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Original Research Article

Awareness of Foot Care among Diabetic Patients in Eastern Province, Saudi Arabia: A Cross-Sectional Study

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Abstract

***Background*:** The increase in prevalence of diabetes mellitus among Saudi population is being associated with many health consequences among diabetic patients. One of the serious complications is diabetic ulcer. ***Aim*:** To assess the awareness, attitudes, practices and risk factors influencing diabetic foot ulcers among diabetes patients in the eastern province of Saudi Arabia. ***Method*:** A cross-sectional study consistent of 38 questions conducted in Eastern region of Saudi Arabia, distributed between 8-Feb-2018 to 1-June-2018 through social media. The structured questionnaire was designed to collect demographic characteristics, in addition to several questions about history of foot problems, current foot or leg problems, foot care, foot wear, safety and prevention and foot care education. ***Result*:** Two hundred and ninety-three participated in the questionnaire, of whom 197 were female and 96 were male. The majority of participant (154) had been diagnosed with T2DM. About the treatment which was multiple choice: 55.3% were using oral hypoglycemic drugs, 34.1% using insulin and 31.1% were using diet while the rest were using parenteral hypoglycemic drugs. Most participants (60.1%) reported having altered sensation (i.e. numbness) in their lower limbs. One hundred twelve of participants examined their feet only when they had problem. Only 50.2% drying well between the toes. About using moisturizing cream for the foot and using cream between toes 39.2%, 19.8% were saying yes 37.9% and 31.1% were answer sometimes while the rest 22.9% and 49.1% answer no, respectively. Participants wore more than one type of shoe, with athletic being used by 46.8% of participants, 29.4% wear broad and round toes, 23.2% were wear shoes which made of leather or canvas. Walking barefoot inside the home was 44.7%. Most participants (50.2%) didn't inspect the shoes before wearing them. Forty participants didn't check about the water temperature before soaking feet, 42% check about it while the other didn't soak the feet. For sitting with legs crossed 54.9%. Around 95% of participants want handout on how to care for the feet. ***Conclusion*:** Foot care is crucial to prevent serious complications in diabetic patients. Pharmacological and non-pharmacological measures should be followed to ensure adequate and proper foot care. The participants in this study had inadequate information and poor practice toward the appropriate foot care.

Keywords: Diabetes mellitus, diabetic foot, diabetic patients, awareness, education, Saudi Arabia.

INTRODUCTION

Diabetes mellitus is a metabolic syndrome characterized by hyperglycemia. Diabetes can be type-1, in which the body's ability to produce insulin is impaired due to autoimmune destruction of beta cells in the pancreas, or type-2, which happens due to resistance to insulin action, insufficient insulin secretion, and excessive or insufficient glucagon secretion) [1, 2]. Diabetes impacts almost all bodily systems because of its complications. In 2013, diabetes resulted in 56 million DALYs (disability-adjusted life years) and 1.3 million deaths (2.4% of all deaths). From 589.9 per

100,000 people in 1990 to 883.5 per 100,000 people in 2013, the DALY rate for diabetes increased. Between 1990 and 2013, the number of DALYs caused by diabetes increased by 148.6%; population growth was responsible for 62.9% of this increase, aging was responsible for 31.8 and age-specific DALY rates increased by 53.9% [3]. Diabetes was reported to affect 13.4% of Saudi Arabians who were 15 years of age or older [4].

The prevalence of diabetes has risen to epidemic proportions worldwide [3]. Many complications secondary to this metabolic syndrome are also increasing, including neuropathy, retinopathy, nephropathy, atherosclerosis, and foot ulcers. [2] 20% of diabetics have a high risk of developing foot ulcers due to neuropathy [5]. In developed nations, diabetic foot ulcers (DFUS) account for 12–15% of the total estimated cost of diabetes; this percentage rises to 40% in developing nations [6]. DFUs are among the most prevalent diabetes complications, affecting 4 to 10% of those with the disease [7]. While it is 2.1-2.2% in smaller populations in Europe, the overall incidence of DFU is 5.8-6.0% in some specific diabetics in the United States [8]. The cost of treating foot ulcers can be high, but between 49 and 85% of DFUS can be avoided by raising awareness and adopting the right precautions [7].

Diabetic foot (ulcers and infections) is one of several severe complications of both types of diabetes and cause more hospital admissions than any other complications and increases morbidity and mortality [2, 3]. The major cause of diabetic foot ulcers is peripheral neuropathy, which affects nerves [2-4]. Hyperglycemic conditions can lead to an increase in the action of aldose reductase and sorbitol dehydrogenase enzymes, which will cause the conversion of glucose to sorbitol and fructose. Accumulation of sorbitol and fructose leads to a decrease in the synthesis of nerve cell myoinositol which is essential for neuron conduction. This, in turn, leads to the depletion of nicotinamide adenine dinucleotide phosphate stores, which is essential for synthesizing the vasodilator nitric oxide. Therefore, vasoconstriction will increase, resulting in ischemia [2, 9].

Diabetic foot ulcers can lead to infection, which is not the cause. Still, a consequence of diabetic foot ulcers almost begins as a slight problem (superficial). It may progress to a severe problem in deep tissues, joints, or bones, gangrene, amputation, and even death if not managed [3, 4]. Foot ulcers due to diabetes are the commonest cause of foot amputations [3, 4]. Diagnosis of foot ulcers in diabetics is made by physical examination factors, including erythema, tenderness, edema, and pain, and by the presence of pus secretion from an infected wound [2].

Among the diabetic complications, DFUS impacts the patient's quality of life in the event of an amputation. However, amputation can be avoided by employing care and education strategies [10]. According to data, 25% of diabetic patients experience a foot ulcer at some point in their lives, and treating a diabetic foot ulcer is more expensive than treating any other type of chronic ulcer [11]. More than other complications, diabetic foot amputation continues to have a negative impact on patient's lives [12, 13]. Serious foot problems should be taken care immediately. According to Ndosi et al., 15.1% of patients passed away within a year of their initial diagnosis, 45.5% had healed, but 9.6% had relapsed. Participants with a single ulcer on their index foot had a higher incidence of healing than those with multiple ulcers [14].

