Foot care knowledge, attitude and practices of diabetic patients: A survey in Diabetes health care facility

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Abstract

Background: Among diabetes complications, diabetic foot disease (DFD) is the most common and the most preventable complication. This study aimed to assess the level of knowledge, attitude and practice of foot care among type two diabetes mellitus (DM) patients attending the Diabetic and Endocrine Center at King Fahad Specialist Hospital in Buraydah-Qassim region, Saudi Arabia. Methods: A descriptive cross-sectional facility-based study was conducted randomly among type two diabetic patients; respondents were 260 patients. Participants were interviewed using a pretested semi-structured questionnaire. Results: Of the total studied patients, 54.2% were males with median age of 58 years. Majority 56.5% of patients had good knowledge and 56.9% had good practices regarding diabetic foot care. The mean knowledge score was 4.0 (±1.86) out of 6. About 39.2% of participants received advice regarding foot care from their physicians. Only 41.5% of the patients examined their feet daily, 41.9% carefully dried between the toes after washing, and 40.8% were walking barefooted at home. About 68.5% of the participants had a history of diabetic foot complications. A significant statistical association was found between the good knowledge and patients’ age, educational level, family monthly income, duration of diabetic illness and having prior knowledge regarding foot care (P-value <0.05). While, good practice of the participants towards the diabetic foot care was found to be statistically associated with the family monthly income and the prior knowledge regarding diabetic foot care (P-value <0.05). Conclusion: Our study revealed that more than half of the participants had good knowledge and practices of diabetic foot care. However, the role of physicians and medical staff in annual foot examination and health education is crucial. An awareness program implementation for diabetic foot care is highly needed.

Keywords: Attitude, foot care, knowledge, practice, Qassim, Saudi Arabia, type two diabetes mellitus patient

Introduction

Worldwide, diabetes mellitus (DM) is a major health problem that is increasing in its prevalence.[1] According to the International Diabetes Federation Atlas in 2019, global prevalence of diabetes was estimated to be (9.3%) (463 million people) rising to (10.2%) (700.2 million) by 2045.[2] Furthermore, in Saudi Arabia, according to the International Diabetes Federation Atlas, it was recently reported that about 18.3% of the adult Saudi population suffered from DM.[3] It has been found to be associated with a high rate of mortality, morbidity and increasing health care cost.[4] Several long-term complications are enhanced many folds by DM such as hypertension, heart disease, retinopathy and foot complications.[5,4]

Among diabetes complications, diabetic foot disease (DFD) is the most common.[3] DFD is the foot condition of diabetic patients with ulcers accompanied by peripheral vascular disease and/or lower limb diabetic neuropathy.[6] Multiple factors can precipitate DFD like abnormal joint mobility or foot pressure, trauma, foot deformity, peripheral vascular disease or peripheral neuropathy being the most common.[7] Neuropathy often leads to clinically significant morbidities, such as pain, sensation loss, diabetic foot ulcer (DFU), gangrene and amputations. The only available measure with proven effectiveness in preventing or at
least halting the progression of diabetic neuropathy is optimal metabolic control. However, it should be instituted at an early stage to be effective since, as is the case with other late diabetes complications, the late phases of diabetic neuropathy are poorly reversible or even irreversible. Up to 50% of those who complaining of diabetic peripheral neuropathy are asymptomatic and if not recognized, and unless preventive foot care is applied, patients are at risk of injury.

More than 10 percent of people with type 2 diabetes mellitus have one or two risk factors for foot ulceration at the time of diagnosis and a lifetime risk of 15%. Since the DM type 2 can be diagnosed several years after onset, complications have already occurred. Worldwide prevalence of DFU is 6.3% which is much more among DM type 2 (6.4%). Various studies done in our kingdom have explored prevalence of DFU and showed varying results which ranged from 26.0% to 61.8%. DFU prevalence in Qassim region is 10.8% and the prevalence of a toe, foot or leg amputation is 2.5%.

