Characteristics of Patients with Diabetic Foot Ulcers and Predictors of Surgical Intervention in Basrah, Southern Iraq

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Abstract

Background: Diabetes mellitus is a diseases of worldwide importance, the incidence and complications of this disease became an increasing problem. In Basrah,southern Iraq, the prevalence of DM is very high . Diabetic foot is a source of significant morbidity and change in quality of life for diabetic patients.

Objectives: To describe the characteristics of sample of patients with diabetic foot ulcer who attended Al Fayha Diabetic Foot Clinic and to evaluate the predictors of surgical intervention needed for treatment of these patients especially for those who are in need for amputation.

Method: A cross sectional descriptive study conducted in Al Fayha Diabetic Foot Clinic, Basrah, Iraq. From January 2018 until July 2019. It included 73 adult patients suffering from diabetic foot ulceration : 29 (39.7%) male patients and 44 (60.3%) female patients.

Results: The mean age was 52.86 years. The study included 71 patients with type 2 diabetes (97.3%) and 2 patients with type 1 diabetes (2.7%).The mean duration of symptoms was approximately one month. More than half of the cases who underwent debridement had wounds of grade 2 (University of Texas Classification) while 88% of cases who underwent amputation had wounds of grade 3. In the group of patients who underwent debridement, 41 cases (85.4%) had moderate infection (IDSA), while for those who underwent amputation, 16 cases (64%) had severe infection and this difference was statistically significant (p value <0.001).

Conclusions: The majority of patients were females (60%),the age group of 50 years and above constitutes more than half of the cases,almost 80% have the disease for more than 10 years,all cases showed evidence of uncontrolled disease. Wound stage (UT Classification) and IDSA severity of wound infection were the predictors for surgical intervention in patients suffering from diabetic foot ulcers in Basrah.

Keywords: *Diabetic foot ulcers, predictors, Basrah, surgical intervention.*

Introduction

Diabetes mellitus (DM) affects around 451 million people worldwide.(1) It continued to be a rising global problem. The incidence of DM is rising and consequently the complications of this disease became an increasing problem. Unfortunately complications end with morbidity and premature death in high proportion of cases. In Basrah, Iraq, the prevalence of DM is very high, about 20% of adult population are affected.(2)

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Diabetic foot ulcers (DFUs) are a quite significant sequel affecting around 25% of diabetic patients[3].

DFUs are defined as non-healing or poorly healing full-thickness wound through the dermis below the ankle in individuals with diabetes for more than three months. DFUs are three types: neuropathic, ischaemic and neuro-ischaemic ulcers.[4]

Peripheral neuropathy, ulceration, infection and peripheral vascular disease are the most important causes for ulcer complication and lower limb amputation in diabetic patients.[5,6]

Diabetic foot must be managed by multidisciplinary team.[7] Proper management of diabetic foot infection should be preceded by proper clinical diagnosis, assessment of severity of infection and wound classification, control of blood sugar, debridement, obtaining adequate specimen for culture, adequate selection of antibiotics, proper timing and selection of surgical intervention with adequate wound care.[8]

Surgical debridement is cutting away of all necrotic tissue, infected material from the wound and a surrounding callus until a healthy bleeding edge is reached . The benefit of surgical debridement is the change of infected ulcer into an acute ulcer .[9,10]

Minor amputation, is amputation at the level of the foot without the need for prosthesis for walking while major amputation is amputation above the level of the ankle.[11,12]

Aims of the Study:

1. To describe the characteristics of sample of patients with diabetic foot ulcer who attended Al Fayha Diabetic Foot Clinic.
2. To evaluate the predictors of surgical intervention needed for treatment of these patients especially for those who are in need for amputation, this can aid in planning of treatment.

Patients and Method

Study Design: This is a cross sectional descriptive study conducted in Al Fayha Diabetic Foot Clinic, Basrah, Iraq. From January 2018 until July 2019. It included 73 adult patients suffering from diabetic foot ulceration:29 (39.7%) were male patients and 44 (60.3%) were female patients .A questionnaire form is completed.It included patients name, age, sex, duration of diabetes, duration of symptoms,previous use of antibiotics. Patients were assessed in three levels : the patient as a whole,the involved limb and local examination of the wound.

