

ORIGINAL ARTICLE

The Frequency of Major and Minor Amputations in Patients with Diabetic FootGUL MUHAMMAD¹, IFTIKHAR AHMED², ADEEL UR REHMAN KANDAN³, MUHAMMAD FAISAL BACHA⁴, WAJEED GUL BANGASH⁵, MUHAMMAD NOAMAN⁶, SHAHID MAHMOOD⁷¹Senior Registrar, HBS Medical & Dental College Islamabad²Associate Professor, Akhter Saeed Medical College Rawalpindi³Assistant Professor, HBS Medical & Dental College Islamabad⁴Assistant Professor, Akhter Saeed Medical College Rawalpindi⁵Assistant Professor, Islamic International College⁶Assistant Professor, Akhter Saeed Medical College Rawalpindi⁷Professor of Surgery, Akhter Saeed Medical College RawalpindiCorresponding author: Iftikhar Ahmed, Email: drisoomro4u@gmail.com, Cell: 033373406278**ABSTRACT****Introduction:** Diabetic foot (DF) is the main cause of non-traumatic lower extremity amputations. Major and minor amputations in diabetic foot disease are benchmark indicators of natural history and prognosis of disease. This study will help to prevent DF complications and improve care of diabetes foot.**Objectives:** To determine the frequency of major and minor amputations and the factors responsible for patients with diabetic foot coming in surgical OPD.**Methods:** All the patients who presented in hospital with diabetic foot ulcer were included in this study from 01-11-2019 to 30-10-2020. One hundred and forty patients of either gender with age between 20 to 80 years with diabetic foot ulcers of any grade were enrolled in the study. Frequency of minor and major amputations was measured.**Results:** Out of three hundred and twenty patients, 16.4% (n=69/320) patients underwent lower limb amputations. Minor amputations were made in 12.1% (n=51/320) and major were made in 4.3% (n=18) of patients. Frequency of amputations was significantly higher in older age groups (61-80 years), patients with longer disease duration (>10 years), with poor glycemic control (HbA1c>8.0) and patients with higher grades of ulcers (grades III and IV) (P<0.05). No significant difference was observed among gender, different education and occupation groups (P>0.05).**Conclusions:** A significant percentage of patients with diabetic foot ulcers underwent lower limb amputations, which was significantly associated with older age, longer disease duration, poor glycemic control and higher grades of ulcers.**Keywords:** Diabetic foot, Lower limb amputation, diabetic ulcers.**INTRODUCTION**

Diabetes mellitus patients are at high risk of developing diabetic foot ulcer (DFU) and require amputation in most of cases within 04 years¹. Various factors like angiopathy, neuropathy, physical stress & uncontrolled diabetes causes DFU². Diabetic foot ulcer if infected, causes high morbidity and prolonged hospitalization resulting in approximately doubles the rate of amputation as compared with non-infected ulcers^{2,3}. Patients with long-standing diabetes mellitus result in chronic osteomyelitis of the lower extremity is frequently the leading cause of lower limb amputations². According to studies, nearly one-quarter of foot ulcers can be developed in diabetic patients, and about 1/4th of these ulcers never heals.

Adequate flow of oxygenated blood is required to heal the ulcers, peripheral arterial disease (PAD) is well known risk factor for the amputation in diabetic foot patients, it causes 20 times increase in the rate of amputation. To reduce the risk of amputation screening for PAD and vascular care should be done appropriately, especially in diabetic patients⁴.

The conservative treatment like antibiotics alone is not effective in patients of diabetes mellitus with DFU which is associated with immunosuppression and impaired blood flow, as it requires extensive, repeated debridement or eventual amputation. Patients with diabetes have a varied, yet overall increased risk of LEA with an incidence of 50-500 per 100000^{5,6}. The short- and long-term outcomes as a result of lower extremity amputation (LEA) are profound, as patients with diabetes often have complex comorbidities and socioeconomic backgrounds. Short-term outcomes following LEA are poor, with early post-operatively mortality up to 22%⁷.

Materials and methods:

This descriptive cross sectional study was conducted in Department of Surgery, Federal Government Services Hospital Islamabad from 01-11-2019 to 30-10-2020. After taking written consent from the patients and permission from ethical review board, 320 patients of either gender with age between 20-80 years

with diabetic foot ulcers of any grade were enrolled in the study. Frequency of minor and major amputations was measured. Sample size was calculated using WHO formula & SPSS 27 was used to analyze the data. Data was collected using patients record in the hospital.

RESULTS

Our study was comprised of 320 patients, age ranges between 20 to 80 years presented in hospital with diabetic foot ulcer disease. Out of 320 patients, 16.4% (69) patients underwent lower limb amputations. Minor amputations were made in 12.1% (51) and major were made in 4.3% (18) of patients. Frequency of amputations was significantly higher in older age groups (61-80 years), patients with longer disease duration (>10 years), with poor glycemic control (HbA1c>8.0) and patients with higher grades of ulcers (grades III and IV) (P<0.05). No significant difference was observed among gender, different education and occupation groups (P>0.05).

