

# Diabetic Foot Care - A Public Health Problem

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## Abstract

**Background:** Diabetes is global epidemic with devastating human, social and economic consequences. The disease claims as many lives per year as HIV/AIDS and places a severe burden on healthcare systems and economies everywhere, with the heaviest burden falling on low- and middle-income countries. Despite this, awareness of the global scale of the diabetes threat remains pitifully low, inappropriate diabetic foot care affects, feet health leading to callosities, cracks, fissures, fungal infections, ingrown toe nails and patients end up in ulcers and amputations.

**Objectives:** To assess diabetic patients taking proper foot care according to International Guidelines and its impact on their foot health.

**Methods:** A cross sectional study was conducted at outdoor patients department of Medicine, Liaquat University of Medical Sciences Hospital Hyderabad from 17<sup>th</sup> January 2008 to 16<sup>th</sup> January 2009. 100 diabetic patients were selected by non probability convenience sampling according to Performa having questions regarding diabetic foot care derived from American Diabetic Association Guidelines for Diabetic Foot care.

**Results:** Diabetic patients taking proper foot care was only 6%. There were 45(45%) males and 55(55%) females. Mean age was 51.57±10.72 years. 38% patients knew about foot care. 17% used to inspect their feet daily, 20% washed their feet daily, while 73% washed their feet more than once. 23% patients dried their feet after every foot wash, 27% applied emollients, 25% checked shoes before wearing, 24% used to wear correct shoes, 8% used to wear cotton socks and 36% used to walk bare feet. Foot care practices on foot health has statistically highly significant association ( $p<0.01$ ) e.g. number of foot washes with foot hygiene, fungal infections with proper foot drying, emollient application with skin texture, cracks and fissures. Associations of proper foot care were statistically significant with literacy status of patients and foot care teachings ( $p<0.05$ ).

**Conclusion:** Few diabetic patients are taking proper foot care. Proper Foot care practices were associated with provision of education of foot care and literacy status of patients. Community health education programs regarding diabetic foot care will likely to reduce diabetic foot complications.

**Keyword:** Diabetes, Foot care education, Diabetic foot care, Diabetic foot, Ulceration; Prevention.

## Introduction:

The prevalence of diabetes is high in Pakistan i.e. 12% of people above 25 years of age suffer from this condition and 19% have impaired glucose tolerance.<sup>1, 2</sup>

Prevalence of diabetes in adults worldwide was estimated to be 4.0% in 1995 and to rise to 5.4% by the year 2025. It is higher in developed than in developing countries. The number of adults with diabetes in the world will rise from 135

million in 1995 to 300 million in the year 2025. There will be a 42% increase, from 51 to 72 million, in the developed countries and a 170% increase, from 84 to 228 million, in the developing countries.<sup>3</sup>

Diabetes mellitus if not properly controlled can lead to quite a few dreadful complications, which can lead to immense morbidity and mortality. Every year 3.2 million deaths are attributable to diabetes. In Pakistan, deaths from diabetes

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alone are projected to increase by 51% over the next ten years.<sup>4</sup>

Foot disease is considered to be one of the most common complications of diabetes mellitus and diabetic foot refers to a wide spectrum of disease. Foot complications from diabetes are one of the main causes of amputation and its subsequent physical and emotional problems. Peripheral vessels and nerve disorders may lead to foot ulcers, and superadded infection can cause foot gangrene. This problem is one of the main reasons for admission of diabetic patients to hospital, and leads to billions of dollars in medical expenses worldwide.<sup>4-5</sup>

Peripheral neuropathy may cause loss of sensation in the feet, resulting in a patient's failure to perceive foot problems, and may cause development of foot deformities that increase pressure points susceptible to ulceration. Osteomyelitis and gangrene may develop from inadequate blood supply and infection. Risk factors for amputation include being older, male, or a member of certain racial/ethnic groups, having poor glycemic control, having diabetes for a longer period, and practicing or receiving poor preventive health care.<sup>6</sup>

Diabetologists started recognizing diabetic foot problems in UK in 1980 and in other European countries including Holland in 1990. Realizing the importance of diabetic foot problems, International Diabetic Federation also chose the theme of "Put Feet First, Prevent Amputations" of World Diabetes Day in 2005.