Planning for better control of diabetes and its complications requires understanding the level of knowledge and practice among patients with diabetes. According to a study by Ahmad and Ahmad on 124 diabetes patients in North India, the knowledge and practice of diabetes were rated lower by 60.5% and 79.0% of the participants, respectively [15]. In Nigeria, 79.5% of diabetes patients knew about self-care, above the global average of 70%, according to Jackson, IL *et al*., [16]. According to a study conducted in Malaysia, most patients (58%) had poor knowledge, and 61.8% practiced poor foot care [17].

Foot ulcers are among the diabetes complications that are thought to be the easiest to avoid. Poor practices and lack of knowledge are risk factors for DFUS. Amputation is less likely to occur when diabetic foot complications are treated effectively and consistently [18]. The American Diabetes Association asserts that diabetic patients should undergo annual evaluations of their knowledge, abilities, and behaviors [16]. The current study aimed to evaluate patients' awareness, attitudes, practices, and risk factors influencing diabetic foot ulcers among diabetes patients in the Eastern province of Saudi Arabia.

Objective:

The aim of this study is to assess the awareness, attitudes, practices and risk factors influencing diabetic foot ulcers among diabetes patients in the Eastern province of Saudi Arabia.

METHOD

A cross-sectional study consistent of 38 questions conducted in Eastern region of Saudi Arabia, distributed between 8-Feb-2018 to 1-June-2018 through social media. The structured questionnaire was designed to collect demographic characteristics, in addition to several questions about history of foot problems, current foot or leg problems, foot care, foot wear, safety and prevention and foot care education.

The questionnaire is comprised of 38 questions in seven sections, regarding 1) demographics which contain 8 questions, 2) history of foot problem which contain 4 question, 3) current foot problems which contain 5 questions, 4) foot care which contain 7 questions, 5) foot which contain 2 questions, 6) safety and prevention which contain 9 questions, 7) foot care education which contain 3 questions. Data analysis was done by using Microsoft Excel (15.32) & socscistatistics website.

RESULTS

Table 1: Participants demographic characteristics

Demographic		%	N
Age	From 18 to 25	8.9%	26
	From 26 to 35	10.9%	32
	From 36 to 49	30.7%	90
	From 50 to 65	41%	120
	More than 65	8.5%	25
Gender	Male	32.8%	96
	Female	67.2%	197
Level of education	Not educated	10.9%	32
	Secondary or less	30%	88
	diploma	13.3%	39
	Bachelor	43.3%	127
	Master, Ph.D.	2.5%	7
Medical filed	Student in medical filed	1.7%	5
	Workers in medical filed	2%	6
	Neither students or workers	96.2%	282
Type of diabetes	Type 1 Diabetes	40.5%	119
	Type 2 Diabetes	59.1%	174
Age at diagnosis	Less than 30 years	28.7%	84
	From 30 to 45 years	39.6%	116
	› 45	31.7%	93
Duration of diabetes	≤ 10	51.2%	150
	›10	48.8%	143
Therapy (multiple choice)	diet	31.1%	100
	Oral hypoglycemic drugs	55.3%	162
	Insulin	34.1%	91
	Parenteral hypoglycaemic drugs other than insulin (like liraglutide)	6.5%	19

Table 1 displays the demographic characteristics of the participants. Two hundred and ninety-three participants took part in the questionnaire, of whom 197 (67.2%) were females and 96 (32.8%) were males. Most participants were between the ages of 50 to 65 years. One hundred twenty-seven participants (43.3%) had a bachelor degree, 30% received secondary education or less, 13.3% had diploma, 10.9% were not educated, while only 2.5% had masters or Ph.D. The majority of participants (96.2%) were neither workers or students in medical field. one hundred fifty-four (59.1%) of participants had been diagnosed with T2DM and the rest were type-1 DM. 39.6% were diagnosed with Diabetes at the age 30 to 45 years old, 31.7% were more than 45 years old and the rest were less than 30 years old. Most patients had diabetes for less or equal to 10 years (51.2%). More than half of the participants (55.3%) were on oral hypoglycemic drugs, while 34.1 % received Insulin, 31.1% managed their diabetes through diet and only 6.5% received parenteral hypoglycemic other than Insulin (like Liraglutide) (Table 1).