Table 1: Frequency and percentage of risk factors

Risk factors	Frequency	Percent	
Age Groups	20-40 years	90	21.4
	41-60 years	150	35.7
	61-80 years	180	42.9
Duration Categories	< 5 years	114	27.1
	5-10 years	165	39.3
	>10 years	141	33.6
Hba1c Control	Controlled	255	60.7
	Uncontrolled	165	39.3
Ulcer Grades	Grade I	132	31.4
	Grade II	222	52.9
	Grade III	24	5.7
	Grade IV	42	10.0

Education	< 10 school years	312	74.3
	> 10 school years	108	25.7
Occupation	On job	108	25.7
	No job	312	74.3

Table 2: Stratification WRT Gender, Age, Duration, Glycemic Control and Ulcer Grades

Risk Factors		Major Amputations		Minor Amputations	
		Absent	Present	Absent	Present
Age Groups	20-40 years	90	0	87	3
		22.4%	.0%	23.6%	5.9%
	41-60 years	150	0	138	12
		37.3%	.0%	37.4%	23.5%
61-80 years	162	18	144	36	
	40.3%	100.0%	39.0%	70.6%	
P-value		0.015		0.040	
Gender	Males	234	15	216	33
		58.2%	83.3%	58.5%	64.7%
	Females	168	3	153	18
		41.8%	16.7%	41.5%	35.3%
P-value		0.220		0.627	
Duration Categories	< 5 years	114	0	114	0
		28.4%	.0%	30.9%	.0%
	5-10 years	165	0	153	12
		41.0%	.0%	41.5%	23.5%
	>10 years	123	18	102	39
		30.6%	100.0%	27.6%	76.5%
P-value		0.002		0.001	
Hba1c Control	Controlled	255	0	252	3
		63.4%	.0%	68.3%	5.9%
	Un Controlled	147	18	117	48
		36.6%	100.0%	31.7%	94.1%
P-value		0.002		0.001	
Ulcer Grades	Grade i	132	0	129	3
		32.8%	.0%	35.0%	5.9%
	Gradeii	222	0	210	12
		55.2%	.0%	56.9%	23.5%
	Grade iii	24	0	9	15
		6.0%	.0%	2.4%	29.4%
	Grade iv	24	18	21	21
		6.0%	100.0%	5.7%	41.2%
P-value		0.001		0.001	

DISCUSSION

Our results showed that there were 59% patients were males and 41% were females. A similar study showed that during the 10-year period, 46.6% women and 53.4% men with diabetes⁸. Seth A & his colleagues also showed that no sex-dependent difference was seen in nondiabetic patients. However, female patients with diabetes were significantly older when amputated compared to male diabetic patients⁹.

Mean age was 55.3 years ± 15.5 SD. In a similar study by Ugwu E et al, they enrolled 644 subjects with mean age of 65.1 (±11.2) and diabetes duration of 16.1 (±10.8) years. The mean age of female diabetic patients in their study was 2 years higher (63.9 +/- 12.6) than in male diabetic patients (61.8 +/- 11.9)¹⁰

We showed that 31.4% patients had grade-I ulcers, 52.9% had grade II, 5.7% had grade III and 10% had grade IV ulcers. Our findings are similar with Rebecca Reardon et al who in their study conducted on local population reported 51.4% grade-I ulcers, 29% had grade II, 18% had grade III and IV ulcers¹¹.

Our results showed that out of 320 patients, 16.4% patients underwent lower limb amputations. Minor amputations were made in 12.1% and major were made in 4.3% of patients. Frequency of amputations was significantly higher in older age groups (61-80 years), patients with longer disease duration (>10 years), with poor glycemic control (HBA1-C>8.0) and patients with higher grades of ulcers (grades III and IV) (P<0.05). No significant difference was observed among gender, different education and occupation groups (P>0.05). Results are comparable to one study which showed the amputation rate of 52.2% while the mortality rate was

14.3%¹². Sohaib et al showed amputation rate of 30.5% in study conducted in local population. The baseline ulcer grade was significantly associated with the risk of lower extremity amputation, and the odds ratio was 2.36 (95% 1.06-5.21). In another study¹³, the overall amputation rate was found to be 39.4%. Lawrence A Lavery et al in their study of diabetic patients observed 3.87% amputations rate, which is low in comparison with our results, probably due to better preventive measures and standard of care in Europe¹⁴. Another study on patients with diabetic foot ulcers found that 28.2% of the patients underwent lower limb amputations¹⁵.

The amputation rate in the hospital where the "multidisciplinary approach" has been used was lower (23.7% vs. 30.1%). In another study with diabetic foot ulcers found that major amputations occurred in 15.4% during follow up¹⁶.

Konstantinos Spanos estimated 3-year risk for diabetic foot ulcer (DFU), lower extremity amputation (LEA) and death; determined predictive variables and assess derived models accuracy¹⁷. Cumulative incidence was 26.6% for DFU, 5.8% for LEA and 14.0% for death¹⁸. In multivariate analysis, physical impairment, peripheral arterial disease complication history, complication count and previous DFU were associated with DFU; complication count, foot pulses and previous DFU with LEA and age, complication count and previous DFU with death¹⁹. Sharma R et al in their population-based cohort study aimed to compare the incidence of vascular lower-limb amputation (LLA) in the diabetic and nondiabetic general population²⁰. The incidence of initial unilateral amputation per 100,000 person-years was 192 (95% CI 145–241) for diabetic women, 197 (152–244) for diabetic men. The incidence increased from the age of 75 years. Of all amputations, 74% were transtibial²¹. The incidences of contralateral amputation and of reamputation per 100 amputee-years in diabetic women amputees were 15 (7–27) and 16 (8–28), respectively; in diabetic men amputees 18 (10–29)²².

CONCLUSION

In summary, amputation rate is quite significant in our population with diabetic foot. We recommend implementation of the national and international guidelines on the diabetic foot at our setup. We also recommend dedicated multidisciplinary team with diabetes clinics established in every major hospital.

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