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FOOT SELF-CARE AND EXERCISE AWARENESS AMONG THE PATIENTS WITH DIABETES MELLITUS

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ABSTRACT

Background: The importance of a patient's understanding of proper foot care is critical to preventing diabetic foot problems and amputations. In order to reduce the incidence of foot ulcers and complications, it is essential to translate awareness into appropriate foot care practices. An educated patient has a lower risk of developing foot ulcers and subsequently needing to have amputations. Various scientific societies and organizations provide guidelines for the proper practice and education of foot care. **Methods**: The present study was conducted over the course of 12 months from 2023 to 2024 in Hail city, Saudi Arabia. An ethical approval was obtained from Hail University Research Ethical Committee (REC) at the University of Hail (H-2023-173), and written consent was obtained from all participants. Data collected were analyzed using a validated, pretested, structured, self-assessed diabetic foot care knowledge (9 questions) and practice (11 questions) questionnaire. **Results**: Overall, 69% of participants knew how to self-care for their feet and more than half regularly practiced it. It was found that participants were well aware of the importance of wearing appropriate footwear (91.65%), yet they had a poor understanding of shoe specifications (47.86%). **Conclusions**: Diabetic patients had good knowledge regarding foot self-care, while their practice was acceptable but not optimal. There is a big gap between diabetic patient knowledge and their everyday practice.

KEYWORDS: diabetes mellitus, knowledge, awareness, diabetic feet, complications.

INTRODUCTION

Globally, there are approximately 537 million adults suffering from diabetes mellitus (DM), which is approximately 10.5% of the adult population. It is estimated that approximately 90% of the population has type 2 diabetes (T2DM). A considerable proportion of the population in Eastern Mediterranean countries suffers from diabetes mellitus (DM), making it the second most prevalent disease in the world.[1] It has been reported that a previous meta-analysis carried out in 2023 found that Saudi Arabia had a prevalence of T2DM among adults of 28%. In 2019, it is estimated that 18.3% of Saudi adults will suffer from diabetes, which is a worrying statistic. International Diabetes Federation (IDF) reports that more than half of Saudi adults will suffer from diabetes by 2030.[2] Public health concerns are high in Hail City because of the prevalence of type 2 diabetes. Despite the fact that clinical research and diabetes science have made amazing advances over the last few decades, diabetes remains a terrible, chronic illness. The prevalence of T2DM is increasing among both men and women of all ages in Hail City, regardless of their age group.[3]

In the Middle East, Saudi Arabia has the second-highest number of diabetic patients, and it is ranked seventh globally in terms of the number of diabetic patients. Approximately 17.7% of the Saudi population were affected by diabetes in 2021, and it has been estimated that 5% of the total deaths in Saudi Arabia can be attributed to this disease.[4] It has been found in studies conducted in the Al-Kharj region that diabetes prevalence for women in the region is 3.8%, and for males it is 9.2%.[5]

Diabetes is associated with a number of serious complications, including diabetes foot. The disease is

one of the leading causes of hospitalizations, amputations, and death within diabetic patients. Diabetics with foot ulcers have a 2.5-fold higher mortality risk.[6] A significant burden is placed on the healthcare system and the economy when it comes to diabetes foot complications. There is a greater likelihood of diabetic complications when a person has poor control of their blood sugar, smokes, has foot deformities, has peripheral neuropathy, has vision loss, or has diseases of the kidney.[7] Ischemic and neuropathic changes are pathologically responsible for diabetes-related foot ulcers. Inadequate foot care makes foot ulcers more likely to develop infections and require amputation.[8] In the case of moderate or severe diabetic foot infections, amputation is almost always a necessity. It is very important for people with diabetes to take care of their feet properly so that the feet of the person can be protected. The procedure includes the examination of the skin, an assessment of neurological and vascular function, selection of appropriate footwear, and trimming of the toenails.[8,9] Globally, diabetic feet are considered an economic burden due to the costs associated with their care and management. Based on the study that was conducted in Al Khobar, Saudi Arabia among 99 diabetic foot ulcer patients, it is estimated that the total cost of managing 99 patients with diabetic foot ulcers in Saudi Arabia was 6 618 043.3 Saudi Riyal (SAR), which is approximately 6684.9 Saudi Riyal per patient/year, which translates to an annual cost of $1792.6 USD. The highest cost incurred was for admission expenditure (45.6%), followed by debridement (14.5%) and intensive care unit (ICU) admission (10.4%).[10] As a result of DM, there are a large number of lower limb amputations worldwide, in addition to the economic burden of the disease.

