

# Amputations After Diabetic Foot Infections- the Cost of Neglect

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Diabetic foot infections are the major cause of morbidity and mortality in patients with diabetes mellitus. Most of the infections are treatable even if not preventable. The purpose of this study was to highlight the problems associated with diabetic foot infection and to evaluate their outcome. This prospective observational study was carried out at Mayo hospital Lahore for period of two years started form July 2000. All the patients with diabetic foot ulceration/infection were included. Glycemic control was achieved with insulin. Primary amputations were done depending upon the condition of the limb and the status of infection and that of the patient. A total of 207 patients presented with Diabetic Foot ulceration in 2 years. Most of the patients were in their fifth and sixth decade of life with male to female ratio of 2.5:1, among which 84% (n=174) patient had NIDDM while 16% (n=33) had IDDM. Most of the patients (n=149) 72% were with poorly controlled DM. A total of 152 (73%) amputation were performed with 60% (n=123) primary amputation and 13%(n=29) secondary amputation. The cost spend on the treatment of per patient per day was 800 Rs (14 US\$) with a average total cost of 15000 Rs (255 US\$) per patient per treatment to a total cost of 3105000 Rs (52629 US\$) in two years. Diabetic foot infection is a treatable disease if not preventable that can be done by providing patient education, early diagnosis, early referral and prompt treatment at all levels of health providing agencies.

**Key words:** Diabetic foot, infection, debridement, amputation

Foot infections are a major cause of hospitalization in patients with diabetes, accounting for approximately 20% of all admissions in diabetic population<sup>1,2</sup> Furthermore, diabetic foot infections are frequently associated with a mal perforans ulceration, the most characteristic of diabetic foot lesions<sup>3</sup>.

Although infection is not usually the direct cause of ulceration, it is certainly a significant determinant of outcome<sup>4</sup>. When these ulcers are neglected or treated improperly they become infected due to prolonged exposure to the external environment or excessive weight bearing<sup>5</sup>. When these are associated with peripheral arterial disease, which is another dilemma of diabetes, these ulcers results in limb threatening or even life threatening events that may result in amputation of the lower extremity<sup>6</sup>. The majority of non-traumatic lower extremity amputations in patients with diabetes are the result of amputations from ulceration that lead to the limb loss<sup>7,8</sup>.

## Materials and methods

This study was carried out in department of surgery, East surgical unit of Mayo hospital Lahore from July 2000 to July 2002. All the patients with diabetic foot ulcerations were included in this prospective study. A complete history was taken including patient life style, occupation, present condition, socioeconomic status, glycemic control, present and past medication insulin dosage, frequency of injection, site of injection, added to this a thorough clinical examination including wound status, neurological status, vascular status, nutritional status and diabetic status were noted. The patients with three results of fasting blood sugar of >60 and <100 mg/dl with two random readings of

>100 and <180 mg/dl were considered well controlled status.

Patients with blood glucose level of more than three readings one fasting and two random of fluctuation of more then 50mg/dl (added to normal level) was considered as moderately controlled diabetic status and in patients with more then two readings of fasting and three of random were more than 50mg/dl considered as uncontrolled or poorly controlled diabetic status.

In patients with grossly contaminated wounds primary amputation was planned after getting normal glycemic control and informed consent. In patients with limb salvage primary debridement was done in emergency after obtaining normal glycemic control and repeated debridements were made on elective lists till the wound became healthy. Broad spectrum Antibiotics were given till the report of culture & sensitivity. Then specific antibiotics were started. In all the patients' glycemic control was obtained by putting the patient onto the sliding scale for insulin injection.

## Results

This prospective observational study was carried out at department of Surgery, East surgical unit Mayo hospital Lahore for a period of two years starting from July 2000. A total of 207 patients presented with diabetic foot infection during that period (Figure 1 & 2)

The mean age of presentation was 55.5 years with the minimum age of 17 years and maximum age of 83 years. There was a predominance of male patients (n=144) than female (n=63) (Table 1 & Figure 3).