DFD is the most common cause of hospital admission among diabetic patients, accounting for up to 25% of all diabetic hospital admissions. DFD affects nearly 50% of patients and accounts for almost 80% of all lower-limb non-traumatic amputations. According to the Saudi Ministry of Health’s 2018 statistical year book, the number of cases of amputation as a complication of DM was 1280, 765 in men and women, respectively, making the ministry of health facing a significant challenge. Off all the complications related to diabetes, those occurring in the foot are considered the most preventable. Prevention and prophylactic foot care are promoted to reduce patient morbidity, expensive resource use and amputation possibilities. These interventions include risk factors identification, intensive podiatric care and patient education. Such approach, has been shown to be both cost-effective and cost saving. The effective way to reduce the incidence of diabetic foot ulcers and amputations are through proper awareness and by practicing a daily routine of foot care, and maintaining a good glycemic control among diabetic patients. Nowadays, many scientific societies and organizations provide guidelines on proper education and practice in foot care. Therefore, the American Diabetic Association recommended that all diabetic patients should be educated about self-foot care to increase their knowledge and prompt good practices. In the present study, we assessed the knowledge, attitude and practice (KAP) of diabetic foot care among Saudi diabetic patients.

**Subjects and Methods**

A cross-sectional study was conducted among 260 type two Saudi diabetic patients. The participants were selected by systematic random sampling. The study was conducted at the Diabetic & Endocrine Center at King Fahad Specialist Hospital in Buraidah City, Qassim Region. Ethical approval for study conduction and publication was obtained from the Regional Research Ethics Committee, registered at National Committee of Bio & Med ethics (NCBE). The researcher mentioned the study purpose to the participants and written consent was obtained from each participant before starting the data collection. The data was collected by using pretested semi-structured questionnaire. The questionnaire was adapted from a validated and reliable instrument. This study was carried during a period of 1 year from October 1, 2019 to September 2020. The data was cleaned, entered and analyzed by using computerized program SPSS version 21.0. Frequency, percentage represented categorical variables while range, mean and ± standard deviation represented continuous variables. Chi-square test was used to assess association between variables. The results with P value < 0.05 were considered statistically significant.

**Results**

A total of 260 patients were interviewed of them 141 (54.2%) were males. The mean age was 60 years (±11.7), (Median: 58 years) and (Range: 30-87 years). Less than one-third of the patients were illiterate, 66 (25.4%). Most of the patients, 204 (78.5%), were married. Half of them, 132 (50.8%), had a total monthly family income which ranged from 5,001 to 10,000 Saudi Riyal. Moreover, 120 (46.2%) had a history of diabetic illness for more than 10 years, while 9 (3.5%) patients had a duration of diabetes for less than 1 year. Regarding the smoking status, a few, 34 (13.1%), from the total number of the patients, were smokers. All of them were males. Furthermore, we found that 68.5% of the patients had history of diabetic foot complications. [Table 1].

Considering knowledge of the participants, we had found that 147 (56.5%) had good knowledge about diabetic foot disease where the mean knowledge score was 4.0 (±1.86) out of 6. Most of participants had good knowledge that uncontrolled DM can lead to diabetic foot complications and diabetic patients may probably develop lack of sensation in their feet. However, less than half of the participants knew that smoking causes poor foot circulation.

Considering the attitude, most of the patients replied that diabetic patients are required to practice special foot care (81.5%), 76.5% said that diabetic patients should be responsible for self-foot examination and (70.4%) replied that diabetic patients should have an annual feet examination by specialists (podiatrists), however, only 42.8% replied that self-foot examination should be on a daily basis. Moreover, majority, 182 (70%), of the participants preferred to receive education about diabetic foot care from the medical staff.

In general, practical level of patients was good at 56.9% where mean practice score for the participants was 7.17 (± 2.69). The most common practices reported by patients were washing their feet daily (100%), applying moisturizer on the feet (67.3%), drying their feet properly after washing (65%), inspecting their shoes from inside before wearing (61.2%) and wearing fitting (closed) shoes (60.8%) [Table 2].
These variations can be attributed to different study populations, settings, designs, differences in the tools used to measure the KAP and methods of data collection. Moreover, differences in the performance of health systems in different countries could also explain the differences.

The study revealed that 56.9% of the participants received knowledge in the past about diabetic foot care. This finding was comparable with the previous studies done in Dubai (61.7%)[35] and in Tanzania (48%).[36] In contrast, in some of the previous studies, the diabetic patients had low or never received information about the diabetic foot care, such as a study done in Pakistan (57%)[28] of the participants. They had never received any information regarding foot care, and in a study done in Riyadh only 36.7%[37] of the participants received education about foot care.

