

A COMPARATIVE STUDY ON DIABETIC FOOT ULCERS LEADING TO AMPUTATIONS

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ABSTRACT

Objective: To determine and compare the frequency of foot ulcers leading to amputations in relation to gender, type and duration of diabetes.

Methodology: A descriptive study conducted at three teaching hospitals of Peshawar, from November-2015 to February-2016. Data was collected using convenient sampling technique via semi structured questionnaire. Inclusion criteria were diabetic, non-smoker, having no visible deformity other than ulcer or amputation; while critically ill patients, children less than 13 years, gestational diabetics and who did not consent upon were excluded. One hundred and twelve diabetics (type 1 & type 2) were included in the study. The collected data were entered and analyzed in SPSS version 23. P values were computed and significance level was set at <0.05.

Results: Mean age was 53.55 ± 11.58 years. Twenty four males (60%) had foot ulcers and among them, 16 (40%) got their lower leg amputated, whereas 55.5% females had foot ulcers and 24 (33%) among them had amputations. Type 1 diabetics with foot ulcers were 44 (72%) while type 2 diabetics were 68 (47%). Diabetic foot ulcers were found to be highly significant with type of diabetes (p value = 0.007). Duration of illness more than 11 years was found to be a risk factor in 90% of amputations.

Conclusion: Diabetic foot ulcers were reported more in males and were found to be highly significant with type of diabetes.

Key Words: Diabetes mellitus, Foot ulceration, Amputation

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INTRODUCTION

Diabetes Mellitus (DM) affects about 2–5% of European populations and 20% in other parts of the world¹. Worldwide, approximately 180 million people with type 2 DM are reported by the World Health Organization². New cases of diabetes mellitus are increasing worldwide; and it will get doubled with 366 million by 2030. Changing habits of diet and longer life expectancy is the main reason behind it³. Diabetes mellitus is a global, non-communicable disease affecting all age groups. Deaths in relation to diabetes-associated complications accounted for approximately 6% of the global mortality in the year 2000⁴.

Pakistan with high prevalence of diabetes ranks seventh in the world thereby making diabetes as an epidemic disease⁵⁻⁸. In a developing country like Pakistan, there are higher rates of diabetes and its complications causing a major social and economic burden. Although diabetic patients have a 15-fold higher risk of amputations but still half of these amputations could be pre-

vented with early treatment, awareness and education regarding foot care and emphasis to have good glycaemic control⁷. Diabetic foot ulcers (DFUs) results due to loss of sensations, smaller blood vessels angiopathies and uncontrolled blood glucose levels⁹. Most of the patients with DFUs need to be admitted in health care centers and complicated by infections and ultimately amputations. Amputation rates are higher in infected foot ulcers than in non-infected ulcers. Diabetes is the sole cause of 50% of non-traumatic amputations¹⁰.

Late referrals, inadequate medical facilities and lack of awareness regarding foot care lead to ulcers. Prevalence of diabetic foot ulceration is 4-10% in Pakistan¹¹, and the amputation rates following foot ulceration are 8–21%^{12,13}. Early referrals, immediate management and awareness of taking care of one's feet can prevent amputation. Diabetic neuropathy and infections being the leading causes of gangrene in the developing world¹⁴.

Due to rising prevalence, Pakistan will be the fourth country with highest diabetic population globally (7.6% or 13.8 million) by the year 2030¹⁵. Prospective and de-

scriptive studies consistently point to the fact that diabetic patients are more likely to develop complications which may be micro as well as macro-vascular^{16,17}.

Rationale behind doing this type of study was the growing epidemic of diabetes in Pakistan, affecting every age and gender with rising cases every year and non-availability of reliable data. Amputations are preceded by foot ulceration among diabetics; hence it is extremely necessary to identify the persons at risk. We therefore conducted this study in our population to highlight the importance of this issue in diabetics. Frequency determination and comparison of foot ulcers leading to amputations in relation to gender, duration and type of diabetes were the primary objectives of this study.

METHODOLOGY

A hospital based study was conducted in District Peshawar in three main tertiary care health facilities (Hayatabad Medical Complex, Khyber Teaching Hospital and Kuwait Teaching Hospital) from November-2015 to February-2016. Diagnosed and admitted patients with type 1 and 2 diabetes mellitus were the target population for this study. The study was conducted after ethical clearance and prior permission.

One hundred and twelve patients of 20-78 years of age, were enrolled through non-probability convenient sampling technique. Diabetics who were non-smokers with no visible foot deformity (other than amputation/ulcers due to diabetic complication) and new cases of diabetes were included in the study. Critically ill patients, gestational diabetes and the ones who did not consent upon were excluded. Informed consent was taken from each patient and ethical considerations were duly taken care of. Data were entered and analyzed in SPSS version 23 with computation of percentages and p- values. Significance level was set at <0.05.

RESULTS

A total 112 patients were enrolled. Participant's age ranged from 23-78 years and mean age was 53.55 ±11.58 years. There were more females among the admitted patients as compared to males (72 vs. 40 respectively). Male to female ratio was 1:1.8.

