14.1±2.5	
• Other	9.0±1.4	
Sector:		
• Qatif	12.8±3.3[c]	0.001*
• Dammam	11.0±3.5	
• Khobar	11.3±2.6	
Years of experience		
• <1 year	10.6±3.5	0.012*
• 1 - 5 years	11.9±2.8	
• >5 - 10 years	12.5±3.3[d]	
• >10 years	10.8±3.7[e]	
Current administrative responsibilities:		
• Yes	12.1±3.6	0.208
• No	11.5±3.2	
Number of DM patients / week:		
• None	9.2±4.2	0.452
• 1 - 10	11.7±3.1	
• 11 - 20	12.0±2.6	
• 21 - 30	11.8±3.4	
• >30	11.5±3.7	
Number of DFU / year:		
• None	10.3±3.2	0.243
• 1 - 10	11.8±3.5	
• 11 - 20	11.9±2.8	
• 21 - 30	12.0±2.8	
• >30	11.0±3.6	
Training regarding DF:		
• Yes	12.2±3.3	0.001*
• No	10.7±3.1	
Source of training:		
Undergraduate training:		
• Yes	12.1±3.1	0.103
• No	11.4±3.4	
Residency Training:		
• Yes	13.7±2.6	0.000*
• No	11.0±3.2	
Courses and workshops:		
• Yes	12.4±3.9	0.062
• No	11.4±3.0	
Self - reading:		
• Yes	12.7±2.9	0.000*
• No	10.9±3.4	
Others:		
• Yes	11.5±4.8	0.827
• No	11.7±3.2	

*Statistically significant ($p<0.05$).
[a] GP was significant compared to resident, specialist and consultant
[b] Resident was significant compared to GP, specialist and consultant

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[c] Qatif was significant compared to Dammam and Khobar
[d] >5 - 10 years was significant compared to <1 and >10 years
[e] >10 years was significant compared to 1 - 5 and >5 - 10 years

Table 5: Association between practice and knowledge regarding diabetic foot care

	knowledge		P value
	Poor N (%)	Good N (%)	
Method of diagnosis			
a. Based on Patient complaint: • Yes • No	 59 (33.9) 25 (37.9)	 115 (66.1) 41 (62.1)	0.565
b. Based on physical examination: • Yes • No	 38 (29.0) 46 (42.2)	 93 (71.0) 63 (57.8)	0.033*
c. After referral by nurse: • Yes • No	 28 (40.0) 56 (32.9)	 42 (60.0) 114 (67.1)	0.297
d. Diagnosis by others: • Yes • No	 28 (44.4) 56 (31.6)	 35 (55.6) 121 (68.4)	0.067
e. Didn't encounter any DFU case: • Yes • No	 10 (55.6%) 74 (33.3%)	 8 (44.4) 148 (66.7)	0.057
Choosing dressing type • Yes • No	 27 (25.5%) 57 (42.5%)	 79 (74.5) 77 (57.5)	0.006*
Percentage of referral to higher centers:			
< 25%	27 (34.6)	51 (65.4)	0.014*
25 - 50%	17 (23.6)	55 (76.4)	
> 50 - 75%	22 (37.9)	36 (62.1)	
> 75%	18 (56.3)	14 (43.8)	
How often do you conduct the following test on diabetic patients?			
Monofilament test: • Rarely or never • Sometimes • Often	 28 (52.8) 28 (41.8) 28 (23.3)	 25 (47.2) 39 (58.2) 92 (76.7)	0.000*
Vibration test: • Rarely or never • Sometimes • Often	 25 (55.6) 34 (42.5) 25 (21.7)	 20 (44.4) 46 (57.5) 90 (78.3)	0.000*
Checking pedal and posterior tibial pulses: • Rarely or never • Sometimes • Often	 5 (55.6) 23 (60.5) 56 (29.0)	 4 (44.4) 15 (39.5) 137 (71.0)	0.001*
Pinprick test • Rarely or never • Sometimes • Often	 24 (57.1) 24 (36.9) 36 (27.1)	 18 (42.9) 41 (63.1) 97 (72.9)	0.002*
Motor examination of feet: • Rarely or never • Sometimes • Often	 25 (59.5) 23 (31.5) 36 (28.8)	 17 (40.5) 50 (68.5) 89 (71.2)	0.001*
Checking foot wear • Rarely or never • Sometimes • Often	 19 (70.4) 24 (45.3) 41 (25.6)	 8 (29.6) 29 (54.7) 119 (74.4)	0.000*

This table shows that there was a statistically significant association between good level of knowledge of participants and method of diagnosis based on physical examination and choosing dressing type. Also, it was significantly associated with performing all the tests recommended in diabetic foot examination and referral rate ($p<0.05$).