Diabetes foot ulcers can be prevented and prevented by providing education as well as by preventing complications associated with diabetic foot ulcers. It is possible to reduce the risk of diabetic foot ulcers by educating the diabetic about the proper care they need to take of their feet. This can be achieved by inspecting the feet and between the toes every day, washing and drying the feet regularly, and avoiding walking barefoot in order to achieve this.[11,12] It is very important for a patient to understand how to properly care for his/her feet in order to prevent diabetic foot problems and amputations. As a result of increased awareness, it is imperative that we translate that knowledge into appropriate foot care practices in order to reduce the incidence and complications associated with foot ulcers.[13,14] In order to prevent foot ulcers and subsequent amputations, it is essential for the patient to receive proper education. Many scientific societies and organizations are providing guidelines in order to ensure that proper foot care education and practice is available to everyone.[13,15]

In this study, we aim to determine the current knowledge and practices of diabetic patients in Hail city regarding foot care in order to provide a better service. Obtaining such information is essential if we are to improve that portion of the health care system that is involved in certain areas.

MATERIALS AND METHODS

The purpose of this cross-sectional, analytic study was to assess diabetic foot care knowledge as well as related practices among diabetic patients attending primary health care centers in Hail city of Saudi Arabia during a 12-week period during the middle of 2023.

According to the Raosoft online sample size calculator (Raosoft Inc., Seattle, Washington, United States), the sample size of this study is about 540 respondents. All diabetic patients who were over 30 years of age and were diagnosed with diabetes were included in the study. Those who suffered from mental illness, were younger than 30 years of age, or didn't answer the whole questionnaire were excluded from the study.

After obtaining ethical approval from Hail University Research Ethical Committee (REC) at University of Hail (H-2023-173) a written consent was obtained from the participants and, after that, the data was collected using a valid, pre-tested, structured, self-assessment questionnaire on diabetic foot care knowledge and practice (9 questions) and a self-assessment questionnaire. The questions were related to information and practice modification, as reported by Meijer et al. The questionnaire was re-evaluated by a number of clinicians and piloted on a group of patients, and revisions were made to the questionnaire in order to make it more accurate and valid.[16]

In each center, a nurse from each center was chosen to conduct interviews with patients as well as administer a questionnaire to patients. Besides explaining the questionnaire, nurses were also trained for half a day on diabetic foot complications, foot care, as well as how they could use the research materials to provide care to patients.

In this study, one limitation was that some diabetic patients may not be able to get to the Ministry of Health Primary Health Centers because they belong to a higher socioeconomic class. As a result, they take their follow-up at private health care facilities or in other government-run health facilities.

Data Entry and Statistical Analysis

The data analysis was done using SPSS program version 26; one point was given for each correct answer to the 9 knowledge questions, and the practice questions were scored in the following order: (Always = 3, Often = 2, Sometimes = 1, No = 0), giving those who always behaved in a healthy manner a total of 33 points. In order to express the data in frequency and percentage, descriptive statistics were used and the Pearson chi-square test was used in order to examine the relationship

between variables. P 0.05 was considered to be the level of statistical significance.

TABLES

Table 1: Sociodemographic characteristics of the patients.

