Original Article

The Outcome and cost of Hospital Management of Diabetic's Foot in Khartoum Main Hospitals In Period from November 2018 to November 2019

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Abstract:

Background: Diabetic foot ulcer is a major complication of diabetes with a high mortality and morbidity and now the most common cause of diabetic related hospitalization and disabling problem leading to amputation of the leg. Objectives: This study aimed to study effective management and outcome of diabetic's foot in Khartoum main hospitals. **Patients and Methods:** This was observational, prospective, cross sectional, hospital based study of 133 diabetic patients subjected to hospital management of diabetic foot in five main hospitals at Khartoum State in the period from November 2018 to November 2019.

Results: Male to female ratio was 1.9: 1. The mean age of the patients was 53.6±14.0 years, with mean duration of diabetes 11.6±8.3 years. Surgical management performed for130 patients, 65 (50%) had major amputation, 46(35.4%) debridement and 19(14.6%) minor amputation, deaths rate were 18(13.5%) in our patients. There was significant association between complications of diabetes ketoacidosis and hypertension related to major amputation and death ($P < 0.05$).

Conclusion: In patient with diabetic foot ulcer in main Khartoum hospitals associated with high rate of major amputation, mortality, long hospital stay and high cost. Diabetic limb ischemia was major risk factor for major limb amputation. There significant association between diabetic ketoacidosis and hypertension related to major amputation and death.

Key words: Diabetic foot, diabetes, cost

Introduction:

Diabetes affects approximately 3.9% of urban population in Sudan. Diabetic patients comprise about 3.3% of the surgical load in Hospitals. It is well known that diabetes carries significant rate of morbidities and increases the cost of management both for the individual patients and the health authorities. Foot complications, especially foot ulcer constitute a major public health problem for diabetic patient in sub-Saharan Africa, and are important causes for prolonged hospital admission, and more frequent precursor to amputation, and death of patients from this part of the continent. More than half of all limb amputations are carried out in patients with diabetes mellitus. Amputation is preceded by a foot ulcer progressing to deep gangrenous infection; most of these ulcers are caused by minor trauma, frequently as a result of poorly fitting foot wear or inadequate foot care[(i)].

The most common cause of hospitalization of diabetic patients is soft-tissue and bone infections involving the foot. Mild or superficial infections can be treated in the outpatient setting by oral antimicrobial agents and by avoidance of further irritation. Although many patients with severe infections are hospitalized and treated with intravenous antimicrobial therapy, the final outcome is frequently prolonged immobilization or loss of the limb. Diabetes mellitus is the leading cause of lower-extremity amputation and accounts for about one-half of, all non-trauma- related amputations in the United States. The rate of lower-extremity amputation among diabetics is 17-40 times greater than that among non diabetics. Reported risk factors for lower-extremity amputation include non-healing ulcers, infection, advanced age, male sex, black race, and a history of smoking. Additional risk factors of amputation for patients with diabetic foot infection such as insufficient lower-extremity circulation, decreased ankle-arm blood pressure index, low levels of high- density lipoprotein sub fraction, and lack of previous

education on outpatient care for diabetes[ii].

Appropriate antibiotic therapy of a diabetic foot infection usually requires culturing the wound and performing sensitivity testing on isolated pathogens. The accuracy of a wound culture depends on obtaining an appropriate specimen. This requires careful attention to sterile technique as well as selection of the optimal portion of the wound for sampling. Before collecting a culture specimen, the wound should be derided of all necrotic material and mechanically cleansed. Three methods commonly used for obtaining foot culture samples are swabbing, needle aspiration and wound biopsy. Deep tissue specimens generally are considered to provide the most reliable culture samples in diabetic foot ulcers. One study compared culture specimens obtained by methods that minimize the likelihood of contamination[iii].