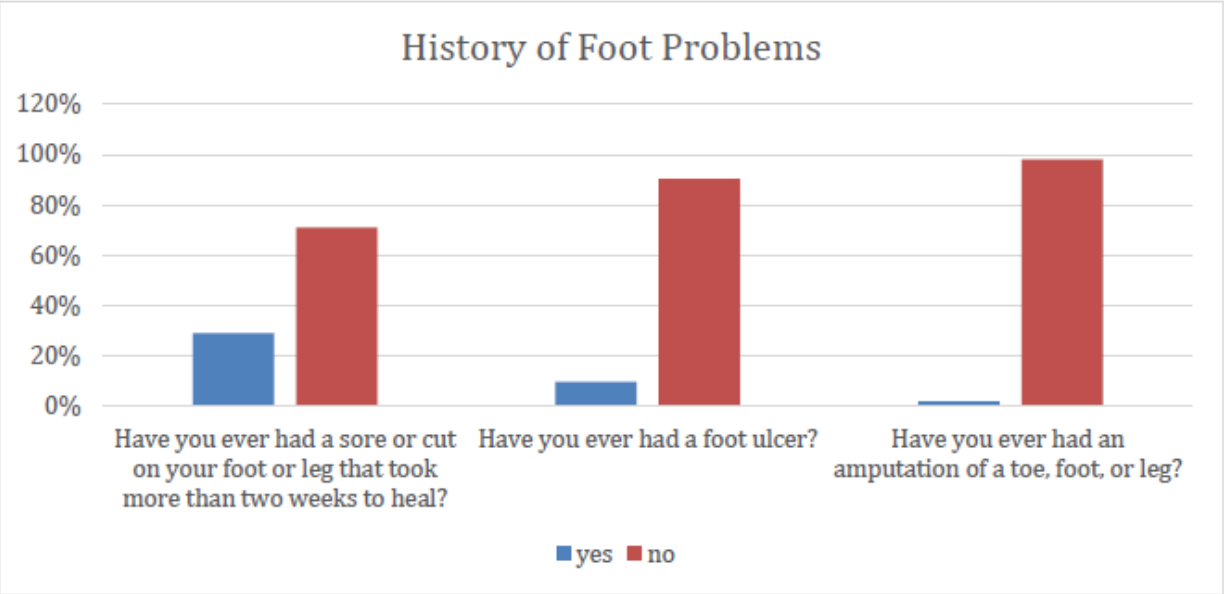

Figure 1

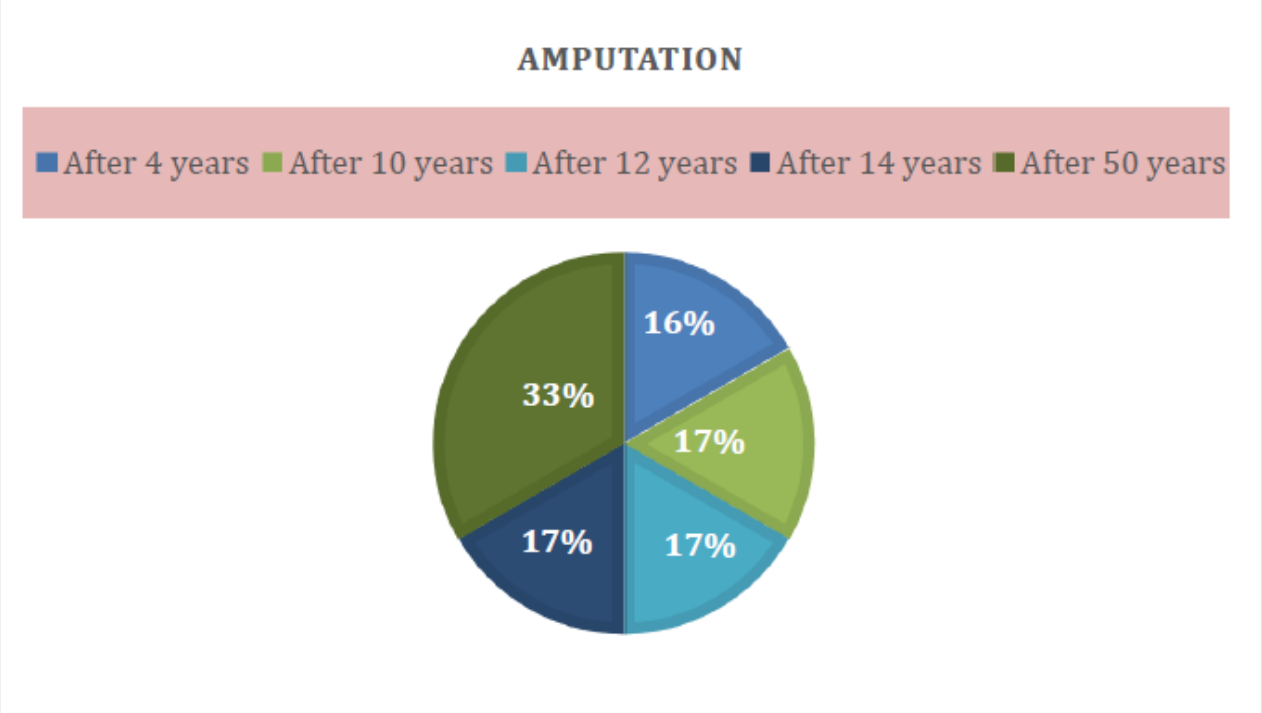

Figure 2

Figure 1 shows the participants' history of foot problems. 71% of the participants did not a sore or cut on foot or leg that took more than two weeks to heal. The majority of participants (90.4 %) did not have a foot ulcer, while 98% reported they did not have an amputation of a toe, foot or leg (Figure 1).

Figure 2 shows that only two patients amputated their foot after 50 years, 1 patient after 12 years, 1 patient after 10 years, 1 patient after 14 years and 1 after 4 years (Figure 2).