Health education for diabetic patients regarding diabetic foot care should be mandatory as part of diabetic patient care at primary health care centers and diabetic clinics at hospitals.

Our study revealed that the source of information was mainly from doctors (39.2%). This finding is much better than what the previous studies reported (16.6%),[35] (22%),[28] and (37.8%).[37] The important role of the doctors is not only to give education but also to translate this knowledge into proper practice. Diabetic foot care knowledge level was significantly associated with participants who received previous knowledge and education regarding diabetic foot care (P-value < 0.05). This finding is in accordance with a study done in Dubai[35] and new study done in Asser, Saudi Arabia.[38] Raising awareness of diabetic patients about foot care and diabetic foot complications usually gives better outcome. Moreover, this study shows that better knowledge among participants with high level of education (P-value = 0.044) was in agreement with the previous studies.[13,39,40]

Moreover, considering the practice of patients toward diabetic foot care, we found that most of participants 202 (77.7%) did not get their feet examined annually by a specialist (podiatrist).

The majority of the study population, 148 (56.9%), were receiving knowledge about diabetic foot care. Participants reported that health care workers were the most common source of knowledge about diabetic foot care (54.0%) (doctors and nurses). Other sources included friends or relatives (18%), social media (15.6%) and mass media or the Internet (12.4%) [Table 3].

The good knowledge scores were found to be strongly statistically associated with the participants’ age (P = 0.009), educational level (P = 0.044), family monthly income (P = 0.005), duration of diabetic illness (P = 0.006) and having prior knowledge regarding foot care (P < 0.001). The good practice of the participants towards the diabetic foot care was found to be statistically associated with the family monthly income (P = 0.017) and the prior knowledge regarding diabetic foot care (P < 0.001) [Table 4].

A strong statistical association was detected between patients’ good knowledge of diabetic foot self-care and good practice (P-value = 0.001) [Table 5].

### Discussion

This study showed that 56.5% of the diabetic patients had a good knowledge of diabetic foot care. Which is higher than a study done in Iran 15.2%,[29] Jorden (41.5%),[30] and many studies conducted in Saudi Arabia (55.1%),[31] (38%).[32] Some studies had a higher good knowledge rate in comparison to our study finding such as study done in Saudi Arabia (76.6%),[20] Malaysia (58%)[33] and India.[14] These variations can be attributed to different study populations, settings, designs, differences in the tools used to measure the KAP and methods of data collection. Moreover, differences in the performance of health systems in different countries could also explain the differences.

### Table 1: Socio-demographic characteristics of the study participants (n=260)

| Characteristics                  | Number (n) | Percentage |
|----------------------------------|------------|------------|
| Gender                           |            |            |
| Male                             | 141        | 54.2       |
| Female                           | 119        | 45.8       |
| Age group                        |            |            |
| 30-44 years                      | 20         | 7.7        |
| 45-64 years                      | 145        | 55.8       |
| ≥65 years                        | 95         | 36.5       |
| Education level                  |            |            |
| Illiterate                       | 66         | 25.4       |
| Primary                          | 94         | 36.1       |
| Middle                           | 18         | 6.9        |
| Secondary                        | 43         | 16.5       |
| University                       | 34         | 13.1       |
| Postgraduate                     | 5          | 1.9        |
| Marital status                   |            |            |
| Married                          | 204        | 78.5       |
| Widow                            | 44         | 16.9       |
| Divorced                         | 9          | 3.5        |
| Single                           | 3          | 1.2        |
| Occupation                       |            |            |
| Employee                         | 77         | 29.6       |
| Retired                          | 62         | 23.8       |
| Housewife                        | 87         | 33.5       |
| Unemployed                       | 34         | 13.1       |
| Monthly income of the family     |            |            |
| <5000 SR                         | 73         | 28.1       |
| 5,001-10,000 SR                  | 132        | 50.8       |
| 10,001-15,000 SR                 | 39         | 15.0       |
| > 15,000 SR                      | 16         | 6.2        |
| Duration of DM                   |            |            |
| <1 year                          | 9          | 3.5        |
| 1-5 years                        | 63         | 24.2       |
| 6-10 years                       | 68         | 26.2       |
| >10 years                        | 120        | 46.2       |
| Smoking                          |            |            |
| Yes                              | 34         | 13.1       |
| No                               | 226        | 86.9       |
| History of diabetic foot complications |    |            |
| Yes                              | 187        | 68.5       |
| No                               | 82         | 31.5       |
### Table 2: Diabetic patients’ knowledge, attitude and practices assessment towards diabetic foot care (n=260)

