

Knowledge and Practice Regarding Foot Care in Patients with Diabetes Mellitus Attending Diabetic Clinics in Health Centers in the Kingdom of Bahrain

Fatima Habbash¹, Afrah Saeed¹, Fadheela Abbas¹, Buthaina Yousif Ajlan¹, Fatima Abdulla¹, Adel Salman Al-Sayyad^{2,*}

ABSTRACT

Background: Diabetes Mellitus (DM) is a serious chronic disease. The prevalence of diabetes in Bahrain in 2007 was 14.3%. One of the most important complications of diabetes is foot problems. In Bahrain the estimated prevalence of diabetic peripheral neuropathy was 36.6%, peripheral vascular disease 11.8% and foot ulceration 4.75%. Although there is a large amount of literature on the diabetic foot and the importance of foot care, there is a lack of population based study of foot care knowledge and practice. The aim of this study is to assess the knowledge and describe the practice of foot care in diabetic patients in diabetic clinic. **Design:** A cross-sectional survey in diabetic clinics in local health centers in Bahrain. **Setting:** Diabetic clinic, Primary health centers, The Kingdom of Bahrain. **Methods:** The target population was all diabetic patients attending diabetic clinics in primary health care in Bahrain during the period of 15th, July, 2008 till 15th October, 2008. The questionnaires were filled by direct interview of 400 patients, 100 patients from each health region. The questionnaire contained demographic data, questions about knowledge and practice of diabetic foot care. **Results:** The mean knowledge score was 8 (SD 2) out of 11. Only 33% of the patients knew that there is no relationship between diabetes and flat feet. 44% of the patients were unaware that they should inspect their feet daily. 38.7% did not think that they should inspect their footwear every time they were worn. Higher knowledge score was found in Bahraini patients ($P=.000$), Patients with high educational level ($P=.004$) and in patients with less than 20 years duration of diabetes ($P=.001$). On the other hand, there were no associations between the knowledge score and gender, glycemic control or having previous foot problem. Feet inspection was practiced by 66.5% of the patients. 86.8% were washing their feet daily and 78.5% were washing their feet in warm water. Practices that put patients at risk included trimming toenails straight across, not having their feet measured when they last bought footwear and walking barefoot regularly. **Conclusion:** This study revealed a good knowledge score in this study (mean 8, SD 2), but are still deficiencies in knowledge about the frequency of foot inspection (44%) and awareness regarding inspection of the inside of footwear for object and torn lining (38.7%). Feet inspection was practiced by 66.5% of the patients, 86.8% were washing their feet daily and 78.5% were washing their feet in warm water. Findings from this study can be used in implementing health education programs on foot care for diabetic patients to improve their knowledge and practice.

Key words: Knowledge, Practice, Foot care, Diabetes, Health centers, Bahrain.

Fatima Habbash¹, Afrah Saeed¹, Fadheela Abbas¹, Buthaina Yousif Ajlan¹, Fatima Abdulla¹, Adel Salman Al-Sayyad^{2,*}

¹Consultant Family Physician, Ministry of Health, Manama, KINGDOM OF BAHRAIN.

²Associate Professor of Family and Community Medicine, Arabian Gulf University, Manama, KINGDOM OF BAHRAIN.

Correspondence

Dr. Adel Salman Al-Sayyad, M.D, MSc, ABFM, DLSHTM
Associate Professor of Family and Community Medicine, Arabian Gulf University, P.O.Box. 12, MOH, Manama, KINGDOM OF BAHRAIN.
Mobile no: +973 3349959
Email: aassyyad2010@gmail.com

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INTRODUCTION

Diabetes mellitus (DM) is a serious chronic disease. The increase in the prevalence of diabetes and its complications is alarming. The global prevalence of diabetes is estimated at over 200 million and has been predicted to reach 333 million by 2025. The prevalence in the Middle East in 2003 was 14.5%.¹