		N	Percentage
Gender	Males	372	69
	Females	167	31
Age	30-40	106	19.7
	41-50	128	23.7
	51-65	305	56.6
Nationality	Non-Saudi	181	33.6
	Saudi	358	66.4
Diabetes Duration	Less than 1 year	129	23.9
	2-5years	171	31.7
	5-10years	124	23.0
	Above 10years	115	21.3

Table 2: Frequency of Foot complications in diabetes patients.

Foot complications	Frequency of "YES" answers (%)	Percentage (%)
Peripheral Neuropaathy	237	44%
Foot Dry skin	405	75.12
bunions	19	3.55
callus	174	32.30
Toe infection	27	5.06
fissure	221	41.0
hammertoe	32	5.9
in growing nails	55	10.20

Table 3. Knowledge about self-practice of foot care among diabetes patients.

Knowledge indicator	Frequency of "YES" answers (%)	Percentage (%)
Washing foot at least once daily	341	63.26
Not to walk barefooted	358	66.41
Care when clipping nails	342	63.45
Seeking medical advice when there is an ulcer	428	79.40
Daily checkup of the foot and exercise	453	84.04
Having appropriate shoes size	494	91.65
Drying foot after washing it	356	66.04
Daily observation of foot to detect any ulcer	341	63.26
Knowledge about shoes specifications	258	47.86

Table 4: Daily practice of activities related to foot care among diabetes patients.

	No Frequency (%)	Sometimes Frequency (%)	Often Frequency (%)	Always Frequency (%)
Assign time for foot care and exercise	118(21.9%)	86(16.0)	95(17.6)	240(44.5)
Washing foot (Ablution at least once)	7(1.3)	106(19.7)	124(23)	302(56)
Drying foot after washing it	165 (30.6)	80(14.8)	87(16.1)	207(38.4)
Using skin lotion or olive oil for the foot	68 (12.6)	100(18.6)	108 (20)	263(48.8)
Checking foot for presence of any ulcer	86 (16.0)	97(18)	104 (19.3)	252 (46.8)
Using a mirror for foot checkup	249 (46.2)	57(10.6)	66(12.2)	167(31.0)
Checking the foot by one of the family members	461 (85.5)	14 (2.6)	16 (3.0)	48 (8.9)
Not to walk barefooted	43 (8)	98 (18.2)	119 (22.1)	279 (51.8)
Wearing shoes	6 (1.1)	106 (19.7)	125 (23.2)	302 (56.0)
Checking the inside of the shoes	7 (1.3)	106 (19.7)	124 (23)	302 (56)
Wearing socks	103 (19.1)	86 (16)	102 (18.9)	248 6)

Table 5: Comparison of knowledge regarding daily foot care practice among male and female diabetic patients.

		No	Sometimes	Often	Always	p-Value
Assign time for foot care and exercise	Male	81(15.0)	59(10.9)	57(10.6)	175(32.5)	0.149
	Female	37(6.9)	27(16.0)	38(17.6)	65(44.5)	
Washing foot (Ablution at least once)	Male	7(1.3)	73(13.5)	71(13.2)	221(41.0)	0.003
	Female	0(0)	33(6.1)	53(9.8)	81(15.0)	
Drying foot after washing it	Male	112(20.8)	53(9.8)	51(9.5)	156(28.9)	0.034
	Female	53(9.8)	27(5.0)	36(6.7)	51(9.5)	
Using skin lotion or olive oil for the foot	Male	49(9.1)	67(12.4)	64(11.9)	192(35.6)	0.064
	Female	19(3.5)	33(6.1)	44(8.2)	71(13.2)	
Checking foot for presence of any ulcer	Male	57(10.6)	66(12.2)	64(11.9)	185(34.3)	0.148
	Female	29(5.4)	31(5.8)	40(7.4)	67(12.4)	
Using a mirror for foot checkup	Male	176(32.7)	39(7.2)	34(6.3)	123(22.8)	0.009
	Female	73(13.5)	18(3.3)	32(5.9)	44(8.2)	
Checking the foot by one of the family members	Male	319(59.2)	10(1.9)	8(1.5)	35(6.5)	0.378
	Female	142(26.3)	4(0.7)	8(1.5)	13(2.4)	
Not to walk barefooted	Male	34(6.3)	67(12.4)	68(12.6)	203(37.7)	0.008
	Female	9(1.7)	31(5.8)	51(9.5)	76(14.1)	
Wearing shoes	Male	6(1.6)	73(13.5)	72(13.4)	221(41.0)	0.005
	Female	0(0)	33(6.1)	53(9.8)	81(15.0)	
Checking the inside of the shoes	Male	7(1.3)	73(13.5)	71(13.2)	221(41.0)	0.003
	Female	0(0.0)	33(6.1)	53(9.8)	81(15.0)	
Wearing socks	Male	73(13.5)	63(11.7)	58(10.8)	178(33.0)	0.032
	Female	30(5.6)	23(4.3)	44(8.2)	70(13.0)	