| Characteristics                                                                 | Yes (n) | No (n) |
|---------------------------------------------------------------------------------|---------|--------|
| **Knowledge and education assessment**                                           |         |        |
| Can uncontrolled diabetes mellitus lead to diabetic foot complications?          | 238     | 8      |
| Do diabetic patients probably develop a lack of sensation in their feet?         | 239     | 10     |
| Does the lack of sensation in a diabetic patient's feet cause ulcers?            | 181     | 24     |
| Does a diabetic patient have poor blood flow in their feet?                     | 146     | 37     |
| Does poor blood flow in a diabetic patient's feet cause ulcers?                 | 130     | 93     |
| Does smoking reduce blood flow to the feet?                                     | 109     | 83     |
| **Diabetic patients’ attitude assessment**                                      |         |        |
| In your opinion, should a diabetic patient take special care for his/her feet?  | 212     | 48     |
| In your opinion, should a diabetic patient do self-examination for his/her feet?| 199     | 61     |
| If yes, how to check? (n=199)                                                   | 85      | 54     |
| In your opinion, should a diabetic patient have their feet examined annually by a specialist? | 183 | 77 |
| In your opinion, what is the best source of knowledge for diabetic patients to learn how to care for their feet? | 182 | 30 |
| **Diabetic patients’ practices assessment**                                     |         |        |
| Do you examine your feet daily and look for any new red spots, swelling or wounds? | 108 | 152 |
| Do you check the water temperature before showering and washing your feet?      | 141     | 119    |
| Do you wash your feet daily?                                                     | 260     | 0      |
| Do you dry your feet after washing?                                              | 169     | 91     |
| Do you dry the area between the toes after washing?                              | 109     | 151    |
| Do you use moisturizing cream on your feet and toes?                             | 175     | 85     |
| Are you applying a moisturizing cream between the toes?                          | 74      | 186    |

Contd...
This study also highlights that patients who had good knowledge had a better practice toward diabetic foot care (P-value < 0.001). This is similar with previous studies.\cite{26,29,35,42,48} However, it was inconsistent to a study done in Dubai, where the participants who had previously received knowledge had poor practice.\cite{7} Moreover, there was better practice among patients who had a good family income. This matches with the results from previous studies\cite{35,42} and inconsistent to the study done in Jorden.\cite{30}

Less than half (41.5%) of the participants examined their feet daily, about 42% of them dried their feet between the toes after washing. This finding was lower than the previous studies\cite{27,28,39} but better than a study recently conducted in Riyadh, Saudi Arabia.\cite{48} Majority of the patients (61.2%) inspected their shoes before wearing; this rate was higher than many studies.\cite{44-46} Moreover, almost all of the patients (100%) washed their feet; this is a logic finding as the Islamic religion commands washing of the feet five times per day before prayers. Less than half of the patients (40.8%) walked barefoot inside their homes which could be risky for them in case they got foot injury.

Another important finding in our study is the percentage for annual foot examination by specialist (podiatrist) as recommended by American Diabetic Association.\cite{48} This examination was done for only 22.3% of our participants, which was lower than (34.2%) reported in a study conducted in Riyadh, Saudi Arabia.\cite{49} In a study done in Dar es Salaam, Tanzania (27.5%), where the participants reported that the doctors had examined their feet at least once since their initial diagnosis.\cite{53}

Our study had some limitations. Questionnaires consists of many questions responded by either yes or no and it will influence the validity of the data.\cite{47}

Good knowledge and practices in more than half of the participants may be due to reporting bias, which is a social desirability bias where respondents prefer to give answers which are assumed good.

Our study was conducted only in one diabetic center; hence the findings cannot be generalizable to the population in Qassim region or in Saudi Arabia.