4.Discussion

Physicians working in primary care services are the frontline of health care system and they play a critical role in prevention, early diagnosis, and proper management of DF cases. The present study aims to evaluate knowledge, attitude and perceived practice of DF care among

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physicians working in MOH in PHCCs in the Eastern Province of KSA.

The current study demonstrates a good level of knowledge among participants regarding DFU care. In comparison to a study conducted in Malaysia, GPs involved in that study showed low level of knowledge although they were found to be psychologically ready for DF management. (14) In our study, specific knowledge regarding risk stratification of DF was poor and this finding was parallel to quasi - experimental pre - test/post - test study conducted in 2016 in Western Australia to determine the knowledge and practice of healthcare professionals which showed poor knowledge regarding risk stratification even after completing a 3 - hours education and training workshop. (15) This could raise a question about efficacy of these types of training received by participants in improving their knowledge. Additionally, majority of participants had incorrect knowledge about type of dressing indicated in infected DF wound. These considered as major defects that affect proper foot care, early identification, prevention and referral of DFU cases.

Furthermore, FM specialists significantly achieved higher knowledge scores compared to GPs and FM residents and this could be clarified by the impact of their recent training during postgraduate years.

Moreover, most of physicians fail to specify monofilament test as the most sensitive test for DF and this was reflected on physicians' practice during DF examination were 22.1% of physicians rarely performed monofilament test, although many international guidelines endorse it as an initial screening tool for diabetic neuropathy (16, 17). Minority of respondents rarely or never conduct monofilament and vibration test, while the majority often check pedal and posterior tibial pulses. This could be explained by the lack of resources to complete examination of DF in PHC settings. When comparing our results to the study that was done to assess perception of DFU among GPs in four European countries, neurological tests (monofilament, vibration, and temperature tests) were the most conducted tests during clinical examination in Germany while in France doppler US was conducted more frequently than other countries. In Spain, about one third of participants didn't carry out any vascular assessment. (18)

Regarding physicians' attitude towards managing DFU, a small percentage denied the presence of well established guidelines. This supports a similar finding from four European countries study where about third of GPs in France and Germany believed that absence of clinical guideline was a major barrier for implementing proper DFU care. This reinforces the importance of development of national guideline and updating the already existing international guidelines to be more practical and simplified. (18)

Most of involved physicians agreed that intense education regarding DF care should be provided to all diabetic patients to reduce DF complications and this was in parallel to the European study results were almost all GPs agreed to this concept. (18)

Additionally, 75.8% of physicians look for additional training on management of DF problems for better patient outcome, while only 29 - 40% of GPs in all countries of European study stated that they did not have sufficient training. (18) So, providing extensive training in form of medical conferences, workshops, and continuous medical education activities could help in increasing physicians' confidence regarding DFU care as suggested by our findings and recommendations from other similar studies (14, 19)

Most of participants stated that diagnosis of DFU was established after a compliant by patient or his/her relatives while almost half of them established a diagnosis after an incidental discovery during routine examination. A similar finding from another study showed that a compliant from patient and an incidental discovery during examination were the most common ways of diagnosis of DF cases respectively. (18) Based on these similar findings we can recommend the importance of performing a comprehensive history and examination regarding diabetic foot and encourage patients for self - foot care regularly.

About half of participants decided to refer their patients in the first week of presentation and this could be explained by presence of complexed cases and insufficient facilities in PHCCs as agreed by 70% of participants. Also, our study displayed a significant positive correlation between good level of knowledge and percentage of referral and this could be explained by awareness of those physicians regarding indications of referral to higher levels of care.

In conclusion, the current study showed that most of participants exhibit a good level of knowledge regarding DF care. Most of them agreed that intense foot care education should be provided to all diabetic patients to reduce foot complications and the importance of getting additional training to physicians to manage DF problems. Insufficient PHCCs facilities and advanced cases were the most common reasons of referral to secondary care. Therefore, the authors recommend the following:

1. Importance of development of national guideline and updating the already existed international guidelines to be more practical and simplified.
2. Providing extensive training in form of medical conferences, workshops, and CME activities could help in increasing physicians' confidence regarding DFU care.
3. Importance of performing a comprehensive history and examination regarding DF and encourage patients for self - foot care regularly, this could help in earlier detection of DFU cases and prevent complications.
4. Providing necessary resources for DF assessment are highly recommended for better management and decreasing unnecessary referral.

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5.Study Limitations

There was a paucity of studies discussing knowledge, attitude and practice regarding DFUs among physicians whether locally or internationally which make a difficulty for authors to compare their data to different studies. Also, this study is a cross sectional study and further studies with different methodologies like pre and post training test interventional studies would be helpful to confirm its results.

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