Figure 3

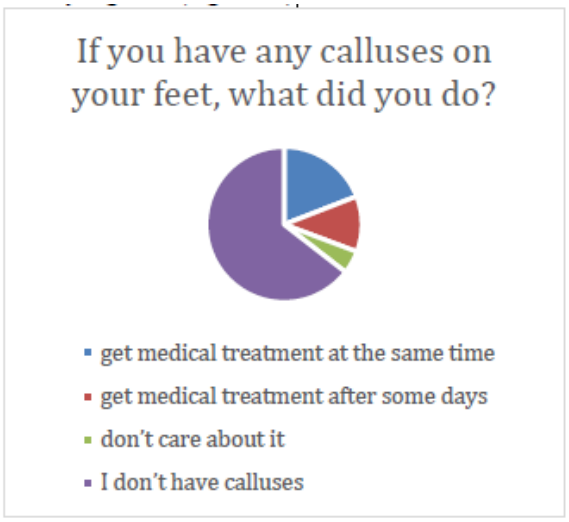

Figure 4

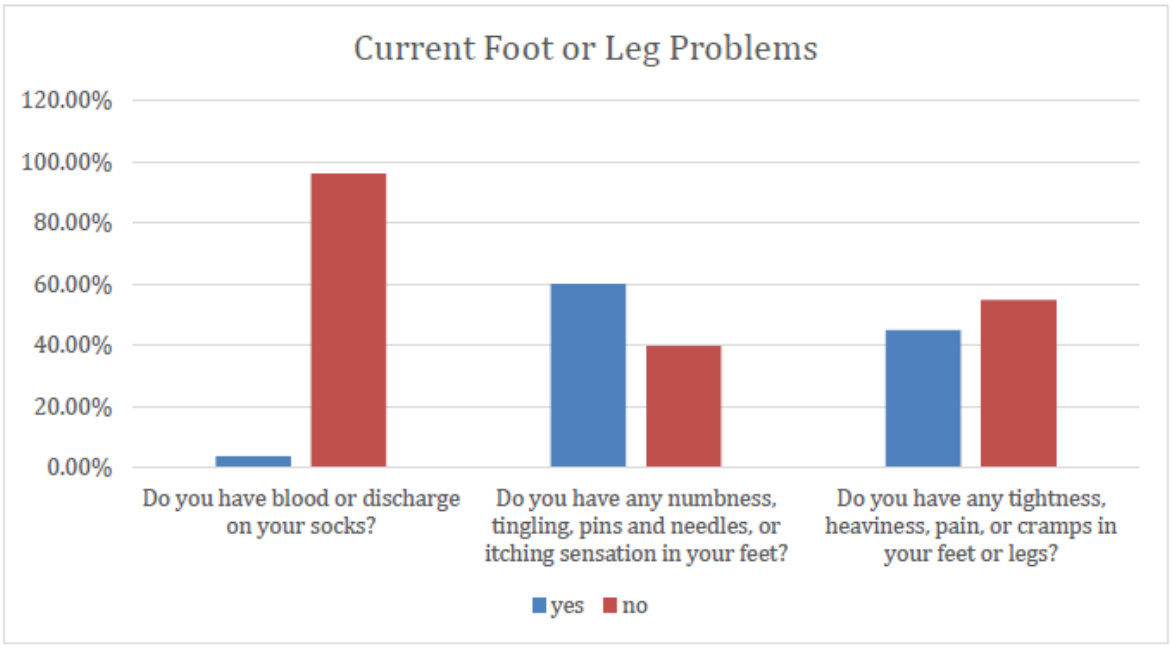

Figure 5

About having ulcer, sore, or blister on feet, 60.1% answered that they would get medical treatment at the same time, 31.1% would try to be treated at home, 5.1% would get the medical treatment after some days if rest wouldn't take care of it (Figure 3).

In Figure 4, 64.5% reported not having any calluses, 19.1% got medical treatment immediately, and 11.6% would get treatment after some days while the other didn't care about it (Figure 4).

Two hundred eighty-nine of participants didn't have any blood or discharge on the socks. Most participants (60.1%) reported having altered sensation (i.e. numbness) in their lower limbs. As a comparison between males and females, the p-value is 0.77. This result is not significant. About any tightness, heaviness, pain, or cramps 45.1% reported experiencing such symptoms, while 54.9% were saying no (Figure 5).