To decrease diabetic foot complications, it is recommended to strengthen the current health education programs to raise the patients’ awareness about diabetic foot care by using different activities based on international guidelines. The health care providers should be properly trained about patients’ foot care education as it is approved by our study that the medical staff is the main source of information. In addition, most of the participants preferred to take knowledge from them. Ensure the importance of the annual foot examination for every diabetic patient by a podiatrist for early detection of ulcers and/or injuries to prevent serious complications. Make group counseling and voluntary peer support groups at health

| Source of knowledge                  | Frequency (n) | Percentage |
|--------------------------------------|--------------|------------|
| Doctors *                            | 98           | 39.2       |
| Friends or relatives*                | 45           | 18.0       |
| Social media (Twitter, Facebook, etc.)* | 39         | 15.6       |
| Nurses*                              | 37           | 14.8       |
| Mass Media and the Internet*         | 31           | 12.4       |
| Total                                | 250*         | 100        |

*Multiple answered question

Table 3: The source of knowledge about diabetic foot care (n=148)

It is found that the patients with middle and elderly age group had better knowledge about diabetic foot care in comparison to young adults patients (P-value = 0.009). This could be due to the long experience and knowledge that the patients learned during the long course of the disease. The significant association between the good knowledge and long duration of DM also had been approved in this study in concordance with the newly study done in Iran\cite{29} and in a contrast study done in India.\cite{46} In fact, patients with long duration of DM regularly visited their physicians and spent more time to build good knowledge preventing them from future diabetic foot complications. It is mandatory for the medical staff to understand the significance of health education and counseling and implement awareness for diabetic patients.\cite{49} Also, in our study, we found strong relationship between the good knowledge and the patients’ socioeconomic status (P-value = 0.005). This was similar to the finding in a previous research.\cite{48}
facilities to encourage sharing of experience and information about foot self-care. To conclude, our study showed that more than half of the participants had good level of knowledge and practices about diabetic foot care. Middle and elderly age groups participants, highly educated, high family income, who had long duration DM of more than 10 years and who received previous knowledge regarding diabetic foot care tend to be more knowledgeable about diabetic foot care. Strong statistical association was detected between good knowledge and better practices of the diabetic patients towards foot care. The strengthening of health education awareness for diabetic patients will improve the patients’ practices and prevent further foot complications. Further investigations

Table 4: Statistical association between the level of knowledge and practice of diabetic patients and different variables, \((n=260)\)