Several countries of the region have lately reported data on the epidemiology of diabetes.² According to the national non communicable disease and risk factors survey done in Bahrain in 2007, the prevalence of diabetes is 14.3%³ as compared to Kingdom of Saudi Arabia (KSA) 23.7% (2004), United Arab of Emirate (UAE) 20% and Qatar 16%.⁴ Profound changes in

the way of life in the Arabian Peninsula during the last 30 years have been associated with the emergence of diabetes. A genetic susceptibility in this population may explain why diabetes has become an epidemic. Long life expectancy, sedentary lifestyle and changing dietary are other contributing factors.⁵

Although many serious complications, such as kidney failure or blindness, can affect individuals with diabetes, it is the complications of foot that take the greatest toll. Diabetic foot can be defined as any Infection, ulceration and/or destruction of deep tissues

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associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb".⁶

Diabetic foot ulcers are classified to 2 main types: neuropathic and neuro ischemic. Neuropathy has sensory, motor and autonomic components. Sensory loss results in loss of protective sensation and unnoticed foot injuries. Loss of motor control to the small muscles of the feet results in a claw foot deformity. Autonomic neuropathy leads to vasomotor denervation and arteriovenous shunting. This compromises the ability to direct blood flow to the capillary beds. Ischemia can affect the large blood vessels resulting in atheroma of the femoral, popliteal and tibial vessels. Small vessel ischemic changes may affect the microcirculation.⁷

Worldwide, more than a million lower leg amputations are performed each year as a consequence of diabetes, which means that in every 30 sec a lower limb is lost to diabetes somewhere in the world. This figure is unacceptably high. The treatment and subsequent care of people with diabetic foot problems have a significant impact on health care budgets and potentially devastating effect on the lives of affected individuals and their family members, particularly in developing countries.⁸

Substantial evidence concludes that Diabetic Neuropathy (DN) leading to Foot Ulceration (FU) is associated with increased morbidity and increased risk of mortality. The estimated prevalence of diabetic peripheral neuropathy was 33.5% in Greece,⁸ 32.3% in Italy,⁹ 39% in UAE¹⁰ and 36.6% in Bahrain.¹¹ On the other hand peripheral vascular disease prevalence was 12.7% in Greece,⁸ 12% in UAE¹⁰ and 11.8% in Bahrain¹¹ and foot ulceration estimated to be 4.75% in Greece⁸ and 5.9% in Bahrain.¹¹

A nationwide primary care diabetes clinic-based study was conducted in Bahrain (2005) to assess the prevalence of diabetic foot problem and its potential risk factors concluded that: older age, longer duration of diabetes, current smoking, were significant risk factors for foot ulceration.¹¹ In KSA Type 2 diabetics (84%) were found to be more prone to develop diabetic neuropathy than type I (16%).¹

A study in the United States (US) showed that the strongest association with foot ulceration was duration of disease of [greater than or equal to] 21 years (odd ratio OR= 2.3).¹² A mean diabetes duration associated with diabetic neuropathy was 10.6 +/- 6.56 years in the previous study in KSA.¹

In one study done in US, Foot ulcers were significantly more prevalent among insulin users (OR=1.6) than among persons who did not use insulin ($p < 0.001$).¹² On the other hand in KSA only 28% of patients with diabetic neuropathy were on insulin, 63% on Oral Hypoglycemic (OHG) agents and 5% on diet alone and the remaining 4% were using combined OHG agents and insulin.¹

Foot ulcer increased with smoking from 10.3% among nonsmokers to 11.9% among former smokers to 15.8% among current smokers.¹

A study was conducted in the United Kingdom (UK) to assess the knowledge and practice of foot care in people with diabetes. A knowledge score was calculated and the mean knowledge score was (6.5 out of 11). There was a positive correlation between the score and having received advice on foot care. Deficiencies in knowledge included the inability to sense minor injury to the feet (47.3%), proneness to ulceration (52.4%) and effect of smoking on the circulation (44.5%).¹³ While in India, 6.6% of diabetic patients knew about diabetic gangrene.¹⁴