Local Examination of the Wound:

1. Diabetic foot wound classification according to University of Texas Classification (four grades and four stages).[13]
2. Evaluation of foot vascularity clinically and by the use of hand hold Doppler.
3. Infected diabetic foot ulcers were diagnosed clinically by presence of features of inflammation, infection severity was evaluated according to Infectious Diseases Society of America (IDSA). [14] Surgeons should keep in mind that systemic signs of inflammation (fever and leukocytosis) are not present even with advanced foot infection.[15,16]

Investigations: All patients had been sent for the following investigations :hemoglobin, random blood sugar, Hb A1c, white blood cells count, renal function test and viral markers of hepatitis B, hepatitis C and HIV. HbA1c $\geq$ 9 is considered as an indicator of poor glycemic control.[17]

Management: The patients admitted to the surgical ward of Al Fayha Hospital. Empirical antibiotics started with control of blood sugar . Surgical debridement has been done in the operating theatre and specimen from the wound has been sent to the laboratory for culture and sensitivity .This was followed by wound care. All patients were followed twice weekly for twelve weeks,then monthly for six months.

Exclusion Criteria: Patients who did not come for regular follow up were excluded.

Statistical Analysis: The results were analyzed by the use of Statistical Package for the Social Sciences (SPSS) version 23 . P-value $\leq$ 0.05 was the statistically significant level.chi-squared test and Fissures exact test were used whenever needed.

Results

Demographics of the Studied Patients: Most of the patients were females 44(60.3%) and tended to increase in proportion with advancing age in both sexes. The percentage in males increased from 13.8 to 37.9% and from 2.3 to 29.5% in females. The bulk of patients in females was in the age group 40-49 (40.9%).

The mean age was 52.86 years (standard deviation 9.059) The study included 71 patients with type 2 diabetes (97.3%) and 2 patients with type 1 diabetes (2.7%) (Table 1).

Table 1: Age and sex distribution of the studied patients

Age (Years)	Male No.%	Female No.%	Total No.%
<40	4 13.8	1 2.3	5 6.8
40-49	5 17.2	18 40.9	23 31.5
50-59	9 31.0	12 27.3	21 28.8
60 & above	11 37.9	13 29.5	24 32.9
Total	29 100.0	44 100.0	73 100.0
Sex composition	29 39.7	44 60.3	73 100.0

Characteristics of diabetes: Table 2 shows a number of characteristics of diabetes patients enrolled in the present study. The chronic status is very clearly indicated by the long duration of the disease. Almost 80% have the disease for more than 10 years. In addition cases showed very unsatisfactory control indicated by the high level of random blood sugar (Almost 94.5% have a level 200 mg/dl or more) and the high values of HbA1C (All cases showed evidence of uncontrolled disease).With respect of diabetic foot, it seems that it is a fairly recent pathology as the duration of symptoms and antibiotic use were both recent events. More than half of the patients delayed asking for doctor advice for 30 days or more.

Table 2: Some characteristics related to diabetes

Characteristic	Number	%
A. Duration of diabetes (Years)		
<10	16	21.9
10-19	45	61.6
20-30	12	16.4
B. Status of Hb A1C at the time of study		
Controlled (3.0-6.9)	0	0.0
Uncontrolled (7.0-8.9)	19	26.0
Very poor control (≥9)	54	74.0
C. Random blood sugar (Mg/dl)		
100-199	4	5.5
200-299	23	31.5
300-399	37	50.7
(≥400	9	12.3
D. Duration of symptoms before consultation (Days)		
<10	4	5.5
10-19	23	31.5
20-29	6	8.2
≥ 30	40	54.8
E. Duration of use of antibiotics before consultation (Days)		
None	20	27.4
<10	3	4.1
10-19	34	46.6
≥20	16	21.9
Total	**73**	**100.0**

Predictors of surgical management: Three types of surgical management were done to patients; debridement, minor amputation and major amputation. We attempted to use selected demographic and clinical characteristics to predict which patient needed debridement only and which patient needed amputation.

The mean age of both groups was comparable. Most patients who underwent debridement were females (30 cases), while there was no sex difference for those cases who underwent amputation. The mean duration of diabetes for both groups was approximately 12 years.

The mean duration of symptoms was approximately one month in both groups. Regarding wound grade (UT Classification), more than half of the cases who underwent debridement had wounds of grade 2 while 88% of cases who underwent amputation had wounds of grade 3.

In the group of patients who underwent debridement, 41 cases (85.4%) had moderate infection (IDSA), while for those who underwent amputation, 16 cases (64%) had severe infection and this difference was statistically significant (p value <0.001) (Tables 3).

