

## Foot-care behaviour amongst diabetic patients attending a federal care hospital in Pakistan

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### Abstract

**Objective:** To assess foot-care behaviour in diabetics attending a tertiary care hospital, and to see if there are any influencing factors.

**Methods:** The cross-sectional descriptive study was conducted from September to November 2017 at the Pakistan Institute of Medical Sciences, Islamabad, Pakistan, and comprised diabetes patients either admitted to the wards or attending the outpatient clinics. Foot-care behaviour was assessed through the validated Nottingham Assessment of Functional Foot-care scale. A score over 50 demonstrated adequate foot-care behaviour. The score was correlated with several variables. SPSS 23 was used for data analysis.

**Results:** Of the 400 individuals, 238(59.5%) were females and 162(40.5%) were males. The overall mean age was 52.71±11.84 years. Of the total, 228(57%) had never received any education on proper foot-care; 289(72.3%) had a scale score of less than or equal to 50. Urban or rural residence, monthly income, literacy level, family history of diabetes, and previous foot-care education provided by the healthcare provider were significant factors associated with good foot-care behaviour ( $p < 0.05$  each).

**Conclusion:** A majority of the patients demonstrated inadequate foot-care behaviour.

**Keywords:** Diabetic foot, Foot-care behaviour, NAFF, Pakistan. (JPMA 69: 58; 2019)

### Introduction

Diabetes is a major health concern in the 21st century. According to the International Diabetes Federation (IDF) Diabetes Atlas 2017, 425 million people worldwide, or 8.8% of adults aged 20-79 years, are estimated to have diabetes. About 79% live in low and middle-income countries (LMICs). If these trends continue, by 2045 the projected number of individuals suffering from diabetes aged 20-79 years will be 629 million.<sup>1</sup> In 2016, the World Health Organisation (WHO) estimated the prevalence of diabetes mellitus in Pakistan to be 9.8%, which is expected to increase in the near future.<sup>2</sup>

As the disease burden of diabetes escalates, so do the complications associated with it. One of the most dreaded complications is the development of diabetic foot, which frequently results in amputations, hence not only causing a financial burden on the healthcare system, but also resulting in morbidity. Individuals ending up with amputations not only suffer from physical and emotional debilitation, but also tend to lose their livelihood, resulting in far reaching implications for the entire family. Diabetic foot problems account for more hospital admissions than any other long-term complications of

diabetes and are responsible for nearly 50% of all diabetes-related hospital bed days. Diabetic foot ulcers affect 15% of all diabetic patients.<sup>3</sup> The lifetime risk to a person with diabetes for developing a foot ulcer could be as high as 25%. Additionally, 50% of all lower limb amputations are performed in people with diabetes.<sup>4</sup> In a study carried out in 25 centres across Pakistan the prevalence of diabetic foot syndrome was found to be 13.9%.<sup>5</sup>

Diabetic foot ulcers and amputations are preventable through proper awareness and by practising a daily routine of foot-care, and maintaining a good glycaemic control. The current study was planned to evaluate foot-care behaviour in diabetic patients presenting to our hospital and to identify social, demographic and clinical factors which influence foot-care behaviour so that a strategy for foot-care education can be developed.

### Subjects and Methods

The cross-sectional descriptive study was conducted from September to November 2017 at the Pakistan Institute of Medical Sciences, Islamabad, Pakistan, and comprised individuals aged >20 years, with a diagnosis of diabetes based on the American Diabetes Association (ADA) criteria.<sup>6</sup>

Approval was obtained from the institutional ethics committee and informed consent was taken from all the

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study subjects. Sample size was calculated using Raosoft online sample size calculator<sup>7</sup> with a population prevalence of 9.8%<sup>2</sup> with 95 % confidence level and 5% margin of error. The subjects were enrolled from among the new and follow-up patients visiting the medical outpatient department (OPD) as well as from the inpatients. Those who did not volunteer to fill the questionnaire and patients with cognitive/hearing impairment were excluded.

Details of the age, gender, duration of diabetes, educational level, socio-economic status, control of diabetes, complications, a previous history of diabetic foot and history of foot-care education by the healthcare provider were noted. Diabetes-related macro-vascular complications, like peripheral vascular disease, cerebrovascular accidents and myocardial infarctions, were assessed via review of patients' medical records. As far as micro-vascular complications were concerned, neuropathy was assessed by microfilament examination, nephropathy by the presence of micro-albuminuria or frank proteinuria, and retinopathy was assessed by detailed fundoscopic retinal examination. Routine laboratory parameters, including glycated haemoglobin (HbA1C), fasting and random blood sugar (FBS and RBS) measurements, complete blood count (CBC), urea and creatinine, alanine transaminase (ALT) and the fasting lipid profile were also documented. HbA1c was measured with the use of Cobas 6000 series analyzer e 601 (Roche/Hitachi Diagnostics, Tokyo, Japan), while FBS and RBS measurements, urea and creatinine, ALT and the fasting lipid profile were measured using Cobas 6000 series analyzer (Roche/Hitachi Diagnostics, Tokyo, Japan). CBC was measured with Sysmex XP 100 automated analyser (Sysmex Corporation, Kobe, Japan).