Results regarding practice of foot care showed that 71.6% of diabetics were taking care of their foot by regular washing (63.3%) and by regular inspection (8.3%)¹³ In the UK 24.6% of diabetics never visited a chiropodist, (18.5%) failed to inspect their feet and 83% did not have their feet measured when they last purchased shoes. The results highlight areas where efforts to improve knowledge and practice may contribute to the prevention of foot ulcers and amputation.¹³

Although there is a large amount of literature on the diabetic foot and the importance of foot care,¹⁵⁻¹⁷ there is a limited population based study of foot care knowledge and practice.^{13,18-20} In addition the outlook and research on foot care knowledge and education in patients with this disease is still not established. Therefore, this research aims to assess patients' knowledge and practice of foot care, since it can prevent foot complications.

METHODS

Study design

A cross-sectional survey in diabetic clinics in local health centers in Bahrain.

Sample size

Using the following formula to calculate the sample size

$$\text{Sample size} = \frac{Z^2 P(1-P)}{d^2}$$

Where Z=1.96 (for 95% level of confidence)

P=0.5 (as we assumed 50% of knowledge score)

D=0.05 (as we assumed confidence interval between 0.45 to 0.55)

The sample size was calculated as 384 and 400 patients were taken to overcome the non-responders.

Sampling method

There are 22 health centers in Bahrain distributed in 4 health regions. In each one there is a diabetic clinic, with registry of appointments. The target group was all adult (20 years and above) diabetic patients attending diabetic clinics in primary health care in Bahrain during the period of 15th July, 2008 till 15th October, 2008. Since the sample size was 400 a convenient sample of 100 patients were interviewed from each health region. Assuming that the population in each health region share similar characteristics any health center in its region was eligible to be selected. The sample was selected from diabetic patients >20 years attending diabetic clinics in these health centers.

Data collection tool

In order to assess the knowledge and practice of foot care in diabetic patients attending health centers, we used a questionnaire adopted from a previous study (R.D. Pollock, N.C. Unwin, V. Connolly).¹³

Permission obtained from the author of the study to use the questionnaire.

The original questionnaire consists of 2 parts:

1. Knowledge:

- Foot problem (minor injury, infection and delayed wound healing and foot ulcer).
- Effect of smoking on foot circulation.
- Frequency of foot washing and inspection of feet and foot wear.
- Response to foot problem (redness, bleeding and corn).
- Temperature of water used in foot wash.

2. Practice:

- Inspection and washing of foot.
- Trimming of toenails
- Foot wear selection
- Wrong behavior (wear elasticated hosiery, use sharp instrument, walk per foot and add irritant to water)

A third part was added to the original questionnaire contains demographic data and information about patient medical history which in-

clude: gender, age, nationality, level of education, type of diabetes, duration of diabetes, type of management, last HbA_{1c}, history of smoking and current or previous foot problems.

The questionnaire was translated to Arabic by the authors and re-translated to English by an English teachers. A face validity was checked and translation was corrected accordingly. A pilot study was conducted to check the questionnaire and no changes were needed.

Definitions of variable

- **Age group:** Participants age were divided into 4 groups; less than 40, 40-49 years, 50-59 years and more than 60 years.
- **Education level:** divided into: Illiterate, primary, intermediate, secondary, university level.
- **Smoking status divided into: Smoker:** person who is currently smoking regardless the type (cigarette, Hubble bubble, shisha and pipe); **Ex-smoker:** person who quit smoking regardless the duration of quitting; and **Non-smoker:** person who never smoked.
- **HbA_{1c}:** Used to assess glycemic control in diabetic patients, HbA_{1c} levels by (International Federation of clinical chemistry): Excellent (<5.3%), Good-fair (5.3-7%) and Poor (>7%).¹⁵
- **Type of DM:** patients were divided into either type 1 or type 2 diabetes based on the recorded diagnosis in their files.
- **Duration of DM (years):** duration since the patient was diagnosed with diabetes have been divided into three groups , less than 10 years, 10-20 years and more than 20 years.
- **Foot problem:** patients were divided based on the presence or absence of foot problem.
- **Type of management:** The management style that the aptients received were identified and recorded for each patients as yes or no responses. These management styles are diet, doing exercise, taking oral hypoglycemic tablet and taking Insulin.

