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Awareness of diabetic foot among type 2 diabetes in a tertiary care hospital, Saudi Arabia: a cross-sectional study

Abstract

Aim: To assess the awareness of diabetic foot among Saudi population with type 2 diabetes.

Methods: This cross-sectional study was conducted among the participants who attended the outpatient diabetes clinic at Diabetes Treatment Center in Prince Sultan Military Medical City, Saudi Arabia between July 2015 to September 2015. Data were collected using a structured questionnaire.

Results: Compared to females (53.3%) males (72.4%) were found to be more aware of diabetic foot problem related knowledge. Also participants with family history and long duration of DM were more aware of diabetic foot problem and the related knowledge. Compared to females (48%), males (67.2%) have more pins and needles sensation in the feet. Similarly those with the family history, higher duration of DM, have shown more pins and needles sensation. More than 15% of highly educated participants reported that pain alters their sleep pattern and also affects the daily life (12.1%) compared to lower educated participants. Compared to the females (68.2%), male participants (55.2%) were reported to be more ignorant in doing self-examination of feet. Similarly, the participants of more than 40 years (72.9%) reported that they ignore the self-examination of feet than the participants of less than 40 years (53.9%). Majority of the male participants have good compliance to medication.

Conclusion: There is a disparity in diabetic foot awareness among the Saudi diabetic population. It is necessary to educate people about foot care, lack of which will lead to a health burden due to preventable complications of diabetes.

Keywords: type 2 diabetes, diabetes complication, diabetic foot ulcer, diabetes mellitus, world health organization, peripheral neuropathy, gangrene, amputation

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Abbrevations: DPN, diabetic peripheral neuropathy; DFU, diabetic foot ulceration; DFI, Diabetic foot infection; DF, diabetic foot; T2D, type 2 diabetes; DN, diabetic neuropathy

Introduction

Type 2 Diabetes (T2D) is one of the main threats to human health in the 21st century and the number of participants with T2D is increasing rapidly in both the developed and developing countries around the world.[1] According to the World Health Organization, Saudi Arabia has ranked second among the Middle East and seventh in the world with almost more than 8 million people living with diabetes.[2,3] Over 25 percent of the estimated adult population of Saudi Arabia is suffering from diabetes and the number is expected to be more than double by 2030. Half of the people over 30 years of age are at risk of diabetes.[2,3] Diabetes mellitus is associated with high-risk of complications, including micro-and macro vascular chronic complications with peripheral neuropathy is the most common complication of T2D.[4,5] The rising trend of diabetes make it as an epidemic disorder all over the world the existing evidence demonstrates the significant consequences of the disease on both health care providers and the community as a whole.[6]

Diabetic foot problems are common throughout the world, resulting in major economic burden for the participants and their families, the health care system resulting in serious consequences to affect their quality of life and care.[7,8] Foot ulcers are more likely to be of neuropathic origin, and preventable with proper care.[7] People at greatest risk of ulceration can easily be identified by careful clinical examination of the feet: education and frequent follow-up visits of the participants.[7]

Studies reported that a multidisciplinary approach including patient and the staff education, the preventive strategies and multidisciplinary care plans has been reported to reduce the amputation rate by more than 50%.[9] However, when compared with the developed countries, the research work conducted in Saudi Arabia, focusing on the awareness of diabetic foot (DF) is limited, despite the condition constitutes a major public health problem in the country. Hence, the present cross sectional study aimed to assess the awareness of DF among Saudi population with type 2 diabetes.

Methods

Study design and setting

This cross-sectional observational study was conducted among the participants who attended the outpatient diabetes clinic at Diabetes Treatment Center in Prince Sultan Military Medical City, Saudi Arabia between July 2015 to September 2015.

Inclusion criteria

Type 2 diabetes, age range between 20-70 years, able to read and write Arabic.

Participants' selection criteria

The respondents were purposively and conveniently selected according to their availability during their routine visit to the outpatient clinics. All participants were informed about the purpose and methods of the research verbally and in written form.