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Figure 1: Monthly distribution of patients with diabetic foot infection year 2000.

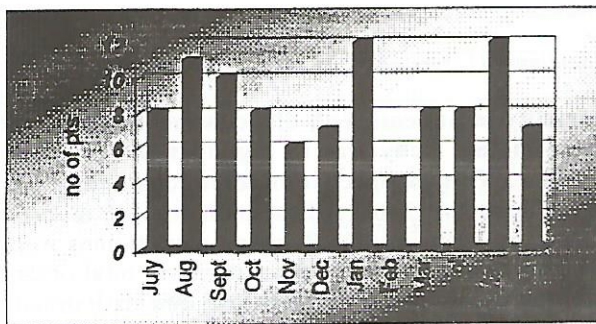


Figure 2: Monthly distribution of patients with diabetic foot infection year 2001.

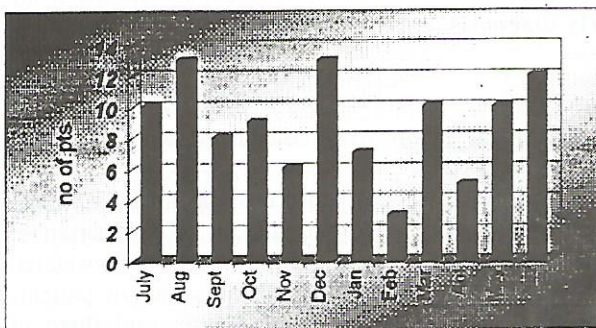
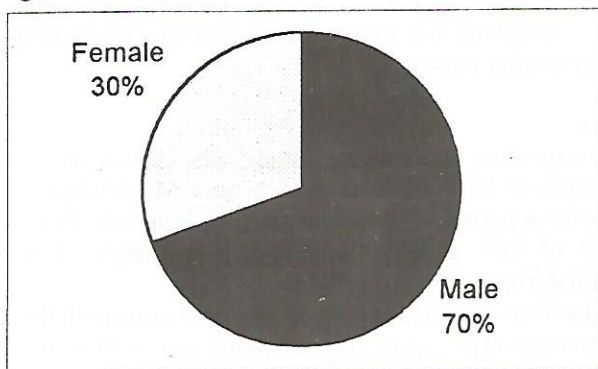


Table 1: Age Distribution

Age	n=	%age
< 25 yrs	03	1.44%
26-40	29	14%
41-55	118	57%
56-70	38	18.35%
70 & above	19	9.17%
Total	207	100%

Figure 2: Sex Distribution



Most of the patients were with Non-insulin dependent

diabetes mellitus (n=174) and were taking medication for an average of more than 10 years (Table 2)

Table 2: Diabetic Status of patients

Diabetes status	n=	%age
NIDDM (Type I)	174	84%
IDDM (Type II)	33	16%
Total	207	100

Most of the patients were in poorly controlled status of diabetes (n=159), followed by moderately controlled status (n=37) and only 5% of the patients (n=11) were with good glycaemic control. (Table 3)

Table 3: Glycemic control of the patient

Glycemic control	n=	%age
Well controlled	13	6%
Moderately controlled	45	22%
Poorly controlled	149	72%
Total	207	100%

Of these 207 patients with diabetic foot infection majority of the patients have limb-threatening infections (Table 4). The initial amputation level were; debridement and synovectomy in 84 limbs, toe and digital ray in 59 limbs, transmetatarsal in 17 limbs, transtibial in 36 limbs and transfemoral in 11 limbs (Table 5). 60% of the patients have primary amputations and rest of 40% had debridement of which 29 patients (35% of debridement) had amputation some times latter.

Table 4: Degree of infection

Degree of infection	n=	%age
Moderate degree	61	30
Limb threatening	119	58
Life threatening	27	12
Total	207	100

Table 5: Level of primary amputations (n=123)

Level of amputation	n=	%age
Toe and digital ray	59	28%
Transmetatarsal	17	8%
Transtibial	36	17%
Transfemoral	11	6%

The average study of the patients in the hospital was four weeks with the patients with early amputation followed by daily good glycaemic control had shorter hospital stay than those patients where repeated debridements were done and than amputation was planned at a later stage.