Data collection method

The questionnaire used in UK study was translated from English to Arabic and retranslated again to English to insure the compatibility. The group members reviewed the questionnaire and agreed on how to ask each question (for both Arabic and English version).

Two language (Arabic, English) questionnaires were used. The questionnaire was piloted on 20 patients with diabetes in four health centers (Naim, Budia, Arad and Sitra) and no changes were required.

Each questionnaire was coded and the confidentiality was assured. The questionnaires were filled by the research group. The questionnaires were filled by direct interview of all patients attending diabetic clinic, non-Arabic and English speaker were excluded.

The interviews were conducted in the diabetic clinic after finishing the appointment with the nurse/doctor.

Ethical consideration

The protocol of this study was approved by the primary care research committee, also a permission letter was taken and sent to the health centers and a verbal consent was taken from the patients before the interview.

Data analysis

Data were analyzed using SPSS statistical program version 16.0.

A knowledge score was calculated totaling all correct responses to those questions that were considered to be correct answers from the validated questionnaire adopted from reference.¹³

Mean score and frequency with percentage were used. *t* test was used to compare between two means and Anova test was used to compare between more than two means. *P* value considered to be significant if it is (<0.05).

RESULTS

A total of 400 questionnaires were filled by the research team through interviewing diabetic patients directly.

Demographic data and disease characteristics

The mean age was 53 years (SD 10). 44.8 % of the sample was male. The sample consisted mostly of Bahraini patients (78%) and there was a variable educational level which includes illiterate (31.9%), primary school (13%), intermediate school (11.5%), secondary school (27.3%) and university (16.8%). (16%) were current smoker. (Table 1)

Most of the patients were having type II diabetes (98%). Patients were on different modalities of managements including diet, exercise, oral therapy and insulin either alone or in combination. The majorities were on oral therapy (86%). 19.5% were on insulin injection, while 55.5% were on diet and only 36.3% of the sample was exercising. (Table 2)

The mean duration of diabetes mellitus was 9.08 years (SD 8.21). The mean HbA_{1c} for the sample was 7.9 (SD 2.7). Foot problem was present in 19.5% of the sample and of these 2.5% had foot ulcer and 0.5% had amputation. (Table 2)

Knowledge

The maximum possible knowledge score was 11 and it ranged from 0 to 11. The mean was 8 (SD 2). Only 33% of the patients knew that there is no relationship between diabetes and flat feet, 44% of the patients were unaware that they should inspect their feet daily and 38.7% did not think that they should inspect their footwear every time they were worn.

The study showed that Bahraini patients had better knowledge score than non-Bahraini patients (*P*<0.001). Patients with high educational level had a significantly better knowledge score (*P*=0.004). Also higher knowledge score was found in patients with less than 20 years duration of diabetes (*P*=0.001). On the other hand, there were no associations between the knowledge score and gender, glycemic control or having previous foot problem. (Table 3)

Practice

Feet inspection was practiced by 66.5% of the patients, 86.8% were washing their feet daily and 78.5% were washing their feet in warm water. Only 2% of the patients visited a chiroprapist and 1.3% had their toenails trimmed by the chiroprapist. 29.8% were trimming their toenails straight across.

71% of all the patients did not have their feet measured when they last bought footwear and only 17.5% received advice about the proper footwear to buy. 20% of them never inspected the inside of their footwear for object and torn lining. 56.5% of the patients were walking barefoot regularly and cleaning nails with sharp instruments was practiced by 22.8%.

Only 16.3% of the patients were adding irritants to the water when they washed their feet. Wearing elasticated hosiery was practiced by 21% of them. (Table 4)

DISCUSSION

For the lack of studies on the importance of knowledge and practice of foot care in diabetic patients, this cross sectional study was conducted in Bahrain for the first time to assess knowledge and practice of foot care in patients with diabetes in primary health care centers.

Table 1: Demographic data of patients attending diabetic clinic in primary care in Bahrain and its relationship with the mean knowledge score.