Data collection

Socioeconomic status was evaluated as a combination of factors, including income, level of education and occupation. It is also a way to look as to how an individual or a family fit into society using economic and social measures. In addition to socioeconomic status age and gender were also collected. Living environment (rural and urban), duration of diabetes (Duration of diabetes in the study was defined as from the time of their first diagnosis of diabetes) were collected using a structured questionnaire. Also, awareness of DF was collected using same structured questionnaire. A pilot study was conducted among 15 participants in order to validate the questionnaire.

Statistical analysis

Data analysis was be carried out using Microsoft Excel 2002 (Microsoft Corporation, Seattle, WA, USA) and Statistical Package for Social Sciences version 22 (SPSS Inc., Chicago, IL, USA). In addition to the descriptive analysis, chi-square test was done to understand the variables associated with awareness of DF. A p-value of <0.05 was considered to be statistically significant.

Results

Participant characteristics

The demographic data is presented in Table 1. The mean age of the study participants was 46.4±1.97 (mean±SD) years. Fifty-three were males (40.2%) and Seventy nine were females (69.8%). The mean duration of diagnosis of DM was 12.4 ± 4.5 (mean±SD) years.

Table 2 shows the diabetes related foot problem knowledge, self-examination of the feet and footwear related problems. Compared to females (53.3%) males (72.4%) were found to be more aware of diabetic foot problem related knowledge. Participants with family history and long duration of DM were more aware of diabetic foot problem and the related knowledge. There were no major differences were obtained between different age, education, occupation, income and province.

Table 3 shows the of pins and needles sensation in the feet, pain in leg, pain related sleep disturbance and the quality of life of participants. Compared to females (48%), males (67.2%) have more pins and needles sensation in the feet. Similarly those with the family history, higher duration of DM, have shown more pins and needles sensation. More than 15% of highly educated participants reported that pain alters their sleep pattern and also affects the daily life (12.1%) compared to lower educated participants.

Table 4 shows the response of the participants about the self-examination of the feet, visit to a doctor/podiatrist, adherence to medications and finding out the hard skin corns or calluses. Compared to the females (68.2%), male participants (55.2%) were reported to be more ignorant in doing self-examination of feet. Similarly, the participants of more than 40 years (72.9%) reported that they ignore the self-examination of feet than the participants of less than 40 years (53.9%). Majority of the male participants have good compliance to medication.

Table 1 Demographic and history of diabetes mellitus of the study population

Variable(s)	Frequencies	%
Gender		
Male	58	39.7
Female	88	60.3
Age (years)		
≤ 40 Years	76	52.1
>40 Years	70	47.9
Education		
Uneducated	23	15.8
School	90	61.6
College or above	33	22.6
Occupation		
Unemployed	50	34.2
Employed	36	24.7
Retired	60	41.1
Income (SAR)		
< 5000	62	42.5
5000-10000	38	26
>10000	46	31.5
Province		
Rural	19	13
Urban	127	87
Smoking		
Smokers	25	17.2
Non Smokers	121	82.9
Family History		
Yes	112	76.7
No	34	23.3
BP		
Yes	89	61
No	57	39
Duration of DM		
≤10 Years	55	37.7
>10 Years	91	62.3

Table 2 Variables associated diabetic foot problem related knowledge, self-examine the feet and footwear