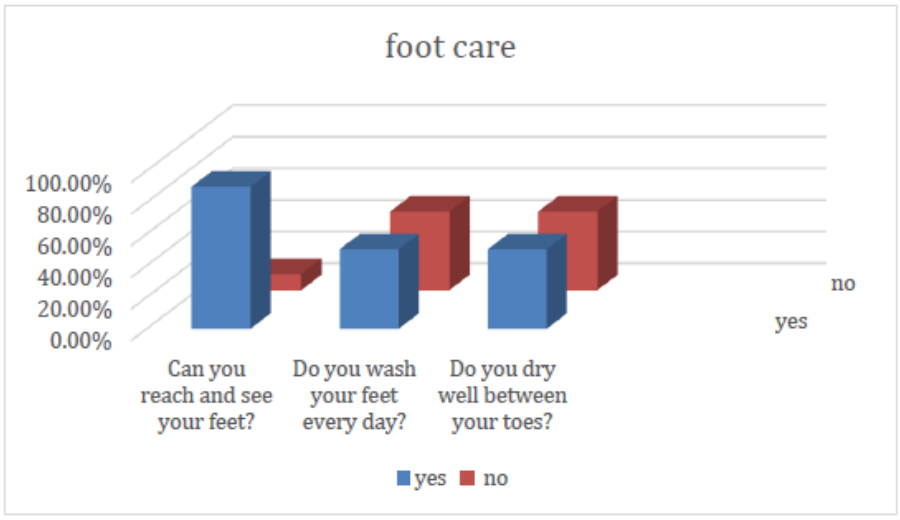

Figure 6

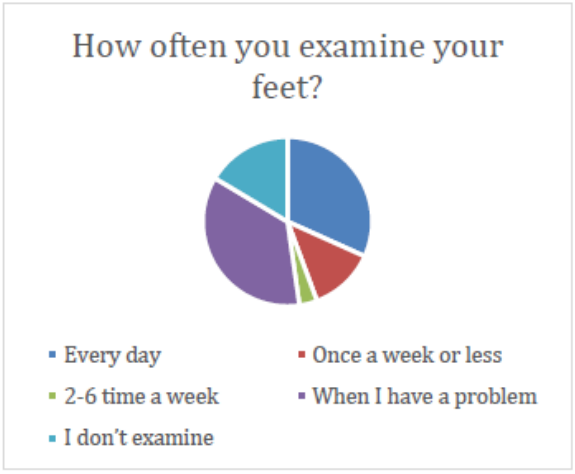

Figure 7

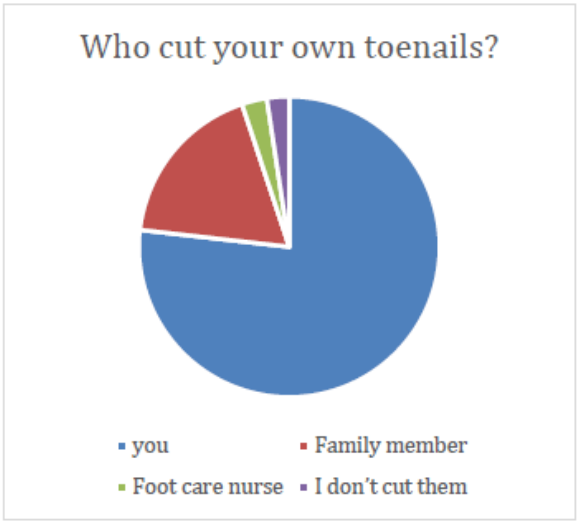

Figure 8

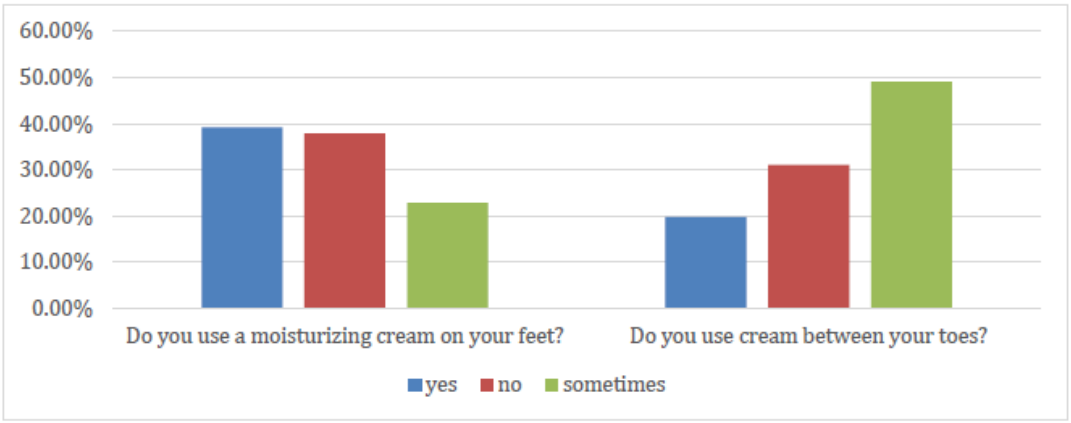

Figure 9

Regarding foot care, 89.8% reported they could see and reach their legs. 89.4% reported to wash their legs daily, while 50.2% reported drying well between toes. As a comparison between males and females, the p-value is 0.88. This result is not significant at $p < 0.05$ (Figure 6).

One hundred twelve of participants reported examining their feet only when they had problem, 31.7% examined their feet every day and16.4% didn't examine it whereas12.6% once every week or less while the other twice to 6 times per week (Figure 7).

76.8% reported cutting their toenails by themselves, 18.1% by one of the family member, 2,7% by caregiver while the rest didn't care about them (Figure 8).

About using moisturizing cream for the foot and using cream between toes. 39.2% said they used moisturizer, while 22.9% reported using moisturizer sometimes and 37.9% did not use moisturizer cream (Figure 9).