Assessment of foot-care behaviour was done using the validated Nottingham Assessment of Functional Foot-care (NAFF).<sup>8</sup> It was translated into Urdu. The translated questionnaire was revalidated experimentally within the hospital prior to its use in the study. A score of more than 50 showed adequate foot-care behaviour, while a score of 50 or less showed that foot-care behaviour was poor and required further evaluation.

NAFF is a 29-item self-reported measure of the extent to which people comply with recommended foot-care behaviours. Each question is given a score of 0 to 3. The total score is attained from the sum of all the responses. It was developed by converting information, from printed leaflets in hospitals and podiatry departments in Nottingham and Derby, into a questionnaire format and ascribing scores to various responses. It was designed to identify people who were not engaging in recommended

foot-care practice, and to be used as an outcome measure for people with healed foot ulcers to prevent recurrence. NAFF is an internally consistent measure of foot-care behaviour and is reliable over time, hence it may be used as a measure of change. NAFF can also be used as an outcome measure in rehabilitation.<sup>8</sup>

Data was analysed using SPSS 23 to calculate mean values and standard deviation for variables addressed in the collection instrument. The NAFF scores were correlated with a number of variables, including rural and urban background, patient literacy, monthly income, past history of diabetic foot, foot-care education provided by the healthcare providers using chi square test, and with HbA1C and duration of diabetes using independent sample t test.  $P < 0.05$  was taken as significant.

## Results

Of the 400 subjects, 238(59.5%) were females and 162(40.5%) were males. The overall mean age was  $52.71 \pm 11.84$  years. Of the total, 267(66%) subjects hailed from urban areas, 152(38%) were illiterate, 80(20%) had done intermediate or above, and 194(48.3%) had a household income of less than Rs20,000 (Table-1).

The mean duration of diabetes was  $7.9 \pm 6.8$  years. The mean HbA1C was  $8.37 \pm 2.04\%$ . A family history of diabetes was found in 235(58.8%) patients, and 75(18.8%) reported a history of diabetic foot. In terms of diabetic complications, 206(51.5%) had retinopathy, 236(59%) had neuropathy, 73(18.3%) had nephropathy, 84(21%) had cardiovascular and 31(7.8%) had cerebrovascular

**Table-1:** Demographic characteristics of the study population (n=400).

Characteristic	Frequency	Percentage (%)
<b>Gender</b>		
Male	162	40.5
Female	238	59.5
<b>Urban or Rural background</b>		
Urban	267	66.8
Rural	133	33.2
<b>Patient education</b>		
Illiterate	152	38
Primary	55	13.8
Middle school	59	14.8
Secondary school	54	13.5
Intermediate and above	80	20
<b>Marital status</b>		
Married	373	93.2
Single	27	6.8
<b>Income</b>		
<Rs 20,000	193	48.3
Rs 20-40,000	122	30.5
>Rs 40,000	85	21.3

**Table-2:** Distribution of responses to individual items of the Nottingham Assessment of Functional Foot-care.

Item	0	1	2	3
1) Do you examine your feet?	68	177	1	154
2) Do you check your shoes before you put them on?	54	52	111	183
3) Do you check your shoes when you take them off?	108	91	103	98
4) Do you wash your feet?	8	28	81	283
5) Do you check your feet are dry after washing?	68	85	110	137
6) Do you dry between your toes?	125	106	87	82
7) Do you use moisturising cream on your feet?	171	51	76	102
8) Do you put moisturising cream between your toes?	82	71	50	197
9) Are your toenails cut?	7	45	191	157
10) Do you wear sandals?	68	126	84	122
11) Do you wear slippers?	14	34	96	256
12) Do you wear trainers?	216	90	71	23
13) Do you wear lace-up shoes?	223	67	76	34
14) Do you wear pointed-toe shoes?	25	50	77	247
15) Do you wear flip-flops?	65	92	74	169
16) Do you break in new shoes gradually?	113	167	88	32
17) Do you wear artificial fibre (e.g. nylon socks)?	38	127	99	136
18) Do you wear seamless socks/stockings/tights?	204	78	85	33
19) Do you wear shoes without socks?	142	129	82	47
20) Do you change your socks/stockings/tights?	128	114	129	29
21) Do you walk around the house in bare feet?	40	99	97	144
22) Do you walk outside in bare feet?	11	40	50	299
23) Do you use a hot water bottle in bed?	11	44	60	285
24) Do you put your feet near the fire?	12	76	101	211
25) Do you put your feet on a radiator?	19	46	70	264
26) Do you use a bath thermometer?	134	60	140	66
27) Do you use corn remedies/corn plasters/paints when you get one?	66	140	60	134
28) Do you put a dry dressing on a blister when you get one?	129	75	139	57
29) Do you put a dry dressing on a graze, cut or burn when you get one?	103	78	145	74