Variable(s)	Foot problem knowledge		Self-assessment of the Feet		Footwear	
Gender	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Male	42(72.4)	16(27.6)	46(79.3)	12(13.6)	38(65.5)	20(34.5)
Female	47(53.4)	41(46.6)*	69(78.4)	19(21.6)	48(54.5)	40(45.5)
Age (years)						
≤40 Years	45(59.2)	31(40.8)	60(79)	16(21)	49(64.5)	27(35.5)
>40 Years	44(62.9)	26(37.1)	55(78.6)	15(21.4)	37(52.9)	33(47.1)
Education						
Uneducated	17(73.9)	6(26.1)	16(69.6)	7(30.4)	13(56.5)	10(43.5)
School	48(53.3)	42(46.7)	71(78.9)	19(21.1)	49(54.4)	41(45.6)
College or above	24(72.7)	9(27.3)	28(84.8)	5(15.2)	24(72.7)	9(27.3)*
Occupation						
Unemployed	38(76)	12(24)	37(74)	13(26)	30(60)	20(40)
Employed	18(50)	18(50)	32(88.9)	4(11.1)	28(77.8)	8(22.2)
Retired	33(55)	27(54)*	46(76.7)	14(23.3)	28(46.7)	32(53.3)
Income						
<5000	34(54.8)	28(45.2)	49(79)	13(21)	33(53.2)	29(46.8)
5000-10000	21(60)	14(40)	30(85.7)	8(22.9)	23(60.5)	15(39.5)
>10000	31(67.4)	15(32.6)	36(78.3)	10(21.7)	30(65.2)	16(34.8)
Province						
Urban	81(63.8)	46(36.2)	102(80.3)	25(19.7)	77(60.6)	50(39.4)
Rural	8(42.1)	11(57.9)*	13(68.4)	6(31.6)	9(47.4)	10(52.6)
Smoking						
Smokers	13(52)	12(48)	19(76)	6(24)	13(52)	12(48)
Non Smokers	76(62.8)	45(37.2)	96(79.3)	25(20.7)	73(60.3)	48(39.7)
Family History						
Yes	74(66)	38(34)	86(76.8)	26(23.2)	73(65.2)	39(34.8)
No	15(44.1)	19(55.9)*	29(85.3)	6(17.6)	13(38.2)	21(61.8)*
Duration of DM						
≤10 Years	26(47.3)	29(52.7)	47(85.5)	8(14.5)	34(61.8)	21(38.2)
>10 Years	63(69.2)	28(30.8)*	68(74.7)	23(25.3)	52(57.1)	39(42.9)

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Table 3 Variables associated with feel pins and needles, feel pain in leg, pain alters sleep and pain affects daily life.

Variable(s)	Perception of Pins and Needles		Feel Pain in Leg		Sleep Alters by Pain		Pain Affects Daily Life	
Gender	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Male	39(67.2)	19(32.8)	29(50)	29(50)	33(56.9)	25(43.1)	25(43.1)	33(56.9)
Female	43(48.9)	45(51.1)	25(28.4)	63(71.6)*	24(27.3)	64(72.7)	15(17)	73(83)*
Age (years)								
≤40 Years	46(52.3)	30(34.1)	30(34.1)	46(52.3)	34(38.6)	42(47.7)	22(25)	54(71.1)
>40 Years	36(51.4)	34(48.6)	24(34.3)	46(65.7)	23(32.9)	47(67.1)	18(25.7)	52(74.2)
Education								
Uneducated	17(73.9)	6(26.1)	9(39.1)	14(60.9)	11(47.8)	12(52.2)	6(26.1)	17(73.9)
School	51(56.7)	39(43.3)	39(43.3)	51(56.7)	41(45.6)	49(54.4)	30(33.3)	60(66.7)
College or above	14(42.4)	19(57.6)	6(18.2)	27(81.8)	5(15.2)	28(84.8)*	4(12.1)	29(87.9)
Occupation								
Unemployed	34(68)	16(32)	25(50)	25(50)	28(56)	22(44)	21(42)	29(58)
Employed	19(52.8)	17(47.2)	9(25)	27(75)	10(27.8)	26(72.2)	6(16.7)	30(83.3)
Retired	29(48.3)	31(51.7)	20(33.3)	40(66.7)*	19(31.7)	41(68.3)*	13(21.7)	47(78.3)
Income								
<5000	41(66.1)	21(33.9)	32(51.6)	30(48.4)	30(48.4)	32(51.6)	22(35.5)	40(64.5)
5000-10000	20(52.6)	18(47.4)	13(34.2)	25(65.8)	18(47.4)	20(52.6)	13(34.2)	25(65.8)
>10000	21(45.7)	25(54.3)	9(19.6)	37(80.4)	9(19.6)	37(80.4)	5(10.9)	41(89.1)
Province								
Urban	70(55.1)	57(44.9)	47(37)	80(63)	49(38.6)	78(61.4)	37(29.1)	90(70.9)
Rural	12(63.2)	7(36.8)	7(36.8)	12(63.2)	8(42.1)	11(57.9)	3(15.8)	16(84.2)
Smoking								
Smokers	12(48)	13(52)	9(36)	16(64)	8(32)	17(68)	6(24)	19(76)
Non Smokers	70(57.9)	51(42.1)	45(37.2)	76(62.8)	49(40.5)	72(59.5)	34(28.1)	87(71.9)
Family History								
Yes	72(64.3)	40(35.7)	42(37.5)	70(62.5)	48(42.9)	64(57.1)	33(29.4)	79(70.5)
No	10(29.4)	24(70.6)*	12(35.3)	22(64.7)	9(26.5)	25(73.5)	7(20.6)	27(79.4)
Duration of DM								
≤10 Years	23(41.8)	32(58.2)*	14(25.5)	41(74.5)	16(29.1)	39(70.1)	13(23.6)	42(76.4)
>10 Years	59(64.8)	32(35.2)	40(44)	51(56)	41(45.1)	50(54.9)*	27(29.7)	64(70.3)