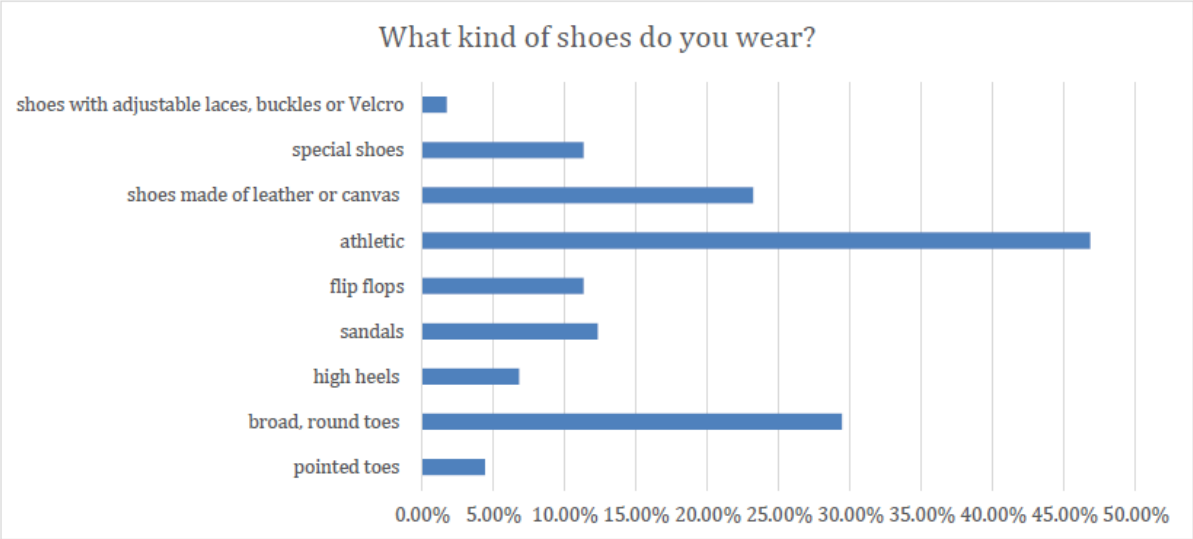

Figure 10

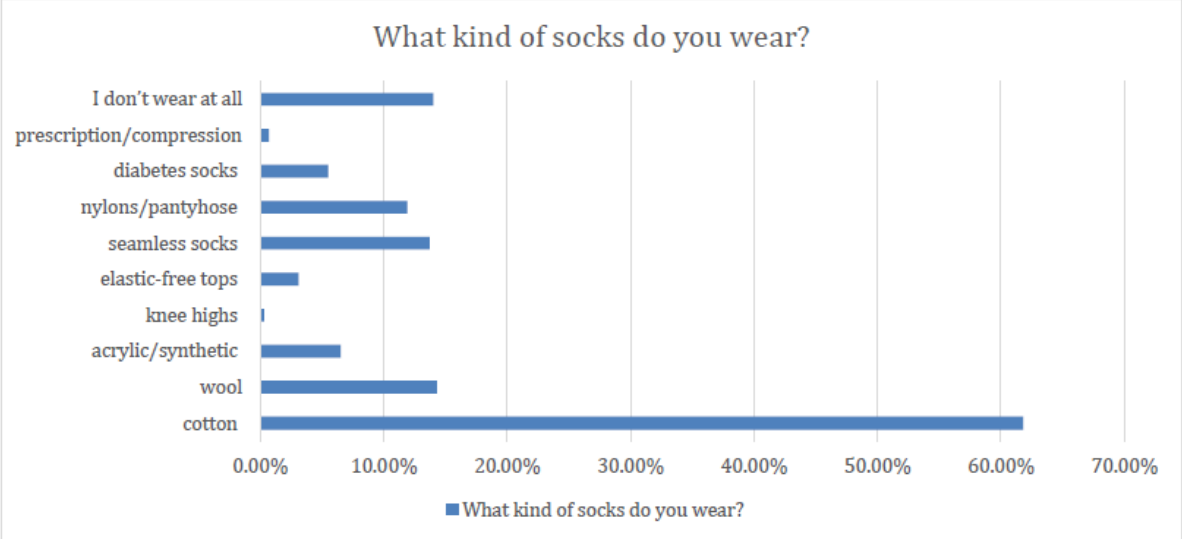

Figure 11

Concerning foot wear, Participants wore more than one type of shoe, with athletic being used by 46.8% of participants, 29.4% wear broad and round toes, 23.2% were wear shoes which made of leather or canvas, 12.3% of them wear sandals while the same percentage 11.3% were wearing special shoes and flip flops. Twenty participants were wearing high heels and 4.4% were wearing pointed toes, the rest were wearing shoes with adjustable laces, buckles or Velcro (Figure 10). For what kind of socks: 61.8% were using cotton, 14.3% were using wool, 14% didn't wear any sock, 13.7% were using seamless socks, 11.9% were wearing nylons/pantyhose, 6.5% using acrylic/synthetic, 5.5% were using" diabetes" socks, while the rest were using knee highs and prescription (Figure 11).

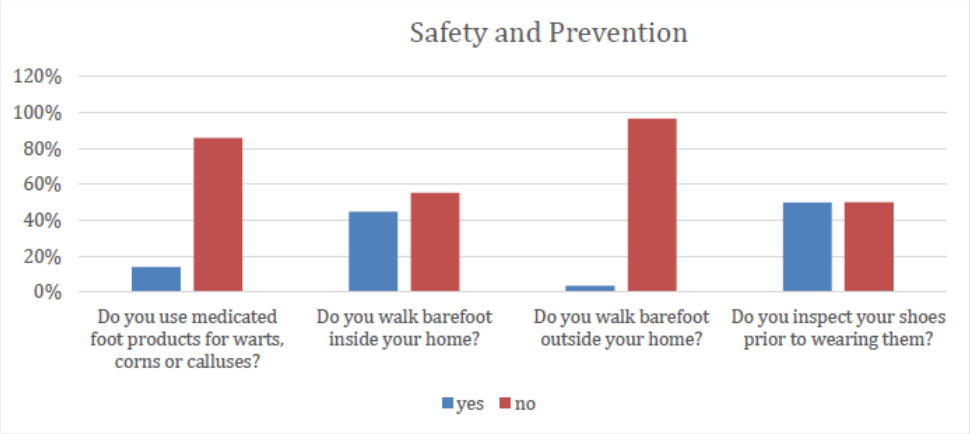

Figure 12

Regarding Safety and Prevention, 86% did not use any medicated foot products for warts, corns or calluses while the rest were using (Figure 12). 44.7% reported walking barefoot inside the home and 3.4% reported walking barefoot outside the home (Figure 12). As a comparison between males and females, the p-value is 0.000001. This result is significant. Almost half the participants (50.2%) didn't inspect their shoes before wearing them, while the rest of them did (Figure 12).

Figure 13

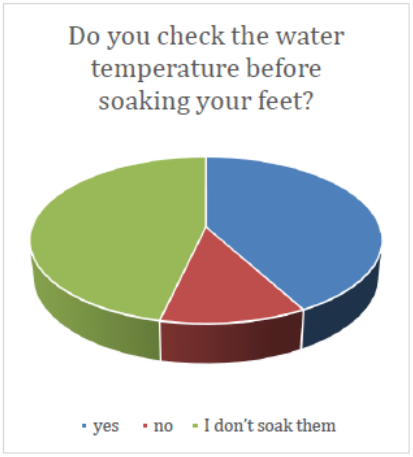

Figure 14

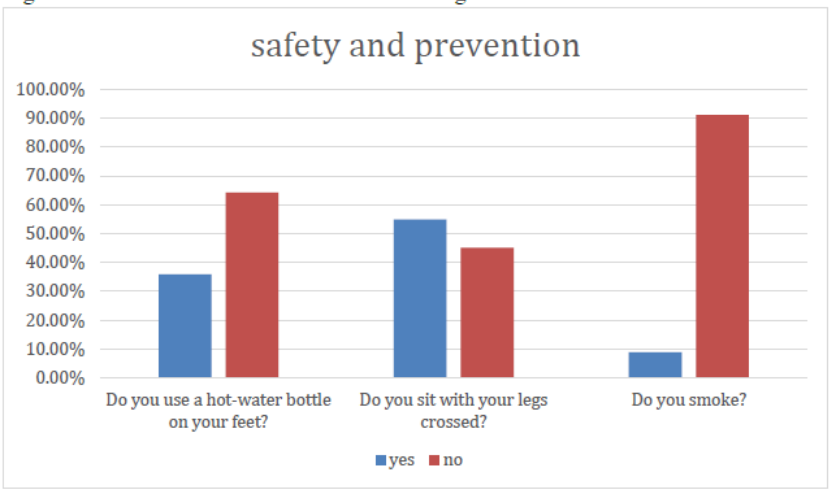

Figure 15

About wearing shoes without socks 15.7% were always do that, 29.7% were sometimes do that, 13.3% were rarely do that while the other didn't wear shoes without sock (Figure 13).

Forty participants didn't check the water temperature before soaking feet, 42% checked it while the other didn't soak the feet (Figure 14).