Visual disturbances were present in 32 (28.5%) individuals, 40 (35.7%) had nephropathy, 36 (32.1%) had cardiovascular problems, 64 (57.1%) had burning or shooting sort of pain, 88 (78.5%) individuals felt tingling sensations, 28 (25%) had claudication and 32 (28.5%) had cold feet. Random blood sugar estimation showed that 12 (10.7%) individuals had blood sugar level of 151-200 mg/dl, 12 (10.7%) individuals had level between 201-250 mg/dl, 60 (53.6%) individuals had level between 251-300mg/dl, while 28 (25%) had more than 301mg/dl. Moreover, 48 (42.8%) patients had never checked their glycemic levels.

The frequency of foot ulcers was more in males (24 out of 40 or 60%) and among them, 16 (40%) got their lower leg amputated. On the other hand (40 out of 72 or 55.5%) females had foot ulcers and 24 (33%) among them had amputations. Comparison of foot ulcers leading to amputations in relation to gender are shown in Table1.

Type 1 diabetics with foot ulcers were 44 (72%) while type 2 diabetics with foot ulcers were 68 (47%). Diabetic foot ulcers were found to be highly significant with type of diabetes (p value =0.007). Foot ulcers in relation to type of disease along with their p values are shown in Table 2.

Duration of illness of more than 11 years was found to be a risk factor for 36 amputations out of 44 in type 1 diabetes and 56 amputation in type 2 diabetes (p value =0.085), details are shown in Table 3.

Table 1: Gender wise comparison of amputations with p- values

Amputation	Gender		Total	P Value
	Male	Female		
Yes	16	24	40	0.482
No	24	48	72	
Total	40	72	112	

Table 2: Foot ulcers in relation to type of diabetes with the p- values

Foot Ulcers	Type 1 Diabetes Mellitus (n=44)	Type 2 Diabetes Mellitus (n=68)	P value
Yes	32 (72%)	32 (47%)	0.007
No	12 (28%)	36 (53%)	
Total	44 (100%)	68 (100%)	

Table 3: Comparison of amputations with duration & type of disease

Duration of Diabetes	Type of Diabetes		Total	P Value
	Type 1	Type 2		
<6years	4	4	8	0.085
6-11 years	4	8	12	
≥11 years	36	56	92	
Total	44	68	112	

DISCUSSION

Pakistan being a developing country bears the high burden of diabetes due to its rising prevalence¹⁸. Diabetes substantially raises the morbidity and mortality and quality of life is compromised among the sufferers^{18,19}. This study showed increased frequency of diabetic foot ulcers in males though females were greater in number. Length of the disease had a direct effect on the development of foot ulcers but not found to be significant according to the results of this study. However maximum patients having HB1Ac of more than 11% had amputations. Risk of micro-vascular and macro-vascular complications in relation to raised HBA1c levels (>6.5%) and poor glycemic control were depicted in a landmark study of United Kingdom Prospective Diabetes Study (UKPDS)¹⁸. Type-2 diabetes with poor glycemic control has profound implications on health and is a major contributing risk factor for the development of diabetic complications²⁰. In another research it was found that poor glycemic control with HbA1c levels higher than 10% were associated with increased risk of foot ulcers and diabetic foot deformities²¹. Results of the present study revealed that diabetic foot ulcers occurred with poor glycemic controls as reported in other studies²²⁻²⁴.

A study reported prevalence of diabetic foot ulcers as 41.6% and among these 5.3% had past history of foot ulcers. Peripheral neuropathies and peripheral vascular disease are considered underlying pathologies after adjusting their ages and duration of disease²⁵, which was consistent with our results; however frequency of past ulcers was not included in this study.

The present study described increased frequency of neuropathic symptoms, which is consistent with the findings of a study by Maulik et al²⁶. Diabetics had a mean duration of 172.2 months (14.3 years) in a study by Madanchi et al²⁷ whereas our study showed duration of 11 years. Male dominance in foot ulcers was also reported by them as in this study²⁷.

The findings of the current study showed higher frequency of foot ulcers when compared to a study conducted in Kenya which reported the burden of foot ulcers as 4.6% in diabetic patients²⁸. Other studies con-

ducted in Ethiopia and Nigeria found diabetic foot ulcer prevalence to be 31.1% and 41.1%, respectively^{29,30}. Type of diabetes mellitus was one of the strongest predictors of diabetic foot ulcer occurrence. Those diabetic patients who had type 1 diabetes mellitus were two times more likely to develop diabetic foot ulcers than those who had type 2 DM depicting highly significant p value of 0.007. This finding was inconsistent with the studies conducted in Nigeria, Egypt and Asia^{2,30,31} which indicated that type 2 diabetes mellitus was significantly associated with the occurrence of diabetic foot ulcers.

Small sample size, hospital based data and absence of control group were the main limitations of this study, so results cannot be extrapolated to rest of the district, city or the province.

CONCLUSION

The frequency of diabetic foot ulcers among diabetic patients at tertiary care hospitals of Peshawar was found to be high among males. Diabetic foot ulcers were found to be highly significant with type of diabetes.

RECOMMENDATIONS

Patients with diabetes should be screened for foot complications regularly. Patients should be told to wear comfortable shoes. Early referral of the diabetic patient from primary health care centers to the tertiary health care /diabetic center is of paramount importance so that they can be screened early for the diabetic complications by the multidisciplinary specialist team.

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CONTRIBUTORS

RR conceived and designed the study and did data collection. FRM did statistical analysis and review, editing and final approval of manuscript. ZR did data collection. All authors contributed significantly to the submitted manuscript.