Table 4 Variables associated with, self-examination of the feet, visit to a doctor/podiatrist, adherence to medications and find hard skin corns or calluses

Variable(s)	Self-Examination of the Feet				Visit to a Doctor/ Podiatrist		Adherence to Medication			Find Hard Skin Corns or Calluses				
Gender	**Daily**	**weekly**	**Monthly**	**Never**	**Yes**	**No**	**Poor**	**Normal**	**Good**	**SD/P**	**SR**	**WA**	**DN**	**Ignored**
Male	5(8.6)	11(19)	10(17.2)	32(55.2)	31(53.4)	27(46.6)	11(19)	4(6.9)	43(74.1)	36(62.1)	11(19)	4(6.9)	5(8.6)	2(3.4)
Female	2(2.3)	20(22.7)	6(6.8)	60(68.2)	33	55(37.5)	5(5.7)	23(26.1)	19(21.6)	57(64.8)	20(22.7)	6(6.8)	5(5.7)	0
Age (years)														
< 40 years	2(2.6)	23(30.3)	10(13.2)	41(53.9)	43(56.6)	33(43.4)	7(9.2)	11(14.5)	58(76.3)	53(69.7)	15(19.7)	2(2.6)	6(7.9)	0
>40 years	5(7.1)	8(11.4)	6(8.6)	51(72.9)*	21(30)	49(70)	9(12.9)	16(22.9)	45(64.3)	40(57.1)	16(22.9)	8(11.4)	4(5.7)	2(2.9)
Education														
Uneducated	5(21.7)	6(26.1)	0	12(52.2)	13(56.5)	10(43.5)	4(17.4)	2(8.7)	17(73.9)	12(52.2)	7 (30.4)	1(4.3)	1(4.3)	2 (8.7)
School 90	2(2.2)	18(20)	12(13.3)	58(64.4)	39(43.3)	51(56.7)	8(8.9)	16(17.8)	60(66.6)	55(61.1)	22(24.4)	7(7.8)	6(6.7)	0
College or above	0	7(21.2)	4(12.1)	22(66.7)*	12(36.4)	21(63.4)	4(12.1)	9(27.3)	20(60.6)	26(78.8)	2(6.1)	2(6.1)	3(9.1)	0
Occupation														
Unemployed	5(10)	11(22)	6(12)	28(56)	28(56)	22(44)	10(20)	2(4)	38(76)	32(64)	10(20)	3(6)	3(6)	2(4)
Employed	0	7(19.4)	6(16.7)	23(63.9)	18(50)	18(50)	2(5.6)	8(22.2)	26(72.2)	23(63.9)	7(19.4)	1(2.8)	6(16.7)	0
Retired	2(3.3)	13(21.7)	4(6.7)	41(68.3)	18(30)	42(70)	4(6.7)	17(28.3)	39(65)	38(63.3)	14(23.2)	6(10)	2(3.3)	0
Income														
<5000	1(1.6)	16(25.8)	5(8.1)	40(64.5)	27(43.5)	35(56.5)	4(6.5)	10(16.1)	48(77.4)	42(67.7)	13(21)	5(8.1)	1(1.6)	1(1.6)
5000-10000	4(10.5)	4(10.5)	5(13.2)	25(65.8)	15(39.5)	23(60.5)	8(21.1)	6(15.8)	11(28.9)	22(57.9)	7(18.4)	4(10.5)	5(13.2)	0
>10000	2(4.3)	11(23.9)	6(13)	27(58.7)	22(47.8)	24(52.2)	4(8.7)	11(23.9)	31(67.4)	29(63)	11(23.9)	1(2.2)	4(8.7)	1(2.2)
Province														
City 127	4 (3.1)	27(21.2)	16(12.6)	80(63)	56(44.1)	71(55.9)	14(11)	19(15)	94(74)	82(64.6)	24(18.9)	10(7.9)	10(7.9)	1(0.8)
Rural 19	3(15.8)	4(21)	0	12(63.2)	8(42.1)	11(57.9)	2(10.5)	8(42.1)	9(47.3)	11(8.7)	7(5.5)	0	0	1(0.8)
Smoking														
Smokers	2(8)	3(12)	5(20)	15(60)	12(48)	13(52)	3(12)	6(24)	16(64)	18(72)	5(20)	0	2(8)	0
Non-smokers	5(4.1)	28(23.1)	11(9.1)	77(63.7)	52(43)	69(57)	13(10.7)	21(17.4)	87(71.9)	75(62)	26(21.5)	10(8.3)	8(6.6)	2(1.7)
Family history														
Yes	6(5.4)	21(18.7)	16(13.2)	69(61.6)	51(45.5)	61(54.5)	14(12.5)	23(20.5)	75(67)	71(63.4)	24(21.4)	7(6.3)	9(8)	1(0.9)
No	1(2.9)	10(29.4)	0	23(67.6)	13(38.3)	21(61.7)	2(5.8)	5(14.7)	27(79.4)	22(64.7)	7(20.6)	3(4.8)	1(2.9)	11(2.9)
Duration of DM														
<10 years	0	12(21.8)	10(18.2)	33(60)	27(49.1)	28(50.1)	10(18.2)	5(9.1)	40(72.7)	37(67.3)	9(16.4)	6(10.9)	3(5.4)	0
>10 years	7(7.7)	19(20.9)	6(6.6)	59(64.8)	37(40.7)	54(59.3)	6(6.6)	22(24.2)	63(69.2)	56(61.5)	22(24.2)	4(4.4)	7(7.7)	2(2.2)