| Variables                  | Knowledge |          |          |          | Practice |          |          |
|----------------------------|-----------|----------|----------|----------|----------|----------|----------|
|                            | Good n (%)| Poor n (%)| \(P\)    | Good n (%)| Poor n (%)| \(P\)    | Good n (%)| Poor n (%)| \(P\)    |
| Gender                     |           |          |          |          |          |          |          |
| Male                       | 79 (56)   | 62 (44)  | 0.478    | 78 (53.3) | 63 (44.7) | 0.329    |          |          |
| Female                     | 68 (57.1) | 51 (42.9) |          | 70 (58.8) | 49 (41.2) |          |          |          |
| Age group                  |           |          |          |          |          |          |          |
| 30-44 years                | 5 (25)    | 15 (75)  | 0.009*   | 8 (40.0)  | 12 (60.0) | 0.134    |          |          |
| 45-64 years                | 89 (61.4) | 56 (38.6) |          | 80 (53.2) | 65 (44.8) |          |          |          |
| \(\geq 65\) years         | 53 (55.8) | 42 (44.2) |          | 60 (63.2) | 35 (36.8) |          |          |          |
| Education level            |           |          |          |          |          |          |          |
| Illiterate                 | 33 (50)   | 33 (50)  | 0.044*   | 35 (53.0) | 31 (47.0) | 0.150    |          |          |
| Writes and read            | 39 (67.2) | 19 (32.8) |          | 34 (58.6) | 24 (41.4) |          |          |          |
| Primary                    | 17 (47.2) | 19 (52.8) |          | 17 (47.2) | 19 (52.8) |          |          |          |
| Middle                     | 6 (33.3)  | 12 (66.7) |          | 9 (50.0)  | 9 (50.0)   |          |          |          |
| Secondary                  | 24 (55.8) | 19 (44.2) |          | 23 (53.5) | 20 (46.5) |          |          |          |
| University                 | 24 (70.6) | 10 (29.4) |          | 27 (79.4) | 7 (20.6)   |          |          |          |
| Postgraduate               | 4 (80)    | 1 (20)   |          | 3 (60.0)  | 2 (40.0)   |          |          |          |
| Marital status             |           |          |          |          |          |          |          |
| Married                    | 120 (58.8)| 84 (41.2) | 0.478    | 117 (57.4)| 87 (42.6) | 0.521    |          |          |
| Widow                      | 21 (47.7) | 23 (52.3) |          | 26 (59.1) | 18 (40.9) |          |          |          |
| Divorced                   | 4 (44.4)  | 5 (55.6)  |          | 3 (33.3)  | 6 (66.7)   |          |          |          |
| Single                     | 2 (66.7)  | 1 (33.3)  |          | 2 (66.7)  | 1 (33.3)   |          |          |          |
| Occupation                 |           |          |          |          |          |          |          |
| Employee                   | 49 (63.6) | 28 (36.4) | 0.385    | 48 (62.3) | 29 (37.7) | 0.585    |          |          |
| Retired                    | 35 (56.5) | 27 (43.5) |          | 33 (53.2) | 29 (46.8) |          |          |          |
| Housewife                  | 47 (54)   | 40 (46)   |          | 50 (57.5) | 37 (42.5) |          |          |          |
| Unemployed                 | 16 (47.1) | 18 (52.9) |          | 17 (50.0) | 17 (50.0) |          |          |          |
| Family monthly income      |           |          |          |          |          |          |          |
| <5,000 SR                  | 36 (49.3) | 37 (50.7) | 0.005*   | 35 (47.9) | 38 (52.1) | 0.017*   |          |          |
| 5,001-10,000 SR            | 70 (53)   | 62 (47.0) |          | 73 (55.3) | 59 (44.7) |          |          |          |
| 10,001-15,000 SR           | 26 (66.7) | 13 (33.3) |          | 26 (66.7) | 13 (33.3) |          |          |          |
| >15,000 SR                 | 15 (93.8) | 1 (6.3)   |          | 14 (78.5) | 2 (12.5)  |          |          |          |
| Duration of diabetes       |           |          |          |          |          |          |          |
| <1 year                    | 1 (11.1)  | 8 (88.9)  | 0.006*   | 4 (44.4)  | 5 (55.6)  | 0.246    |          |          |
| 1-5 years                  | 30 (47.6) | 33 (52.4) |          | 30 (47.6) | 33 (52.4) |          |          |          |
| 6-10 years                 | 39 (57.4) | 29 (42.6) |          | 43 (63.2) | 25 (36.8) |          |          |          |
| >10 years                  | 77 (64.2) | 43 (35.8) |          | 71 (59.2) | 49 (40.8) |          |          |          |
| Prior information about diabetic foot care |           |          |          |          |          |          |          |
| Yes                        | 114 (77)  | 34 (23)   | 0.001*   | 119 (80.4)| 29 (19.6) | 0.001*   |          |          |
| No                         | 33 (29.5) | 79 (70.5) |          | 29 (25.9) | 83 (74.1) |          |          |          |
| Foot complication          |           |          |          |          |          |          |          |
| Yes                        | 104 (58.4)| 74 (41.6) | 0.220    | 105 (59.0)| 73 (41.0) | 0.196    |          |          |
| No                         | 43 (52.4) | 39 (47.6) |          | 43 (52.4) | 39 (47.6) |          |          |          |

*significant at 5% level

Table 5: Association between the level of knowledge and the level of practices of the participants about foot self-care, \((n=260)\)

| Knowledge level | Practice level | Total | \(P\) |
|-----------------|----------------|-------|-------|
|                 | Good n (%)     | Poor n (%) |     |
| Good            | 114 (77.6)     | 33 (22.4) | 147 (100) | 0.001|
| Poor            | 34 (30.1)      | 79 (69.9)| 113 (100) |       |
| Total           | 148 (56.9)     | 112 (43.1)| 260 (100) |       |
depending on large-scale sample in different regions of the kingdom should be conducted.

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Conflicts of interest
There are no conflicts of interest.

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