		No. of patients	%	Mean Knowledge score	SD	P-value
Age group	Less than 40	43	10.8%	8.23	2.103	0.245
	40-49	109	27.3%	8.17	1.761	
	50-59	160	40%	8.03	2.160	
	More than 60	88	22%	7.64	2.013	
Gender	Male	179	44.8%	7.86	2.052	0.214
	Female	221	55.3%	8.11	1.996	
Nationality	Bahraini	312	78%	8.31	1.786	<0.001
	Non-Bahraini	88	22%	6.91	2.410	
Level of education	Illiterate	126	31.5%	7.44	2.261	<0.05
	Primary	52	13%	8.10	2.032	
	Intermediate	46	11.5%	8.35	2.152	
	Secondary	109	27.3%	8.23	1.730	
	University	67	16.8%	8.37	1.695	
Smoking status	Smoker	64	16%	7.7	2.273	0.424
	Previous smoker	79	19%	8.00	1.833	
	Non-smoker	257	64.3%	8.07	2.013	

Table 2: Characteristic of diabetic patients attending diabetic clinic in primary care in Bahrain and its relationship with the mean knowledge score.

		No. of patients	%	Mean knowledge score	SD	P-value
Type of DM	Type I	8	2	-	-	-
	Type II	392	98	-	-	-
Duration of DM (years)	Less than 10	271	67.8	8.10	1.817	<0.001
	10-20	92	23	8.16	2.396	
	More than 20	37	9.3	6.84	2.128	
HBA _{1c}	Less than 5.3	64	16.6	8.2	1.912	0.541
	5.3-7	101	26.2	8.09	1.955	
	More than 7	221	57.3	7.91	2.090	
Foot problem	Yes	78	19.5	8.00	2.291	0.099
	No	322	80.5	8.00	1.956	
Type of management						
	Diet	Yes	222	55.5	7.98	2.017
Exercise	No	178	44.5	8.03	2.035	0.254
	Yes	145	36.3	7.94	2.16	
Tablet	No	255	63.7	8.03	1.938	0.299
	Yes	344	86	7.95	2.056	
Insulin	No	56	14	8.29	1.796	0.163
	Yes	78	19.5	7.9	2.105	
	No	322	80.5	8.02	2.005	

The mean knowledge score was 8 (SD 2) out of possible 11, contrary to previous survey done in the UK (6.5 (SD 2.1)).¹³ Because it was conducted in diabetic clinic in the primary care sitting and shortly after finishing appointment with diabetic nurse\ doctor, in which patients may receive foot care advice.

Although there was a good knowledge score in this study, there were still deficiencies in knowledge about the frequency of foot inspection

and awareness regarding inspection of the inside of footwear for object and torn lining. Compared to the study done in UK, the awareness regarding these knowledge aspects were higher in Bahrain, possibly due to the advice given to the patients by health providers.¹³ In UK study, most patients had correct responses to the question about the relationship between diabetes and flat feet.¹³ On the other hand, a false answer was found in most cases in this study. Perhaps, because they did not know the meaning of flat feet.

Table 3: Response to questions regarding knowledge of patients attending diabetic clinic in primary care in Bahrain.

Knowledge questions	Correct answer	No of patients	%
1-People with diabetes should look after their feet because they are more liable to get flat feet	False	133	33.3
2-People with diabetes should look after their feet because they may not feel a minor injury to their feet	True	283	70.8
3-People with diabetes should look after their feet because wounds and infection may not heal quickly	True	353	88.3
4-People with diabetes should look after their feet because they may get a foot ulcer	True	349	87.3
5-People with diabetes should not smoke because smoking causes poor circulation affecting the feet	True	326	81.5
6-How often do you think you should inspect your feet?	Daily	224	56
7-If you found redness/bleeding between your toes what's the first thing you would do?	See doctor/ nurse	254	63.5
8-Even if you never had a corn, what would you do if you had one?	See doctor/ nurse	364	91
9-How often do you think your feet should be washed?	Daily	357	89.3
10-What temperature of water do you think you should wash your feet in?	Warm	312	78
11-How often do you think you should inspect the inside of your footwear for objects and torn lining?	Every time foot wear put on	245	61.3

Table 4: Response to questions regarding practice of patients attending diabetic clinic in primary care in Bahrain.