Table 6: Comparison of knowledge regarding daily foot care practice among different age group in diabetic patients.

		No	Sometimes	Often	Always	p-Value
Assign time for foot care and exercise	30-40years	20(3.7)	86(16.0)	0(0)	0(0)	0.000
	41-50years	33(6.1)	0(0)	95(17.6)	0(0)	
	51-65years	65(12.1)	0(0)	0(0)	240(44.5)	
Washing foot (Ablution at least once)	30-40years	0(0)	106(19.7)	0(0)	0(0)	0.000
	41-50years	4(0.7)	0(0)	124(23.0)	0(0)	
	51-65years	3(0.6)	0(0)	0(0)	302(56.0)	
Drying foot after washing it	30-40years	26(4.8)	80(14.8)	0(0)	0(0)	0.000
	41-50years	41(7.6)	0(0)	87(16.1)	0(0)	
	51-65years	98(18.2)	0(0)	0(0)	207(38.4)	
Using skin lotion or olive oil for the foot	30-40years	6(1.1)	100(18.6)	0(0)	0(0)	0.000
	41-50years	20(3.7)	0(0)	108(2.0)	0(0)	
	51-65years	42(7.8)	0(0)	0(0)	263(48.8)	
Checking foot for presence of any ulcer	30-40years	8(1.5)	97(18.0)	1(0.2)	0(0)	0.000
	41-50years	25(4.6)	0(0)	103(19.1)	0(0)	
	51-65years	53(9.8)	0(0)	0(0)	252(46.8)	
Using a mirror for foot checkup	30-40years	49(9.1)	57(10.6)	0(0)	0(0)	0.000
	41-50years	62(11.5)	0(0)	66(12.2)	0(0)	
	51-65years	138(25.6)	0(0)	0(0)	167(31.0)	
Checking the foot by one of the family members	30-40years	92(17.1)	14(2.6)	0(0)	0(0)	0.000
	41-50years	112(20.8)	0(0)	16(3.0)	0(0)	
	51-65years	257(47.7)	0(0)	0(0)	48(8.9)	
Not to walk barefooted	30-40years	8(1.5)	98(18.2)	0(0)	0(0)	0.000
	41-50years	9(1.7)	0(0)	119(22.1)	0	
	51-65years	26(4.8)	0(0)	0(0)	279(51.8)	
Wearing shoes	30-40years	0	106(19.7)	0(0)	0(0)	0.000
	41-50years	4(0.7)	0(0)	124(23.0)	0(0)	
	51-65years	2(03.4)	0(0)	1(0.2)	302(56.0)	
Checking the inside of the shoes	30-40years	0	106(19.7)	0(0)	0(0)	0.000
	41-50years	4(0.7)	0(0)	124(23.0)	0(0)	

	51-65years	3(0.6)	0(0)	0(0)	302(56.0)	
Wearing socks	30-40years	20(3.7)	86(16.0)	0(0)	0(0)	0.000
	41-50years	26(4.8)	0(0)	102(18.9)	0(0)	
	51-65years	57(55.3)	0(0)	0(0)	248(46.0)	

Table 7: Comparison of knowledge regarding daily foot care practice among educated and uneducated diabetic patients.