Self-examination of the feet, visit to a doctor/podiatrist, adherence to medications and finding out the hard skin corns or calluses. SD/P, See the doctor or podiatrist; SR, Self-remedy by peeling off or scraping by sharps; WA, Wait for appointment to see doctor; DN, Do nothing.

Citation: Salman A, Robert AA, Al-Ayed MY, et al. Awareness of diabetic foot among type 2 diabetes in a tertiary care hospital, Saudi Arabia: a cross-sectional study. *Endocrinol Metab Int J.* 2016;3(5):123–129. DOI: 10.15406/emij.2016.03.00063

Discussion

Among diabetes' complications, diabetic peripheral neuropathy (DPN) is one of the major complications with diabetic foot related problem resulting in DF. It has shown an increasing trend in the past decade.[10] Studies have shown almost 15 percent of diabetic participants will be suffering from diabetic foot ulceration (DFU) during their lifetime.[11,12] Diabetic foot ulcer is the one of the major cause of hospitalization in diabetic participants leading to diabetic foot infection (DFI), gangrene, amputation and even death if the necessary care is not provided.[6,13] Further studies reported that the overall rate of lower limb amputation in diabetic participants is 10-30 times higher than non-diabetics [6,14,15] and every 20 seconds one leg is amputated due to diabetes in the world.[6,14,15]

It is well demonstrated that many factors which directly or indirectly lead to DF like habitat, the level of education and lack of awareness of diabetes related foot problems.[16] Also, several studies have consistently shown that awareness of DF in the general and diabetes population is low. However, there were limited studies available about the awareness of DF among the Saudi population even though the condition constitutes a major public health problem in the country. The aim of the present study was to assess the awareness of diabetic foot among Saudi population with type 2 diabetes mellitus.