The diabetic foot care program implemented at King Abdulaziz Medical City in Riyadh in 2002 is a comprehensive approach to maintaining the health of diabetic patients' feet in order to reduce the lower limb amputation rate, thereby dramatically reducing the cost to patients, society, and the health care system.<sup>7</sup>

Few studies have been done in Pakistan about knowledge, attitude and practices of diabetic patients e.g. in one study done in Shifa International Hospital, Islamabad showed the awareness about the disease in majority of diabetic patients was inadequate.<sup>8</sup>

In Pakistan there is lack of qualified and trained diabetes educators or structured diabetes education programs and facilities; lack of trained podiatrists. There is no well established diabetic foot clinic. In absence of Diabetic Foot Clinics, patients with diabetic foot ulcers are referred from medical to surgical and orthopedic wards with no body willing to own them. Hence, they continue to suffer and end up in grave consequences. The current study intended to address this important public health problem, which certainly help the decision makers to design some better strategy.

### Materials and Methods:

To assess diabetic patients taking proper foot care according to International Guidelines and its impact on their foot health.

A cross sectional study was conducted at outdoor patients department of Medicine, Liaquat University of Medical Sciences Hospital Hyderabad from 17<sup>th</sup> January 2008 to 16<sup>th</sup> January 2009. From diabetic patients who are having diabetes of type 1, 2 or MODY, for at least 3 years and capable of self care 100 were selected by non probability convenience sampling. Diagnosis of diabetes was made on the basis of history and investigations i.e., fasting blood sugars, random blood sugars, or glucose tolerance test. They were interviewed and derived examined by trained doctors through questionnaire having questions regarding diabetic foot care from American Diabetic Association Guidelines for Diabetic Foot care.<sup>9</sup>

Data was entered in SPSS version 10.0 for analysis. Mean  $\pm$  standard deviation was calculated for age. Frequencies and percentages were presented for gender, socioeconomic status, education, type and duration of diabetes, drug compliance, smoking, history of foot infections and admission due to it, provision of foot care knowledge, foot inspection, foot wash, foot drying, emollient application, shoe checking, wearing of correct shoes and socks, bare foot walking, foot burn, self treatment, examination by doctor, foot deformities, hygiene, skin texture, corns and callosities, cracks and fissures, fungal infections and in growing toe nails. A chi-square test ( $\chi^2$ ) was applied to find out the association of different practices of foot care with foot conditions on examination (variables mentioned above). A p-value less than 0.05 is considered significant. p-value of less than 0.01 ( $< 0.01$ ) is considered highly significant.

### Results:

The frequency of diabetic patients doing proper foot care, according to ADA guidelines was only 6 (6%) 4% were males and 2% were females. Only 17% used to inspect their feet daily. 20% washed their feet daily; while 73% washed their feet more than once (wazo purposes) 23% patients dried their feet after every foot wash, 27% applied emollients, 25% checked shoes before wearing, 24% used to wear correct shoes, 8% used to wear cotton socks and 36% used to walk bare feet. 21% were in habit of self treatment for foot problems e.g. cutting corns and callosities, ointment applications etc. There was history of foot burn in 16%, foot infections in 34% and 16% patients had been admitted in hospital due to foot infections.

None of the patients had foot examination by doctors regularly, 60% patients were never examined by any doctor

and 39% were once examined many years ago. At the time of foot examination 68% had good foot hygiene, 50% patients had good and healthy skin, 40% had corns and callosities, 48% had cracks and fissures and fungal infections were present in 43%. 35% patients had ingrown toe nails, 23% had loss of joint mobility, 81% had improper nail cuttings and 37% were wearing appropriate foot wears.

