

Original Research Article

Management of diabetic foot ulcers in a teaching hospital

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ABSTRACT

Background: Diabetic foot ulcers (DFUs) are major public health problem, especially in developing countries. Still now management of diabetic foot ulcer is the major challenge for surgeons.

Methods: A prospective study was done at Kamineni Institute of Medical Sciences, Narketpally; from February 2014 to January 2017. All the collected data was analyzed by the SPSS 20.0 software.

Results: A total of 350 DFUs patients was included in this study. Among all of them 77.14% were male and 22.86% were female. Most common age group with DFUs was 40-60 years. All the patients had type 2 diabetes mellitus. The majority of patients were presented foot ulcers between 4 weeks to 32 weeks. 18% patients had previous history of DFUs and 11.14% had previous amputation. The forefoot was commonly affected in 48.3% of cases. Neuropathic ulcers were the most common type of DFUs in 50.6% of cases. Wagner's stage 3, 4 and 5 ulcers were the most common at 20.86%, 28% and 22% respectively. 52.86% patients were treated surgically. Lower limb amputation was the most common surgical procedure performed in 60% of cases. The complication rate was (49.7%) and surgical site infection was the most common complication (34.8%). 60% of cultures had polymicrobial growth and *Staphylococcus aureus* (53.3%) was the most common microorganism isolated. Most of the microorganisms isolated showed multi drug resistance to commonly used antibiotics except for Carbapenems group drugs (sensitivity 100%). The hospital stay was ranged between 15-116 days. Mortality rate was 9.4%.

Conclusions: Diabetic foot ulcer is the major cause of morbidity and mortality among patients with diabetes mellitus. A proper education on foot care and appropriate foot ware, good sugar level control and early surgical intervention is needed to decrease the morbidity and mortality among diabetic foot ulcer patients.

Keywords: Diabetic foot ulcers (DFUs), Prevalence, Surgical management, Type 2 diabetes

INTRODUCTION

Diabetic foot is one of the major complications of diabetes; with ulceration of foot that is associated with neuropathy in a patient with diabetes. Diabetic foot ulcers cause major public health problem worldwide with high morbidity and mortality among diabetes patients.¹⁻³

15-20% of diabetic patients will develop foot ulcers at some point of life and many of them treated by surgical procedures.⁴ Lower limb amputations are more common in diabetic foot ulcer patients in developing countries.⁵ The majority of diabetic foot ulcers will heal but 10-15% of cases remain non-healing and will lead to limb amputation.⁶ Diabetic foot ulceration is still major

problem for developing countries due to unavailability of proper diagnosis and treatment. Most of the diabetic foot ulcer patients admitted to the hospital with advanced foot ulcers which is the major drawback to manage these cases. The late admission of DFUs in hospital is due to poor knowledge of diabetes healthcare, socio-cultural reasons and poor economic status.⁷ Several studies have shown that surgical procedures for DFUs with gangrene may be too late to prevent death. Therefore, it is necessary early presentation by patients and proper surgical procedures should apply during primary stages of ulcer, which may improve quality of life in patients and reduce mortality rate.^{8,9} Management of DFUs involve multidisciplinary approach, therefore the present study was aimed to describe our own experience in the surgical management of DFUs, various risk factors associated with DFUs and treatment pattern.

METHODS

This study was carried out in Kamineni Institute of Medical Sciences, Narketpally; during the period of 3 years from February 2014 to January 2017. The patients with diabetic foot ulcers attended in hospital were included in this study. The detailed history of the patients was recorded. Proper clinical diagnosis was done for each patient such as; duration of diabetes, types of diabetes (type I or II), duration of foot ulcer and patient's awareness, any anti-diabetic treatment, type of DFUs (ulcer, cellulites, gangrene), various co-morbid conditions, Wagner's classification for grading of DFUs and previous history of any amputation.¹⁰

Type of operative procedures and outcome was recorded. Various clinical laboratory investigations (pathological, biochemical and microbiological) were done for each patient. Data were collected and analyzed by SPSS 20.0 statistical software. Chi-square and Student T test was performed to analyze the data.