Table 3: Univariate analysis: Association of type of management and selected variables

Characteristics	Patients undergone debridement only No.%	Patients underwent amputation No.%	Total No.%	P value
Age (Years)	53.2	52.3		0.184
Sex				
Male	18 (37.5%)	11 (44%)	29 (39.7%)	0.385
Female	30 (62.5%)	14 (56%)	44 (60.3%)	
Mean Duration of diabetes (Years)	12.8	12.2		0.92
Mean Duration of symptoms (Days)	35.3	34.2		0.22
Wound Grade (UT Classification)*				
Grade 2	27 (56.3%)	3 (12%)	30 (41.1%)	<0.001
Grade 3	21 (43.8%)	22 (88%)	43 (58.9%)	
Wound Stage (UT Classification)*				
B	48 (100%)	21 (84%)	69 (94.5%)	0.01
D	0 (0%)	4 (16%)	4 (5.5%)	
IDSA				
Mild	2 (4.2%)	0 (0%)	2 (2.7%)	<0.001
Moderate	41 (85.4%)	9 (36%)	50 (68.5%)	
Severe	5 (10.4%)	16 (64%)	21 (28.8%)	
Total	48 (65.8%)	25 (34.2%)	73 (100%)	

*University of Texas Classification

Multivariate analysis: Logistic regression:

Predictors of Amputation: To predict independent and significant predictors of surgical intervention (amputation), a logistic regression analyses were done and the results are shown in Tables 4 and 5. Three variables (wound stage, wound grade and random blood sugar) were independently significant predictors of surgical intervention in patients with diabetic foot .All other variables (age, sex, HbA1c, duration of diabetes, presence of ulcer, etc…) could not predict this outcome.

Table 4: Predictors of Amputation

Variable	B	t	P value	Confidence Interval	
				Lower	Upper
Wound Stage	0.49	3.834	0.000	o.235	0.744
Wound Grade	0.403	3.411	0.001	0.167	0.639
Random Blood Sugar	0.002	2.174	0.033	0.000	0.003

However, when we introduced IDSA in addition to other variables, only IDSA and stage of the wound were significant predictors (table 5). All other variables (random blood sugar and wound grade) either lost their prediction or they were not predictors from the start.

Table 5: Predictors of Amputation

Variable	B	t	P value	Confidence Interval	
				Lower	Upper
IDSA	0.597	5.455	0.000	0.379	0.815
Wound Stage	0.429	3.588	0.001	0.190	0.667

Discussion

The prevalence of diabetes in Iraq is increasing.[18] Diabetic foot is a source of significant morbidity and change in quality of life for diabetic patients,their limbs carries 15-40% higher risk of amputation in comparison to non-diabetic patients.[19] Furthermore, major amputation leads to limited daily activity of the patient.[20]

In the study of Zameer Aziz et at which was done in Singapore in 2005 on 100 patients with diabetic foot infection, the mean age of the patients was 59.8 years with male: female ratio 1:1,they concluded that risk factors for lower limb loss were: gangrene of the foot, ankle brachial index ≤0.8,WBC ≥ 15x 10^{9}/L and hemoglobin ≤ 10.0 g/dl.[21]

In a study done in Brazil by dos Santos et al from March 1999- November 2001, included 99 patients with diabetic foot infection. Most of the patients were males (69.7%), the mean age was 60.2 years, they found that risk factors for major amputation were: age, ascending lymphangitis, calcaneal lesions, Wagner grade 5 lesions, arterial insufficiency, diabetes duration and Gram positive microorganisms in culture.[22]

In a study done by Miyajima et al in Japan between July 1997 – August 2003,they studied 210 patients with diabetic foot lesions, amputation was performed in 52% of cases, the mean age was 64.2 years, they found three independent risk factors for major amputation :multiple arterial stenosis, hemodialysis and HbA1c. While Pemayun et al in a study conducted in Indonesia between January 2012 to December 2014, they concluded in addition to peripheral arterial disease and HbA1c, hypertriglyceridemia and hypertension are predictors of lower extremity amputation.[23]

In the present study, some different findings are identified, younger age, higher proportion of female patients and the predictors of amputations were also somewhat different. The differences could be due to methodological issues, mix of patients and level of control of diabetes mellitus.

Conclusions

1. Characteristics of the studied patients with diabetic foot ulcers were as follows:
   A. The majority of patients were females (60%).
   B. The age group of 50 years and above constitutes more than half of the cases.
   C. Almost 80% have the disease for more than 10 years.
   D. All cases showed evidence of uncontrolled disease.
2. Wound stage (UT Classification) and IDSA severity of wound infection are the predictors for surgical intervention in patients suffering from diabetic foot ulcers in Basrah.

Statement of ethics: Verbal and written informed consent obtained from all patients included in this study. Ethical approval obtained from research ethics committee of Basrah Directory of Health.

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