Impact on foot health, association between emollient application and cracks and fissures, was statistically highly significant with p-value of <0.01. Similarly association between emollient application and skin texture was also highly significant with p value of <0.01. Statistically very highly significant association was found between frequencies of foot wash and foot hygiene with p-value of < 0.001. The association of fungal infections was highly significant with foot drying (p=0.001) and insignificant with frequency of foot wash (p=0.242). Associations of improper foot wears were highly significant for in growing toe nails and corns and callosities (p < 0.01) and insignificant for foot deformity with p-value of 0.358. Foot care teachings were not associated with duration of diabetes (p=0.122) and hospital admissions due to foot infection (p=0.281). Out of 16% of patients, who were admitted for foot infection, only 8% were taught about foot care. Associations of proper foot care were statistically significant with foot care teaching and education (literacy status) of patients (p=0.001 and p < 0.01 respectively, but it was insignificant with socioeconomic

status (p=0.367), duration of diabetes (p=0.149), history of foot infections (p=0.393) and risk status of feet (p > 0.05).

**Table-I**

*Association of Foot Hygiene with Frequency of Foot Washing (n=100)*

		Frequency of foot washing			
		More than once daily	Once daily	Alternate days	Total
Foot hygiene	Good	58	9	1	68
	Poor	15	11	6	32
	Total	73	20	7	100
p Value		0.000			

**Table-II**

*Table: Association of Emollient Applications with Cracks and Fissures and Skin Texture (n=100)*

		Cracks and Fissures			Foot Skin		
		Yes	No	Total	Dry	Soft	Total
Emollient Applications	Yes	7	20	27	7	20	27
	No	41	32	73	43	30	73
	Total	48	52	100	50	50	100
p Value		0.007	0.003				

**Table-III**

*Association of Fungal Infection with Foot Drying and Washing (n=100)*  
Patients who dry feet after foot wash      Frequency of foot washing

		Yes	No	Total	More than once daily	Once daily	Alternate days	Total
Fungal Infections	Yes	3	40	43	31	7	5	43
	No	20	37	57	42	13	2	57
	Total	23	77	100	73	20	7	100
p Value		0.001	0.242					

**Table-IV**

*Association of Foot Care Education with Duration of Diabetes and Hospital Admission due to Foot Infection (n=100)*

		Duration of diabetes			Hospital admission due to foot infection			
		3-5 years	5-10 years	>10 years	Total	Yes	No	Total
Foot care education	Yes	9	18	11	38	8	30	38
	No	27	20	15	62	8	54	62
	Total	36	38	26	100	16	84	100
p Value		0.122	0.281					

**Table-V**  
*Association of Proper foot care with Educational status of patients (n=100)*

		Education					Total
		Uneducated	Below Matric	Matric	Intermediate	Graduate	
Proper foot care	Yes	32	15	25	19	3	94
	No	1	1	2	-	2	6
	Total	33	16	27	19	5	100
p Value	0.017						

**Table-VI**  
*Association of Proper Foot Care with Risk statuses of feet (n=100)*

		Risk statuses of feet		
		Moderate risk	High risk	Very high risk
Proper foot care	Yes	2	-	1
	No	20	8	11
	Total	22	8	12
p Value	>0.05			

**Table-VII**  
*Association of Proper Foot Care with History of foot infection (n=100)*

		History of foot infection		
		Yes	No	Total
Proper foot care	Yes	31	63	94
	No	3	3	6
	Total	34	66	100
p Value	0.393			

**Discussion:**

Extensive epidemiological surveys have indicated that 40% to 70% of all lower extremity amputations are related to diabetes. Every 30 seconds a lower limb is lost to diabetes. The vast majority (85%) of all diabetes-related amputations are preceded by foot ulcers. In developing countries, it has been estimated that foot problems may account for as much as 40% of the resources available.<sup>6,1</sup> Researchers have established that 49% to 85% of all amputations can be prevented. It is imperative; therefore, that healthcare professionals, policymakers and diabetes representative organizations undertake concerted action to ensure that diabetic foot care is structured as effectively as local resources will allow.<sup>10</sup>