Diabetes remains a major cause of mortality and morbidity and is increasing in prevalence at an alarming rate. Chronic complications of diabetes, especially cardiovascular disease, result in hospitalization in many patients with diabetes. In addition, diabetic patients stay in the hospital on average 1 to 3 days longer than patients without diabetes. The exact prevalence of diabetes among hospitalized patients is not known. However, in the year 2000, 12.4% of hospital discharges in the United States listed diabetes as a diagnosis. Among cardiac surgery patients, the prevalence of diabetes is as high as 29%. In a retrospective review of 2,030 consecutive hospital admissions, Umpires et al found that 718 (38%) of the 1,886 patients who had blood glucose measurements recorded in their charts had hyperglycemia. Of the patients with hyperglycemia, 495 had a known history of diabetes, but the other 223 did not. Of interest is that the patients with newly diagnosed hyperglycemia were more likely to require admission to the intensive care unit, had longer hospital stays, and were less likely to be discharged straight home[iv].

Patients with diabetes are particularly susceptible to foot infection primarily because of neuropathy, vascular insufficiency, and diminished neutrophil function. Peripheral neuropathy has a central role in the development of a foot infection and it occurs in about 30 to 50 percent of patients with diabetes. Patients with diabetes lose the protective sensations for temperature and pain, impairing awareness of trauma such as abrasions ,blistering, or penetrating foreign body. Motor neuropathy can result in foot deformities (e.g., claw toe) that contribute to local pressure from footwear, making skin ulceration even more likely. Once the skin is broken (typically on the plantar surface), the underlying tissues are exposed to colonization by pathogenic organisms. The resulting wound infection may begin superficially, but with delay in treatment and impaired body defense mechanisms caused by neutrophil dysfunction and vascular insufficiency, it can spread to the contiguous subcutaneous tissues and to deep structures. Although most diabetic foot infections begin with an ulcer, localized cellulitis and necrotizing fasciitis can develop in the absence of an ulcer or traumatic injury[(v)]. Diabetic septic foot is major leading cause of limb amputation and handicap worldwide. Hospital management of DF needed mainly for short control of diabetes and infection and complicated cases. Our study performed to detect the outcome of hospital management of DF in Khartoum governmental hospitals in the period from November 2018 to November 2019.

Patients and Methods:

Observational prospective, cross sectional, hospital based study. The study was conducted at Khartoum main hospitals including Omdurman, Khartoum North and Ibraheum Malik, Omdurman Military and Bashir university hospitals. The study was conducted during the period from November 2018 to November 2019. The study sample included 133 patients was received hospital treatment for diabetic foot. Data was collected using a questionnaire, about age, sex, diabetes information, hospital management of diabetic septic foot, complications, final outcome and cost of hospital stay. Data was analyzed by using a computer program Statistical Package for Social Sciences (SPSS). Chi squire test was used to test the relations between the variables with P value considered significant < 0.05. T test was used to calculate mean values of hospital stay, cost and age. Consent was obtained from the patients and ethical clearance was obtained from ethical committee of Sudan Medical Specialization Board.

Results:

Male to female ratio was 1.9: 1. Patients with Non-IDDM were 68(51.1%) and with IDDM were 65(48.9%). The mean age of the patients was 53.6±14.0 years. The duration of hospital stay was 7-14 days in 58(43.6%) of the patients, less than 7 days 43(32.4%), between 15 – 21 days 20(15%), between 22 – 28 days 6(4.5%) and more than 28 days 6(4.5%) (Figure 1). The mean duration of hospital stay was 11.3±10.1 days. Regarding types of hospital management all of the patients received IV antibiotics and insulin injection and surgical management performed for 130(97.7%) of the patients (Table 1). The range of cost of hospital stay (whole duration) was 5000 – 10000 SDG in 53(39.8%) of the patients, followed by 1000 – 5000 SDG 46(34.6%), 11000 – 15000 SDG 15(11.3%), above 15000 SDG 15(11.3%) and less than 1000 SDG 4(3%) (Table 2). The mean value of cost of hospital stay for whole duration was 8257.3±944.8 SDG. The mean values of cost in relation to final outcome came as follow: 8855.0, 6242.7, 6798.2, 9577.0, 44110.0, and 11448.9 in healed patients, discharged on outpatient, minor amputation, major amputation, loss of follow up and death respectively (Table 3). Significant association found between prescription of antibiotic without culture sensitivity and some poor outcome, which appeared in 38(56.7%) and 13(19.4%) of the patients with major amputation and death cases respectively (P value = 0.01 < 0.05) (Table 4).