RESULTS

Among 350 diabetic foot ulcer patients, 77.14% were male and 22.86% were female. Most of the patients belong to the age group of 51-60 years (44.86%). 76.86% patients were from rural area and 23.14% belongs to urban area. Patients with smoking and alcohol habits were recorded for 22.3% and 52.3% respectively. 16.3% patients had family history of diabetes mellitus (Table 1).

25.4% cases were newly diagnosed cases. All the patients had type 2 diabetes mellitus. The majority of patients were presented foot ulcers between 4 weeks to 32 weeks (Table 2). Previous history of diabetic foot ulcers and amputation were reported for 18% and 11.14% patients respectively. 48.3% patients had ulcer in fore foot, 27.7% ulcers in toe and 24% in foot sole. Neuropathic ulcers (50.6%) were the most common type of diabetic foot ulcer. According to Wagner's classification grade 3, 4 and

5 ulcers were the most common at 20.86%, 28% and 22% respectively (P value 0.003) (Table 2).

The majority of cases surgically (52.86%) and remaining 47.1% were treated with daily dressings and antibiotics. Out of 185 cases, 60% patients were treated by lower limb amputations. Skin grafting, incision and drainage was done for 7.02% and 4.86% patients respectively (P value 0.012) (Table 3).

A total of 92 post-operative complications were reported, most common were surgical site infection (34.8%) (Table 4).

15 out of 24 (62.5%) cultured specimens had positive bacterial growth after 48 hours of aerobic incubation. 9 cultures had polymicrobial (60%) growth and 40% had pure growth. *Staphylococcus aureus* was the most frequent microorganism isolated 8 (53.3%), followed by *Escherichia coli* (40%) and *Klebsiella spp* (33.3%), *Pseudomonas spp* (20%) and *Proteus spp* (13.3%) (Table 5).

Antibacterial susceptibility testing revealed that most of pathogens isolates had multiple resistant to almost all tested antibiotics (ampicillin, augumentin, cotrimoxazole, tetracycline, penicillin, gentamicin, erythromycin, oxacillin etc.). The majority of isolates were sensitive to imipenem (100%), meropenem (100%), dorepenem (100%), ertapenem (100%) vancomycin (100%), clindamycin (76.5%) and ciprofloxacin (58.6%). The hospital stay was ranged between 15-116 days. Mortality rate was 9.4%.

Table 1: Socio-demographic characteristics of diabetic foot ulcer patients.

Characteristics	Total no. of patients (n=350)	Percentage (%)
Male	270	77.14
Female	80	22.86
Age group		
40-50 years	135	38.57
51-60 years	157	44.86
>60 years	58	16.57
Living status		
Rural	269	76.86
Urban	81	23.14
Smoking habits		
Yes	78	22.3
No	272	77.7
Alcoholic		
Yes	183	52.3
No	167	47.7
Family history of diabetes mellitus		
Yes	57	16.3
No	293	83.7

Table 2: Clinical characteristics among DFUs in percentage.

Characteristics	Total no. (n=350)	Percentage (%)
Duration of diabetes		
Old cases	261	74.6
New cases	89	25.4
Duration of DFUs (weeks)		
1-2	36	10.3
2-4	57	16.3
4-6	69	19.7
6-8	73	20.85
>8	115	32.86
Type of DM		
Type 1	0	00
Type 2	350	100
Previous history of DFUs		
Yes	63	18
No	287	82
Previous history of amputation		
Yes	39	11.14
No	311	88.86
Anatomical site of ulcer		
Fore foot	169	48.3
Toe	97	27.7
Foot sole	84	24
Type of ulcer		
Neuropathic	177	50.6
Ischemic	114	32.57
Neuro-ischemic	59	16.8
Wagner's classification		
Grade 0		
Grade 1	33	9.43
Grade 2	69	19.7
Grade 3	73	20.86
Grade 4	98	28
Grade 5	77	22

Table 3: Type of surgical procedures performed.