**Table-3:** The association of various patient factors with NAFF scores.

Patient characteristic	NAFF? 50 (Frequency)	NAFF>50 (Frequency)	P value
<b>Urban or rural</b>			
Urban	180	87	0.001
Rural	109	24	
<b>Patient education</b>			
Illiterate	129	23	<0.0001
Primary school	45	10	
Middle school	41	18	
Secondary school	32	22	
Intermediate and above	42	38	
<b>Monthly income</b>			
<Rs 20,000	158	45	<0.0001
Rs.20-40,000	80	42	
>Rs 40,000	51	34	
<b>Family history of diabetes</b>			
Yes	105	67	0.005
No	184	44	
<b>History of diabetic foot</b>			
Yes	51	23	0.283
No	283	88	
<b>Foot-care education by healthcare provider</b>			
Yes	105	67	<0.0001
No	184	44	

NAFF: Nottingham Assessment of Functional Foot-care.

complications. Those who reported having received prior foot-care education by healthcare providers were 172(43%).

Mean NAFF score of the patients was  $47.11 \pm 7.69$ . Also, 289(72.3%) subjects had a NAFF score of less than or equal to 50, while only 111(27.7%) scored >50. Patients responses to various NAFF questions were individually noted (Table-2).

The factors which significantly impacted the NAFF score were rural or urban background ( $p=0.001$ ), literacy level ( $p<0.0001$ ), monthly income ( $p<0.0001$ ), family history of diabetes ( $p=0.005$ ) and previous foot-care education provided by healthcare providers ( $p<0.0001$ ). A previous history of diabetic foot did not influence the individuals' foot-care score ( $p=0.283$ ). No correlation could be established between the NAFF score and HbA1c levels or duration of diabetes (Table-3).

## Discussion

Diabetic foot ulcers precede 84% of non-traumatic amputations in diabetics.<sup>9</sup> Around the world, one lower limb is lost every 30 seconds because of diabetic foot ulceration.<sup>10</sup> After amputation, the mortality rate in diabetics ranges 68-90% which is much higher compared to their non-diabetic counterparts.<sup>11</sup> Furthermore, two thirds of the patients with diabetic foot ulcers will develop a foot ulcer again in the next 5 years.<sup>12</sup> Diabetic foot ulcer is a preventable complication if only there is a close liaison between the patients and their healthcare providers, so as to promote better foot-care behaviours(practices) amongst these patients.

The results of the current study point to an overwhelming lack of proper foot-care behaviours and practices amongst the diabetic population. Inadequate foot-care behaviour was demonstrated by 72.8% patients. A number of studies carried out in Pakistan show varying foot-care practices amongst diabetics; although none of these used a validated tool like NAFF which the current study used. In a study carried out in Jinnah Post graduate Medical College (JPMC), Karachi, found mean practice score of 5.6, the range being 1-10, in a self-developed questionnaire.<sup>13</sup> A study carried out at Shifa College of Medicine, Islamabad, found that merely 6% patients had been practising proper foot-care.<sup>14</sup> In another study carried out in Lahore, only 14% respondents had good foot-care practices.<sup>15</sup> Poor knowledge regarding foot-care practices was found in a number of studies from Pakistan.<sup>14,16</sup> The practice of daily examining their feet in our study population was seen in only 38.5% patients. In two other studies, the frequency of daily foot examination was 17% and 53.3% respectively.<sup>14,15</sup> We observed that

frequent washing of the feet (once or more per day) was observed in 70% patients. This finding was similar to other studies.<sup>9,11</sup> This was perhaps due to the religious obligation of performing ablution prior to prayers.