The result of this study showed that a significant proportion of diabetic participants (39%) had a poor knowledge of diabetic foot related problems among the study population 41.1% have poor knowledge related to their footwear and 21.2% were not carrying out the self-examination of the feet. These deficiencies arise from lack of awareness about the effect of DF to cause major problem including lower limb amputations. The lack of knowledge about the foot care in our study is consistent with findings by other investigators worldwide.[17-20] Also, our study reported that when compared to female (53.4%), male (72.4%) possess higher level of diabetic foot problem related knowledge, Also, we found with increased duration of diabetes, there was a simultaneous increase in diabetes foot related knowledge. Similarly, participants with family history of DM have higher diabetic foot problem and the foot wear related knowledge.

There were no major differences were obtained between different age, education, occupation, income and province. However, a study reported that poorly educated participants and in low socioeconomic status significantly had lower knowledge of foot care while gender and age differences were not significantly associated with the knowledge of foot care. The relationship between education and foot care among DM patients has been observed in similar studies in India, Iran and Pakistan where illiterate patients were the least knowledgeable.[17,18]

In the present study, the higher percentage of women (68.2%) not doing self-inspection of the feet compared to the men (52.2%). Further, 72.9% of ≥40 years of age group participants reported that they were not doing self-inspection of the feet compared to the younger age group (53.9%). Studies reported that in diabetes, every individual is required to adhere to medical follow-up with their respective physician or therapist for at least once in 2 months, to keep a check on their glycemic level and as well for evaluation of diabetes-related complications (i.e., diabetic foot).[21]

The present study showed that higher percentage of males (67.2%) had perception of pins and needles over the feet compared to the females (48.9%). We also observed that participants with higher duration of diabetes (>10 years) and those with positive family history of DM reported less in sensation. Previous studies reported that about 10% of diabetic participants experience persistent pain typically worse at night [22]. Painful diabetic neuropathy (DN) can present with burning sensation, pins and needles, tingling shooting, aching, sharp, cold, or allodynia.[23]

A study reported that painful DPN is associated with considerable effect on quality of life. In our study we found when compared to primary and school educated participants, the college educated showed less percentage of daily life issues due to pain, this may be due to the fact that educated participants were more concern about their daily routine life. Similarly, the percentage of participants having diabetes more than 10 years (45.1%) showed altered sleep due to pain in compared to the participants having DM less than 10 years Similar, results had been observed in participants with positive family history of DM (42.9%), lower income (48.4%) and Despite the benefits of therapy, studies have indicated that recommended glycemic goals are achieved by less than 50% of participants, which may be associated with decreased adherence to therapies. As a result, hyperglycemia and long-term complications such as DFU, increase morbidity and premature mortality, and lead to increased costs to health services.[24] In our study, we found majority of the male participants (74.1%) of our study population have good compliance of medication compared to female (21.6%). In contrast to our finding a study reported that female were more likely to follow their prescribed medication regimen compared to men (71.9% vs. 65.6%). There were no noted differences observed on other study variable.

Conclusion

There is a disparity in diabetic foot awareness among the Saudi diabetic population. So, it is clear that primary prevention methods for DFU like educating the people with diabetes, providing reading materials to them and emphasizing the need by using print or electronic media can play a key role in the management of individuals suffering from diabetes. Moreover, it is important to educate the people at an early stage beginning from pre-diabetes to avoid early development of diabetic foot complications. Although several organizations worldwide have emphasized and stressed the need to increase awareness of this problem and called the health care providers to action to decrease the incidence of ulceration followed by minimizing the risk of amputation.

Institutional review board statement

The study protocol was approved by the Research and Ethics committee of Prince Sultan Military Medical City, Riyadh, Saudi Arabia.

Informed consent statement

During the informed consent process, study participants are assured that data collected will be used only for stated purposes and will not be disclosed or released to others without the consent of the participants.

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None.

Conflicts of interest

The author declares there are no conflicts of interest.

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