The total cost of the treatment of the patient with diabetic foot both spend by the hospital and the patient himself was about 800(14 US\$) per day per patient that is 15000Rs (255 US \$) were the cost of treatment of a single patient. So the total cost of 207 patients during two years was 3105000 Rs (52629 US \$).



Table 6: Cost analysis with hospital stay

Cost	Price
Cost per patient per day	Rs. 1200 (20 US \$)
Cost per patient per treatment	Rs. 33600 (579 US \$)
Total cost on DF (2yrs)	Rs.6955200 (119917.24 US \$)

### Discussion

Foot ulcerations, infections and Charcot neuropathic osteoarthropathy are three serious foot complications of diabetes mellitus; that can too frequently lead to gangrene and lower limb amputation<sup>9</sup>.

Development of infections typically follows undetected injury to the neuropathic diabetic foot or is a sequel to neglected or long standing ulceration<sup>10</sup>. The open lesions allow entry of the microbes that flourish in the presence of an impaired host response<sup>11</sup>. In those patients who have associated vascular insufficiency, the infection rapidly progresses leads to medical and surgical emergency<sup>12</sup>. Unfortunately the emergent nature of the problem frequently escapes notice in the neuropathic patients until it is too late to save the limb or life with out amputation<sup>13</sup>. In this present series the age and sex distribution is almost same as local and international studies.

Table 7: Comparison of age and sex distribution

Study	Age	Sex M:F
Present	55.5	2.5:1
M Ashraf et al (14)	53.5	2:1
Oyibo et al (15)	56.5	3:1
Ohsawa et al (16)	67	2.5:1.2

In our present study 84% of the patients had type II diabetes mellitus and 16% had type I diabetes mellitus. The presentation with this distribution of the diabetic status is same as in local studies and international data.

In our present series 72% (n=149) patients had poorly controlled diabetes mellitus where as in international studies particularly in European countries patients had got normal glycemic control which probably entails that our population still needs better education about DM and its care, further more in our circumstances it might not be possible to carry out with such a chronic disease with limited resources of economics.

	Diabetic status	Glycemic control
Present study	NIDDM 84% IDDM 16%	Poorly control 72%
Ohsawa et al	NIDDM 100%	Poorly control 28%

In this present study we found out that a total of 73% patients had amputations starting from toe and digital ray amputations to transfemoral amputations. This high incidence of amputations in our part of the world is because of many factors that include lack of patient's

education, lack of primary care, lack of early diagnosis, management and treatment.

In most of the patients with DM infection plays only a part but limb ischemia is the major determinant of the outcome. In developed countries most modern techniques and procedures are under taken as femorodorsal bypass grafts and micro vascular surgery to break the trial of neuropathy, ischemia and decreased patient resistance.

Study	Amputation
Present	73%
Mysliwice et al (17)	40%
Stone et al (18)	55%

Treatment of the patients with diabetic foot infection is always costly. In present series we found that an average of 25 lac Pakistani Rs. Per year were spend on DF treatment only in our unit. When compared with internal data it showed that the cost of treatment of DF infection is high all over the world, though individual cost per patient is not available from international study. A total of 1.5 billion US \$ spent in the management of DF infection in year 1995<sup>19</sup>. Similarly is the department of surgery Guy's Hospital London UK about 155000 UK pounds were spent for the management of diabetic foot infection in year 1997<sup>20</sup>.

### Conclusion and recommendations:

Diabetic foot infection is a major cause of morbidity in diabetic population. Underestimation of the severity of infection and ischemia can be a significant source of morbidity for these patients, in that a delay in referral and treatment can lead to a treatable infection to limb threatening infection and a limb threatening infection to a life threatening infection.

We concluded that by educating our patients at the very beginning of the disease and regular follow-ups will not only cause benefit to the patient but also reduce some burden from the health providing agencies in terms of financial economy.

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