One hundred eighty-eight didn't use hot-water bottle on their feet while the other were using it. For sitting with legs crossed, 54.9% did that (Figure 15). As a comparison between males and females, the p-value is 0.11. This result is not significant. For smoking 8.9% were smoking only (Figure 15).

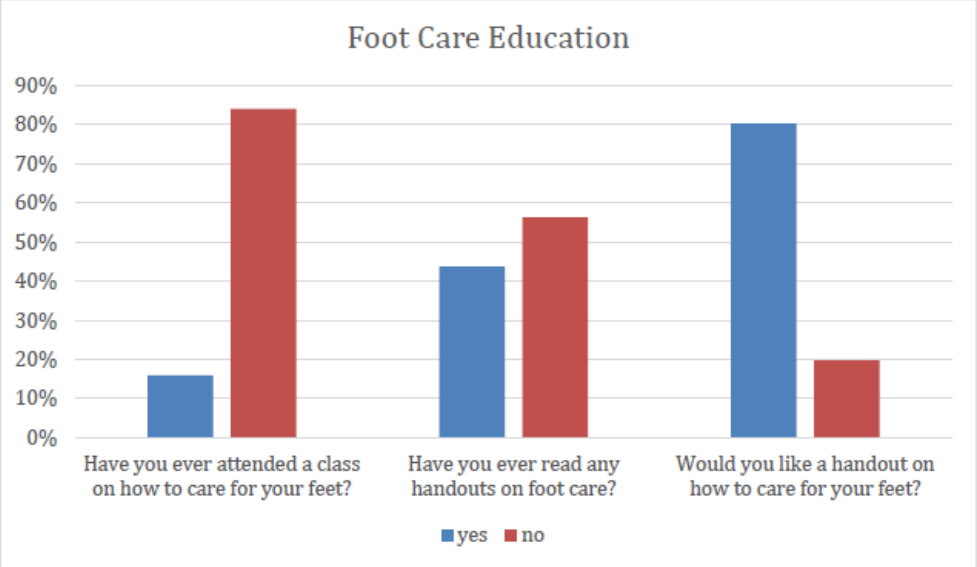

Figure 16

Concerning Foot Care Education to help the community; 16% of the participants reported attending classes to take care of their feet. 43.7% reported reading handouts about foot care. Lastly, 95% reported that they would like to receive a handout on how to take care of their feet (Figure 16).

DISCUSSION

The genders were not equally represented, with 201 female v. 79 male participants in the study. Most of the participants were in the age range of 50 to 65 years. One hundred twenty-seven participants (43.3%) had a bachelorism education, 30% were Secondary education or less, 13.3% were diploma, 10.9% were not educated while the other master, Ph.D., Literacy and Less than primary. Most of the participants were diagnosis for DM with age more 30 years with duration less than or equal 10 years. Only around 4% were working and studying in a medical filed. Although the prevalence of T2DM is unequal amongst the genders worldwide, with more men having T2DM than women, the study shown that there are more women participated in this study. Because most of patient have T2DM there were more participants take oral hypoglycemic drug. Although the therapy was multiple choice in the questionnaire, the result was 55.3% for oral hypoglycemic drugs and 31.1% for diet! Which is a negative response and the result was expected to be 100% for all diabetic patients. Diabetic patients should follow either mediterranean diet or modified DASH diet if the patients have hypertension. All the answers were positive "no" in all questions about history of foot problems. There were 3 questions 1) if patient had a sore or cut on foot or leg that took more than two weeks to heal 2) if patient had a foot ulcer 3) if patient had an amputation of a toe, foot, or leg. Because the current foot problems are very important there was some questions about it. About having ulcer, sore, or blister on feet, more than the half patients chose the correct answer which is "get medical treatment at the same time ". Most of patients not having blood or discharge on socks, which is a positive result. About having calluses on feet, most of patients "64.5%" didn't have calluses. Most of participants (60.1%) have numbness, tingling, pins and needles, or itching sensation in lower extremity. Also, most of participants have tightness, heaviness, cramp in the feet. Both 2 questions are common symptoms in DM patients with poor blood glucose control and could cause nerve damage to feet. For that, Patients should keep blood sugar levels under control. Around 90% of participants can reach and sea their feet.

It is a good result which mean the participant can examine and take care of their foot by themselves. Most of participants can cut their own toenails by themselves. Their toenails should be trimmed using the correct technique, which is straight across. Unfortunately, most of participants examine their foot

when they have a problem only. The diabetic patients should examine their foot daily to avoid any injuries or change that can lead to complications. Daily foot inspection by patients can prevent DFD and its fatal complications. Half of the patients (50%) washing their feet every day which may because of participants Muslims and wash their foot for prayer every day. Keeping the interdigital space dry is important to prevent fungal infections as part of foot care hygiene but unfortunately many participants don't dry well between the toes. Around (39.2%) moisturizing their foot and (22.9%) said sometimes they moisturize their foot. Diabetic patients should use a moisturizer daily to keep dry skin from itching or cracking, but they shouldn't moisturize between the toes which could encourage a fungal infection. Unfortunately, for the question about using cream between toes, 20% said "yes" and 49.1% said "sometimes". About foot wear, around (46.8%) wear athletic shoes, (29.4%) wear broad and round toes shoes, (23.2%) wear shoes made of leather or canvas. Patients should choose comfortable, well-fitting shoes. Never buy tight shoes hoping they will stretch. That is mean Do not wear shoes made from plastic or other materials that do not breathe. They should choose leather, canvas, suede or shoes that can be adjusted with laces, buckles, or Velcro. Avoiding thong sandals, flip-flops, pointed-toe and open-toe shoes, and very high heels. Open footwear would make them more prone to trauma and infection. Around 61.8% wear a cotton socks, 14.3% wear a wool socks which is a good result. Socks can provide an extra layer of soft protection between your foot and your shoe. Diabetic patients should Wear clean, dry socks, or non-binding pantyhose. Avoiding socks or hosiery with seams that can cause additional pressure points or are too tight on the leg.