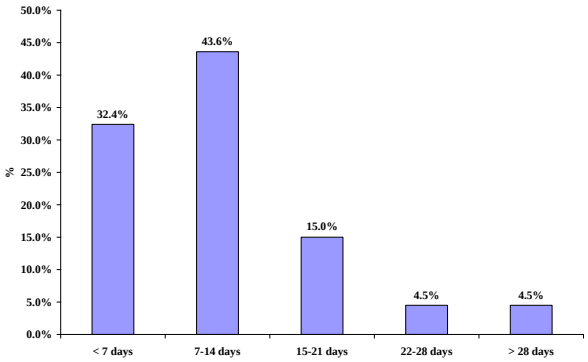

Figure (1): Distribution of the patients with diabetic foot according to duration of hospital stay

Table (1): Distribution of the patients with diabetic foot according to type of management received in the hospital

Type of management	Yes		No	
	N	%	N	%
IV antibiotics	133	100.0	0	0.0
Insulin injection	133	100.0	0	0.0
Surgical intervention	130	97.7	1	0.8

Table (2): Distribution of the patients with diabetic foot according to cost of hospital stay

Cost per whole duration of hospital stay	N	%
< 1000 SDG	4	3.0
1000 - 5000 SDG	46	34.6
5000 - 10000 SDG	53	39.8
11000 - 15000 SDG	15	11.3
> 15000 SDG	15	11.3
Total	133	100.0

Table (3): Distribution of the patients with diabetic foot according to mean cost of hospital stay in relation to final outcome

Final outcome	Mean	±SD
Healing	8855.0	217.8
Discharged on outpatient dressing	6242.7	674.1
Minor amputation	6798.2	657.8
Major amputation	9577.0	140.2
Loss of follow up	4110.0	794.2
Death	11448.9	6456.2

Table (4): Distribution of the patients with diabetic foot according to performance of culture sensitivity in relation to amputation and death

Amputation and death	Antibiotics given according to CS			
	Yes		No	
	N	%	N	%
Minor amputation	1	7.1	16	23.9
Major amputation	8	57.1	38	56.7
Death	5	35.7	13	19.4
Total	14	100.0	67	100.0

P value = 0.01 < 0.05

DISCUSSION

In this study 133 diabetic patients underwent management of diabetic foot at 5 main hospitals in Khartoum State participated to assess management and outcome of diabetic's foot. Male to female ratio was 1.9: 1. The mean age of the patients was 53.6±14.0 years, with mean duration of diabetes 11.6±8.3 years. This is similar to El Bushra[vi] studied the magnitude, presentations and outcomes of diabetic septic foot lesions in El Obeid, Western. There were 55 males and 26 females. The mean age was 56.81 years ± SD 12. Also Fawzy et al[vii] prospective study was conducted at researchers' area "Northern area of Saudi Arabia" to determine the factors associated with diabetic foot (DF) among T2DM patients. Two hundred T2DM patients with/without DF (n = 100 for each group) were recruited. In total, the mean (SD) age of participants was 56 (± 12.2) years and nearly 70% of the patients were females. Moreover, Pemaym and Naibaho[viii] in a study attempted to determine the disease burden in terms of clinical profile and outcome of diabetic foot ulcer (DFU) admissions at a tertiary care hospital in a developing country. Foot problems accounted for 16.2% of total diabetic

admission ($n = 1429$). All patients had type 2 diabetes with no gender predominance. The mean age was 54.3 ± 8.6 years.