Practice questions	No of patients	%
Visit chiropodist/podiatrist	8	2
Inspect feet regularly	266	66.5
-Wash feet daily	347	86.8
-Wash feet with warm water	314	78.5
Trim toe nails straight across	119	29.8
Nails trimmed by chiropodist/podiatrist	5	1.3
Feet measured when last bought footwear	116	29
Received advice when last bought footwear	70	17.5
Never inspect inside of footwear	80	20
Wear elasticated hosiery	84	21
Regularly walk barefoot	226	56.5
Clean nails with sharp instrument	91	22.8
Add irritants to water	65	16.3

As opposed to Bahraini patients, the non-Bahraini had a significant lower mean knowledge score, possibly because most of them had a language barrier and a low level of education. A higher mean knowledge score was found in a higher educational level (university), possibly due to their higher understanding of the information given by the health providers, or self education. Moreover with the assumption that younger patients are more educated and most health educators gave advice for patients at the time of the diagnosis or soon later, the patients will forget the information. This may explain why the patient with duration of diabetes less than 20 years had a higher mean knowledge score than patients with longer duration.

Although there is a clear international guidelines for managing diabetes,²¹ but there is lack of practice identified in this study. For instance, the

lowest response rate was in visiting chiropodists and trimming toenails by them, compared to the UK study,¹³ perhaps because of the lack of foot care specialists (chiropodists) in governmental health centers and hospitals. Also, contrary to the UK study, this study showed that lack of knowledge in these areas might cause deficiencies in trimming toenails straight across and inspection of feet regularly.¹³

Due to religious need for washing feet every time before praying, this study shows that the majority of the patients wash their feet daily, in comparison to the study in UK, in which the patients had deficiency in this aspect¹³ However, one of the hazardous behaviors was walking barefoot, which was practiced by more than half of the patients, in comparison to the UK study (8.9%), possibly, for cultural difference between Bahrain and UK.¹³

Both studies highlighted similar defects in some areas of practice which include measuring feet and receiving advice when last footwear was bought, wearing elasticated hosiery, cleaning toenails with sharp instrument and adding irritants to water.

This study is important, as it aimed at assessing knowledge and practice of foot care in diabetic patients. It also showed the deficit in areas in knowledge and practice putting patients at high risk in developing foot problems. As it was mentioned earlier, high knowledge score showed in this study is attributed to the good, high quality of the program in the diabetic clinic. However, the practice was poor in several aspects, possibly because of the lack of practical sessions given to the patients. In addition, there were some limitations including the absence of registration system for all diabetic patients in Bahrain. Moreover, another limitation was conducting the study in the diabetic clinic only and not including other diabetics following in regular clinics in primary or secondary care who may have different level of knowledge and practice. Also, time limitation was targeting data collection process which lasted only 3 months and diabetic clinic was not available daily and no evening time was available as the clinic opened in morning time only.

In order to improve foot care practice for the diabetic patients we recommend practical group sessions and teaching videos to be used for

the patients. Moreover, a chiropodist is required for the management of the diabetic patients. Additionally, provided care should be multidisciplinary among primary and secondary health care providers.

Although data collection was conducted since sometimes, but we believe that the results are still relevant and important. The demographic, social and educational level in Bahrain did not change significantly for the 20-30 years with high level of literacy, social and economic status and good health services provision.^{22,23}

CONCLUSION

This study revealed a good knowledge score in this study (mean 8, SD 2), but are still deficiencies in knowledge about the frequency of foot inspection (44%) and awareness regarding inspection of the inside of footwear for object and torn lining (38.7%). Feet inspection was practiced by 66.5% of the patients, 86.8% were washing their feet daily and 78.5% were washing their feet in warm water. Findings from this study can be used in implementing health education programs on foot care for diabetic patients to improve their knowledge and practice.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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