Avoiding tight elastic bands because they reduce circulation and don't wear thick or bulky socks because they can fit poorly and irritate the skin. Based on the specific measure of safety and prevention, there are many participants don't soak their foot and some participants use a hot-water bottle on the feet. Those two were deemed crucial in diabetic foot care. Patient should soak their feet and should not be using water that is too hot or too cold in washing and bathing as diabetic patients with neuropathy might not be able to feel any insult to their feet and this could lead to catastrophic consequences. Checking the temperature of water before using was also an important step that should be taught to patients so that scald injury could be avoided especially in the feet of diabetics. Only 49.8% inspect the inside of their shoes every day for tears or bumps that may cause pressure or irritation which was less than the half do that. The participant may not feel a pebble, so always shake your shoes before putting them on. Most participants walk with shoes outside the home but walk barefoot inside the home.

Diabetic patients should never walk barefoot. Not even at home! Because diabetic patients could step on something and get a scratch or cut. Most patients don't use any medicated foot products for warts, corns or calluses. Diabetic foot patients shouldn't sit with legs crossed or stand in one position for long periods of time but unfortunately most patients do that. There is strong evidence that ceasing smoking and following nutritional can reduce DM itself. However, only 8.90% of participants smoked cigarettes, which may be related to the participants' racial composition. Smoking effect on the reduction of blood flow to the lower limbs. Generally, knowledge influences behavior, which may be one of the reasons why a large proportion of participants were non-smokers. Improving knowledge by using smoking cessation interventions amongst T2DM patients may be a good public health strategy in decreasing the risks of DFD. Around 15.7% participants wear shoes without socks which is wrong behavior. Participants should wear suitable sock when decide to wear shoes to avoid any change for foot.

Appendix: 1 (questionnaire)

Age (years)	From 18 to 25
	From 26 to 35
	From 36 to 49
	From 50 to 65
	More than 65
Gender	Male
	Female
Education level	Not educated
	Secondary or less
	Diploma
	Bachelor
	Other
Are you a student or working in the health field?	Yes, I am a student
	Yes, I am working in the health field
	No

Type of diabetes	Type 1 Diabetes
	Type 2 Diabetes
Age at diagnosis	Less than 30 years
	From 30 to 45 years
	More than 45
Duration of diabetes	More than or equal 10 years
	Less than 10 years
Therapy (multiple choice)	Diet
	Oral hypoglycemic drugs
	Insulin
	IM or SQ hypoglycemic drugs other than insulin (like liraglutide)
History of Foot Problems	
Have you ever had a sore or cut on your foot or leg that took more than two weeks to heal?	Yes
	No
Have you ever had a foot ulcer?	Yes
	No
Have you ever had an amputation of a toe or more, foot, or leg? (If yes, When? (Date:_____/_____/_____).	Yes
	No
Current Foot or Leg Problems	
What will you do if you find ulcer, sore, or blister on your feet?	- Get medical treatment at the same time
	- Get medical treatment after some days
	- Try to treat it at home
	- Don't care about it
Do you have blood or discharge on your socks?	Yes
	No
If you have any calluses on your feet, what did you do?	- Get medical treatment at the same time
	- Get medical treatment after some days
	- Don't care about it
	- I don't have calluses
Do you have any numbness, tingling, pins and needles, or itching sensation in your feet?	Yes
	No
Do you have any tightness, heaviness, pain, or cramps in your feet or legs?	Yes
	No

Foot Care

Can you reach and see your feet?	Yes
	No
How often you examine your feet?	- Every day
	- Once a week or less
	- 2-6 time a week
	- When I have a problem
	- I don't examine
Do you wash your feet every day?	Yes
	No
Do you dry your feet well and between your toes,too?	Yes
	No
Do you use a moisturizing cream on your feet?	Yes
	No
Do you use cream between your toes?	Yes
	No
	Sometimes
Who cut your own toenails?	- Myself
	- Family member
	- Foot care nurse
	- I don't cut them

Foot Wear	
What kind of shoes do you wear? (multiple choice)	1. Pointed toes
	2. Broad, round toes
	3. High heels
	4. Sandals
	5. Flip flops
	6. Athletic
	7. Shoes made of leather or canvas
	8. Special shoes
	9. Shoes with adjustable laces or Velcro
What kind of socks do you wear? (multiple choice)	1. Cotton
	2. Wool
	3. Acrylic
	4. Knee highs
	5. Elastic-free tops
	6. Seamless socks
	7. Pantyhose
	8. Diabetic socks
	9. Compression
	10. I don't wear at all
Safety and Prevention	
Do you use medicated foot products for warts, corns or calluses?	Yes
	No
Do you walk barefoot inside your home?	Yes
	No
Do you walk barefoot outside your home?	Yes
	No
Do you inspect your shoes prior to wearing them?	Yes
	No
Do you check the water temperature before soaking your feet?	Yes
	No
	I don't soak them
Do you use a hot-water bottle on your feet?	Yes
	No
Do you sit with your legs crossed?	Yes
	No
Do you smoke?	Yes
	No
Do you ever wear shoes without wearing any socks?	Always
	Sometimes
	Rarely
	I don't wear at all
Foot Care Education	
Have you ever attended a class on how to care for your feet?	Yes
	No
Have you ever read any handouts on foot care?	Yes
	No
Would you like a handout on how to care for your feet?	Yes
	No

CONCLUSION

Foot care is crucial to prevent serious complications in diabetic patients. Pharmacological and non-pharmacological measures should be followed to ensure adequate and proper foot care. The participants in this study had inadequate awareness and poor practice toward the appropriate foot care. One reason for that could be attributed to the lake of educational programs regarding foot care.

RECOMMENDATIONS

Educational campaigns directed to the diabetic patients and their caregivers are needed to improve the adherence to the current guideline of foot care in diabetic patients. Leaflets and brochures, containing some information about the foot care, could be distributed through the pharmacy during the dispensing of diabetes medication. Also, giving advice about how to prevent diabetes complications, should be highlighted and reinforced in all health institutions.

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