In our study all of the patients received IV antibiotics injection including Samixon(Ceftriaxon), Flagyl(Metronidazole), Maxil, Fortum and Cefizox. In the majority of the patients 114(85.7%) the antibiotics were prescribed without culture sensitivity, this procedure done for 19(14.3%) of the patients. Similar to Wahab et al[(ix)] study in Jabir Abueliz Diabetic Center Khartoum, among diabetic patients with diabetic foot culture done for 302 out of 3620. All patients took antibiotics. Ceftriaxone and ciprofloxacin were the most used drugs.

On the other hand, 130 patients underwent surgical management, of them 65(50%) underwent major amputation, 46(35.4%) debridement and 19(14.6%) minor amputation. This is the same as concluded by El Bushra[6] in El Obeid, Western Sudan reported 20 patients ended with major lower limb amputations (24.7%) and 23 others had minor toe amputations (28.4%).

The study showed that the mean duration of hospital stay was 11.3±10.1 days and the mean cost of hospital stays for whole duration was 8257.3±944.8 SDG. On the other hand mean values in relation to final outcome came as follow: 8855.0, 6242.7, 6798.2, 9577.0, 44110.0, and 11448.9 in healed patients, discharged on outpatient, minor amputation, major amputation, loss of follow up and death respectively. This is comparable to SaadEldein, et al[(x)] study among patients with diabetic foot admitted to Wad Medani Teaching Hospital reported that the mean hospital stay was 13.3±15.6 days, after three months of follow up (32.1%) were cured without amputation, (1.3%) had recurrence and (10.7%) had persistent ulcers. Muhammad et al[(xi)]estimated cost of illness among patients with diabetic foot ulcer in northwestern Nigeria. Majority of the patients were males with the mean age of 59.3±15.1 yrs. About 60% of the patients earn less than $100 monthly. The total cost of illness of diabetic foot ulcer was estimated at

$140,735.56 (median=$1381.55[IQR 1002.42-]). Direct cost of illness was $107,797.06 (median=$1023.27[IQR 773.93–1568]), while the indirect cost was $32,938.49 (median=$209.90[IQR 128.74–357.08]). Out of pocket payment accounted for 90% of the payment. Cavanagh et al[(xii)] study in 5 different counties reported that there were marked differences in the treatment plans between countries based on the availability of resources and the realities of local conditions. The costs of treatment for case 1 ranged from Int$102 to Int$3959 in Tanzania and in the United States, respectively. The cost for case 2 ranged from Int$3060 to Int$188 645 in Tanzania and in the United States, respectively. The cost burden to the patient varied from the equivalent of 6 days of average income in the United States for case 1 to 5.7 years of average annual income for case 2 in India. Although these findings do not take cost-effectiveness into account, they highlight the dramatic economic burden of a DFU for patients in some countries.

Regarding the final outcome in terms of major amputation and death, 46(34.6%) with major amputation and deaths were 18(13.5%). These in turn significantly associated with complications of diabetes ketoacidosis and co-morbidity of hypertension (P value < 0.05). This is similar to Adam et al[(xiii)] reported that major lower limb amputation and mortality were 19.2%, and 6.7% respectively. Pemaym and Naibaho[(xiv)] found that a total of 98 (36.3%) lower extremity amputations (LEAs) at various level of the foot were carried out, including major LEA in 24 patients and multiple amputations in seven patients. Mortality rate due to DFU reached 10.7%.

Conclusion:

In patient with diabetic foot ulcer in main Khartoum hospitals associated with high rate of major amputation, mortality, long hospital stay and high cost .diabetic limb ischemia was major risk factor for major limb amputation. There was significant association between diabetic ketoacidosis and hypertension related to major amputation and death.

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