Operation type	Total No. (n=185)	Percentage (%)
Debridement	46	24.86
Lower limb amputation	111	60
Skin grafting	13	7.02
Incision and drainage	9	4.86
Sequestrectomy	6	3.24

Table 4: Post-operative complications.

Complications	Total no. (n=92)	Percentage (%)
Surgical site infection	32	34.8
Stump gangrene	19	20.65
Phantom pain	13	14.1

Diabetic coma	12	13
Wound hematoma	9	9.8
Skin grafting failure	4	4.3
Anemia	3	3.26

Table 5: Polymicrobial growth pattern in DFUs.

Isolated organisms	Total no. (n=15)	Percentage (%)
<i>Staphylococcus aureus</i>	8	53.3
<i>Escherichia coli</i>	6	40
<i>Klebsiella spp</i>	5	33.3
<i>Proteus spp</i>	2	13.3
<i>Pseudomonas aeruginosa</i>	3	20

DISCUSSION

Diabetic foot ulcer is the major problem in worldwide, most common in developing countries than developed one. In the present study, males were more affected than females, which is similar with other studies.¹¹⁻¹³ Most of the patients were belongs to age group of 40-60 years. These findings were comparable with other studies.¹¹⁻¹⁴ Majority of patients were belonging to rural background with 76.86%, similarly reported by other studies.^{11,12} Males were more affected may be due to their smoking and alcoholic habits which were reported as 22.3% and 52.3% respectively. Smoking and drinking alcohol is the two major risk factors to develop diabetic foot ulcer.¹⁵ According to the present study duration of diabetes was much longer in patients with diabetes foot ulcer that may be due to the loss of proper diabetic care. Similar findings were reported by other authors.^{12,16,17} The majority of patients in the present study presented to the surgical department between 4 weeks and 32 weeks of onset of an ulcer. Similar data was showed by other studies.^{11,12} In this present study we used Wagner's classification for grading the foot ulcer.¹⁰ According to Wagner's classification most of the patients were in the severe forms as grades III, IV and V constituted 20.86%, 28% and 22% respectively. According to Alnour AM et al and Mahboob G et al showed comparatively higher incidence range from 42% to 68%.^{18,19} High percentages of advanced foot ulcer also reported by Doumi A, constituted 74%.¹³ In the present study 52.86% DFUs patients were gone through surgical interventions. Among these the rate of lower limb amputation was done in 60% patients, which is higher than the other study reports.^{8,11,18,20-21} The higher amputation rate in the present study could be due to the late presentation and severity of the infection. According to the present study most common postoperative complication was surgical site infection accounting 34.8%.^{11,22} The microbiological findings showed 60% polymicrobial bacterial isolates with *Staphylococcus aureus* and *Escherichia coli* predominating. Similarly reported by other studies.^{11,22} The bacterial isolates in the present study showed multi-drug resistance, except carbapenems group drug showed 100% sensitive to all isolates. Present findings were

comparable with another study done by Chalya PL et al. The multi-drug resistance bacterial isolates from DFUs required immediate surgical intervention. The duration of hospital stay in the present study was between 15-116 days. Another study showed duration of hospital stay was 36.24±12.62 days. The variations of hospital stay due to the availability of facilities in hospital and severity of illness. The rate of mortality in the present study was 9.4%. Another study showed mortality rate 13.2% due DFUs mainly in patients with severe sepsis. The mortality rate can be reduced by proper health care with control sugar level, early presentation in hospital by patients and appropriate antibiotic therapy. The limitations of this present study were patients with diabetic foot ulcers admitted to the surgical ward only included, so there was no data on prevalence of DFUs in this hospital.

CONCLUSION

Diabetic foot ulcer is the major source of morbidity and mortality among diabetes patients. The management of DFUs is the major challenge for surgeon. A good glycemic control, foot care with appropriate foot ware, educate people regarding diabetes control, infection control with proper surgical intervention is needed to reduce the morbidity and mortality rate among diabetic foot ulcer patients.

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