		No	Sometimes	Often	Always	p-Value
Assign time for foot care and exercise	Uneducated	31(5.8)	20(3.7)	21(3.9)	59(10.9)	0.906
	Educated	87(16.1)	66(12.2)	74(13.7)	181(33.6)	
Washing foot (Ablution at least once)	Uneducated	1(0.2)	27(5.0)	27(5.0)	76(14.1)	0.798
	Educated	6(1.1)	79(14.7)	97(18.0)	226(41.9)	
Drying foot after washing it	Uneducated	36(6.7)	17(3.2)	19(3.5)	59(10.9)	0.357
	Educated	129(23.9)	63(11.7)	68(12.6)	148(27.5)	
Using skin lotion or olive oil for the foot	Uneducated	10(1.9)	27(5.0)	25(4.6)	69(12.8)	0.220
	Educated	58(10.8)	73(13.5)	83(15.4)	194(36.0)	
Checking foot for presence of any ulcer	Uneducated	12(2.2)	26(4.8)	25(4.6)	68(12.6)	0.097
	Educated	74(13.7)	71(13.2)	79(14.7)	184(34.1)	
Using a mirror for foot checkup	Uneducated	54(10.0)	15(2.8)	14(2.6)	48(8.9)	0.364
	Educated	195(36.2)	42(7.8)	52(9.6)	119(22.1)	
Checking the foot by one of the family members	Uneducated	119(22.1)	2(0.4)	3(0.6)	7(1.3)	0.254
	Educated	342(63.5)	12(2.2)	13(2.4)	41(7.6)	
Not to walk barefooted	Uneducated	7(1.3)	26(4.8)	26(4.8)	72(13.4)	0.475
	Educated	36(6.7)	72(13.4)	93(17.3)	2.7(38.4)	
Wearing shoes	Uneducated	1(0.2)	27(5.0)	27(5.0)	76(14.1)	0.828
	Educated	5(0.9)	79(14.7)	98(18.2)	226(41.9)	
Checking the inside of the shoes	Uneducated	1(0.2)	27(5.0)	27(5.0)	76(14.1)	0.798
	Educated	6(1.1)	79(14.7)	97(18.0)	226(41.9)	
Wearing socks	Uneducated	23(4.3)	25(4.6)	18(3.3)	65(12.1)	0.238
	Educated	80(14.8)	61(11.3)	84(15.6)	183(34.0)	

RESULTS

A total of 539 patients were subjected to this study, and their data was analyzed. Their sociodemographic characteristics are presented in Table 1. The age range of the participants ranged from 30 to 65 years with a mean of 54.70 years and a standard deviation (SD) of 9.68 years, with a range of 30 to 65 years. A total of 31% of the participants in this study were females. There were 66.4% Saudi citizens among the respondents and 33.6% expatriates among the respondents. Table 2 shows the prevalence of foot complications among diabetics where the majority of the participants had foot dry skin (75.1%), peripheral neuropathy (44%) and fissures (41%) as well as callus formation (32.3%). (Table 1 and 2)

Knowledge regarding diabetic foot care: The overall knowledge about the practice of self-footcare was 69%. As reported, the majority of participants were aware of the importance of wearing appropriate footwear (91.65%), though although they knew the importance of wearing appropriate footwear, they had limited knowledge about the shoe specifications (47.86%). In the study, 84.04% of participants reported checking their foot daily for any injuries or ulcers, and seeking medical advice if any such injuries or ulcers were found and doing exercise regularly. (Table 3)

Practice regarding foot care: More than half of the participants were regularly practicing foot care practice. As a practice, 56% of participants wash their feet regularly and check the inside of their shoes. 46.2% of respondents said they check their feet for injuries and ulcers on a regular basis and wear socks in order to prevent accidental cuts and injuries to their feet. Overall, 40% of the diabetic foot patients had a poor level of knowledge when it came to the practice of diabetic foot care. Despite the fact that the present study examined associations between several factors and level of practice related to diabetic foot care among the participants, none of the factors studied appeared to be significantly associated with the level of practice related to diabetic foot care. (Table 4)