According to our study only 6% of patients were found to be doing proper diabetic foot care. The frequencies of drug compliance, smoking, daily foot inspection, foot washing, drying and emollient application were 63%, 31%, 17%, 20%, 23% and 27% respectively. Few similar studies have been done nationally and internationally showing almost similar results. For example recently a study was done by Murtaza Gondal et al, on 100 diabetic patients, in three tertiary care hospitals of Rawalpindi. It showed that 34 % patients inspected their feet daily and 52% did not know about correct technique of nail cutting.<sup>11</sup>

Another study done in Iran on 100 diabetic patients showed, 60% diabetic patients failed to inspect their feet, 42% did not know how to trim their toe nails and 62% used to walk bare feet.<sup>12</sup> A study in Carolina was done to assess the foot care practices on 61 diabetic patients. All of them had received foot care educations. Even then the patients were using improper or no foot care procedures. Improper foot care was evident in those who already had foot ulcers as well as in those who were at high<sup>13</sup>. In our study we also find that an important reason behind lack of proper foot care is deficiency of provision of foot care education. Only 38% diabetic patients were taught about foot care methods. Diabetic patients remained ignorant of importance and methods of foot care even after hospital admissions due to foot infections. Out of 16% of patients with history of hospital admission due to foot infection, only 8% were taught about foot care (Table IV, V).

According to Professor Karell Baker (Chairman International Working Group of Diabetic Foot) only 14% of doctors treating diabetics ask patients to take off the shoes and examine their feet.<sup>8</sup> A study stated that < 20% of diabetic patients are given proper foot examination by primary care providers.<sup>14</sup>

In our study we found that 20% patients wash feet daily while 73% patients wash their feet more than once, usually five times a day for prayer purposes (Table-I). Few studies have concluded increased prevalence of athlete foot in

Muslims due to washing their feet multiple times and attending mosques.<sup>15</sup> In our study we did not find any association between frequency of foot washing and fungal infection. However fungal infections were related with foot drying practice (Table-III).

In our study we found a significant association between foot wears and corns and callosities but association of foot wears and foot deformities was not found to be significant. The association of foot wears with callus formation has been established in other studies also.<sup>16</sup>

As stated above only 6% of patients were doing proper foot care. 4% of them were males and 2% were females. Frequency of proper care was not related to monthly income and duration of diabetes, however it was related to educational status i.e. out of 3 graduate patients 2 were doing proper care. Usually the illiterate people are those, who do not have much access to health care services (Table-V).

Khamesh et al. also found that illiterate patients were least knowledgeable about foot care practices.<sup>12</sup> A study done at Baqai Institute of Diabetology and Endocrinology on 100 diabetic patients, concluded that lack of awareness, poor glycemic control, and duration of diabetes were the main factors causing diabetic foot problems.<sup>7</sup>

In our study we found a significant association between provision of foot care education and proper foot care practice. De Bernard's also demonstrated that those patients who had received foot care education and had their feet examined were significantly more likely to regularly check their feet.<sup>17</sup>

### Conclusion:

The diabetic foot is a global threat; because it continues to be a major cause of morbidity and mortality<sup>18,19,20,21</sup> In conclusion, this study demonstrate that the frequency of diabetic patients taking proper foot care is highly insufficient. Proper Foot care practices are associated with provision of education of foot care and literacy status of patients. Most of diabetic patients are not provided with foot care educations and they are not offered regular foot examinations including patients with high risk feet. Frequencies of high risk behaviors are high and these malpractices are affecting the feet of diabetic patients.

These findings support, foot care education and regular foot examination as strategies for prevention of foot ulcers. Preventive practices must be reinforced so that patients without foot ulcers should not develop ulcers. These results also high light the need to increase foot care education and to organize proper diabetic foot clinics.

### Recommendations:

- a. Collection of data on the prevalence and clinical manifestations of the diabetic foot.
- b. Continued diabetic education of both physicians, diabetic and general population.
- c. Improvement of organized multidisciplinary foot care throughout the country.
- d. Formulation of a national treatment policy.
- e. Continuous research.

### Conflict of Interest : None

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