Despite the practice of frequent washing of feet, only 42.3% patients dried between the toes after washing them and 42.8% never moisturised their feet. This practice was better than that observed in the study from Shifa, Islamabad, where the corresponding percentages were 23% and 27%.<sup>14</sup> It is a part of our culture to walk barefoot, a practice which can prove harmful for the diabetics, especially those with neuropathy and peripheral vascular disease. The current study found that approximately one-third of the patients frequently walked barefoot. Higher percentages were observed in other studies.<sup>13,14</sup> Poor practices of foot wear were observed in our patients, with most patients not wearing properly fitted shoes with straps or Velcro or using trainers. A high proportion of patients confirmed wearing slippers most of the time (64%). Inadequate behaviour was also observed regarding the use of cotton and seamless socks. Patients also confirmed putting their feet near heat sources and most had never used a bath thermometer. Most of these behaviours (practices) were not adequately assessed in detail in the previous studies carried out in Pakistan.

Previous foot-care education was provided to 172(43%) of our respondents. This was higher than other studies which reported only 16-38% patients.<sup>14,16,17</sup> However, despite more patients being educated regarding foot-care, behaviours remained poor. This might be a result of the little time spent in the out-patient department with each patient due to the patient load and lack of a proper appointment and patient registry systems. In a study carried out in Khyber Teaching Hospital, Peshawar, each patient received only 5 minutes of consultation time from the doctors.<sup>18</sup> It may also be due to poor knowledge of foot-care on behalf of healthcare providers. In a study carried out in Sindh, only 55% doctors had good diabetes knowledge.<sup>19</sup>

In the present study, patients with a previous history of a diabetic foot ulcer also demonstrated poor NAFF scores suggestive of inadequate foot-care practices. A study carried out in India also showed poor foot-care practices in patients with diabetic foot ulcers.<sup>20</sup>

Several factors were found to have a significant correlation between the patients' NAFF scores of <50 or  $\geq 50$ . These included rural or urban background, the patients' literacy, the individuals' monthly income, family history of diabetes and previous foot-care education provided by healthcare providers. These findings are

similar to those found in previous studies, which found literacy,<sup>13,15,20</sup> socioeconomic status<sup>13,20</sup> and previous foot-care education<sup>14</sup> to be significantly associated with the foot-care behaviours.

Several studies from India also show poor foot-care practices in diabetic patients.<sup>21,22</sup> In some studies an inverse relationship was observed between diabetic foot ulceration and foot-care knowledge and practices.<sup>22-24</sup> Various studies from other developing countries like Nigeria and Iran also showed poor foot-care knowledge and practices.<sup>25,26</sup>

Taking into view the lack of adequate foot-care behaviours (practices) amongst our patients, immediate measures need to be taken so as to improve the current situation. Better foot-care practices translate into lower frequency of diabetic foot ulcers and lower rates of amputation. A study on an educational programme on foot-care behaviour had to be terminated prematurely due to the significantly higher incidence of foot ulcer in the control group compared to the interventional group.<sup>27</sup> A randomised control trial also reported significantly lower incidence of new ulcer (18%vs 31%) in the intervention group compared to controls.<sup>28</sup> The healthcare providers, including the doctors, nurses and paramedics, need to be trained in the provision of foot-care. Institutional and countrywide protocols must be formulated to administer foot-care education and improve foot-care practices. These can be achieved by ensuring that every patient is properly educated about foot-care in the out-patient setting. Dedicated diabetic foot clinics must be established. A checklist can be provided to both the healthcare providers and the patients to ensure the protocol is followed through. Feet must be regularly examined by the doctors. Foot self-care is significantly higher in patients who receive advice on foot-care and in those whose feet had been examined by the doctor at least once.<sup>29</sup> Patients can be given pamphlets regarding foot-care in the local languages and demonstrations can be made with the help of audio-visual aids. Group counselling sessions can be undertaken. This type of intervention in which the patients received pamphlets on foot-care education and shown short audio-visual display improved foot-care knowledge and practices in one intervention group.<sup>29</sup> Several other studies also showed improvement in patient knowledge and foot-care behaviour with educational intervention.<sup>24,31-33</sup>

Success in the prevention of diabetic foot ulcers lies in empowering the patients to ensure better self-care practices. Self-efficacy enhancing programmes improve self-care behaviours. A study carried out to evaluate the

effectiveness of health education programmes based on self-efficacy on foot-care behaviour found that knowledge, behaviour and outcome expectation significantly improved with intervention.<sup>34</sup> Several other studies also showed similar outcomes.<sup>35,36</sup>

Hence, a patient-friendly educational intervention coupled with regular reinforcement by the healthcare providers is needed to improve foot-care practices.

## Conclusion

Most patients did not demonstrate good foot-care behaviour, underscoring the lack of proper knowledge and education in this regard. Foot-care behaviour was found to be significantly correlated with rural or urban background, literacy level, monthly income, family history of diabetes, and previous foot-care education provided by healthcare providers.

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