Among the participants, there was a positive correlation between the knowledge regarding daily foot care practices and the age group of the participant ($p>0.001$), while there was no association observed between the gender of the participant. (Table 5,6,7)

DISCUSSION

Diabetic foot is a relatively common health problem affecting diabetic patients and may result, if neglected, in serious complications such as amputation. Having adequate knowledge and good practices regarding foot care play an important role in preventing the

development of serious diabetic foot ulcers.[11,14] Therefore, this study was carried out to assess levels of knowledge and practice regarding foot care among diabetic patients in Hail city, Kingdom of Saudi Arabia (KSA). In the present study, 60% of the participants had a good knowledge on foot care whereas 40% of the participants had poor knowledge on diabetic foot care. A study from Makkah conducted on 409 patients using a self-administrated questionnaire reported that the patients with type 2 DM represented the majority of patients (85.6%). Most of the patients (74.4%) had a poor level of knowledge regarding foot self-care, and only 4.2% had a good level of knowledge.

A study from Al Madinah city, Saudi Arabia included 363 diabetic patients revealed that 90.6% scored good knowledge, whereas 9.4% scored poor knowledge regarding foot care. The good score of knowledge was associated significantly with the occupation of participants and the duration of diabetes. On the other hand, gender and educational levels had no significant association with knowledge.[11] In this study, we observed a positive association between the age group and daily footcare practice. Poor knowledge was reported among diabetic patients from Jeddah, where only 38% had good knowledge about diabetic foot care.[17]

A study from Kuwait reported that the overall mean score of knowledge of diabetic patients about foot selfcare was 12.7, with a maximum possible score of 16. These findings reflected that the majority of patients had good knowledge (79.3%). Being a university student revealed lower odds of having good knowledge, whereas being diagnosed with diabetes for a long duration of 10 years and above and having no additional comorbidities were predictors for higher odds of having good knowledge.[18] In the current study, there was no university student who participated in the study; however, educated participants showed a negation association on level of knowledge.

Regarding practice investigation, there was an acceptable level of practice, but not a good level. The foot care practice was significantly associated with age but not on gender and education status. In contrast to the current findings, reported a good level of practice represented 55.3% participants.[19] Whereas in the current findings, the scores of practices were significantly affected by age but not on gender and education level. In a study from Makkah, the practice of foot self-care among diabetic patients was poor among 63.3% patients. However, the study did not report the factors that affected the practice level.[20]

A good level of practice was reported among 93.7% of diabetic patients from Al Madinah city, and this good score was associated with the education level of the patients, whereas no association was found regarding gender, age groups, occupation, or duration of diabetes.[21] whereas in the present study we found a positive association between age and the level of practice. A poor practice was found among diabetic patients from diabetic centers in Jeddah, where only 22% were following diabetic foot care practice.[17] This disparity in practice levels could be attributed to several factors. One potential reason is a lack of access to proper education and resources about diabetic foot care in Jeddah. Additionally, socioeconomic factors or differences in healthcare infrastructure might contribute to the lower adherence to recommended practices among patients in this region. To improve diabetic foot care practices, targeted educational programs should be implemented to raise awareness about the importance of foot care among diabetic patients. Additionally, healthcare providers can offer regular workshops and hands-on training sessions to reinforce proper foot care techniques. Ensuring easy access to foot care resources and providing personalized care plans could also encourage better adherence to recommended practices.

CONCLUSIONS

There was a good level of knowledge among diabetic patients regarding foot self-care, whereas the practice was acceptable but not optimum. There is a big gap that exists between knowledge of diabetic patients and their daily practice. Bridging this gap will reduce diabetic foot ulcer and amputations and as a result reduction in morbidity, mortality and high cost associated with the treatment of foot ulcer and amputations.

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