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RESEARCH PAPER

THE BURDEN OF DIABETIC FOOT ULCERS IN ABA, ABIA STATE, NIGERIA

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ABSTRACT

The aim of this study is to determine the burden of diabetic foot ulcers (DFU) and to assess the relative associations with some precipitating factors. Subjects for this study were diabetic patients with foot ulcers/gangrene. Their case files were retrieved and information obtained with regards to age, sex, duration of diabetes mellitus (DM), precipitating factors of diabetic foot ulcers, length of hospitalization and outcome of the ulcer/gangrene. Investigations done included wound/urine microscopy, culture, and sensitivity. The data obtained were analyzed using the statistical package for social sciences (SPSS). The student t-test was used and $p \leq 0.05$ was considered as statistically significant. The results showed a male preponderance in the ratio of 1.9:1 and a mean age of 54.9 years $\pm$6.5. The mean DM duration was 7.8 years, mean length of hospitalization was31.6days$\pm$ 8.6, while the prevalence of amputation was 24.3%. DFU was more prevalent among subjects in the 51-60 years age group and among males than females ($p \leq 0.05$). Amputation appears to be significantly associated with precipitating/risk factors of DFU. Thus, good foot hygiene, provision of specialist foot wear and prompt treatment of DFUs are strongly encouraged to reduce the increasing prevalence of handicapped diabetics in our society.

Key words: Diabetic burden, Foot ulcers, Aba, Nigerians.

INTRODUCTION

Diabetes Mellitus (DM) is one of the leading causes of non-traumatic lower extremity amputations worldwide (Boulton, 2001, Reiber et al; 1988, Humphrey et al; 1996, Moses and Klein, 1992, Eregie and Edo, 2008). Persons with DM are prone to foot/leg ulcerations consequent upon interplay of factors such as peripheral sensory neuropathy, vascular disease, and foot deformity in the face of trauma, which may be imperceptible and unintentional (Eregie and Edo, 2008, Percoraro et al; 1994). This combination of ischaemia and neuropathy set the stage for pressure necrosis, ulceration, infection and gangrene (Logerto et al; 1992). Globally, diabetic foot lesions constitute a major medical and socio-economic burden, contributing to DM morbidity and mortality and also prolonged hospitalisation (Ngwogu et al; 2012, Ramsey et al, 1999, Adetuyibi, 1970, Dagogo-Jack, 1991, Benbow and Gill, 1998, Ehusani et al; 1999). Prevalence rates of DM foot/leg lesions vary widely from 1.4% in the United Kingdom, to 4-10% in the United State of America and 0.9-8.3% in Nigeria (Boulton, 2001, Ngwogu et al; 2012, Dagogo-Jack, 1991, Kumar et al; 1994, Osuntokun et al; 1971, Akanji and Adetuyibi, 1990).

Major increase in mortality among diabetic patients, observed over the past 20 years is considered to be due to the development of macro and micro vascular complications, including failure of the wound healing process. Wound healing is an innate mechanism of action that works reliably most of the time. A key feature of wound healing is stepwise repair of lost extra cellular matrix (ECM) that forms the largest component of the dermal skin layer (Iakovos et al; 2006). Controlled and accurate rebuilding is essential to avoid under-or over-healing that may lead to

various abnormalities. Diabetes mellitus is one such metabolic disorder that impedes the normal steps of the wound healing process. Many histopathological studies show a prolonged inflammatory phase in diabetic wounds, which causes a delay in the formation of mature granulation tissue and parallel reduction in would tensile strength (Mc Lennan et al., 2000).

Diabetic foot gangrene is a major public health problem in the tropics (Ward, 1982, Ngwogu et al; 2012). Public enlightenment on its aetiology (precipitating factors), diagnosis and early management is necessary. Unless this fact is appreciated, severe diabetic foot gangrene with a life threatening limb will continue to result in high mortality and major amputations in order to spare life (Osisioma and Onuminya, 1992).

The economic burden of DFU in Nigeria is enormous (Ehusani et al., 1999, Ogbera and Ohwovoriole, 2013). Many diabetic patients with foot ulcers/gangrene resist orthodox treatment and may sign against medical advice only to reappear in hospital much later in a worse clinical condition when life is seriously threatened and amputation becomes inevitable (Ngwogu et al., 2012). When amputation involves the bread winner, the family is crippled. Facilities for rehabilitation of diabetic amputees are scarce in our locality. It is therefore necessary to identify the precipitating factors of DFU and its terminal outcome of amputation with a view towards instituting appropriate preventive measures and ultimately reducing DM morbidity and mortality.

MATERIALS AND METHODS

Study duration and protocol: This was a four year retrospective study of all diabetic patients with foot ulcer/gangrene seen at the Accident and Emergency Department, Diabetic Clinic, and the Surgical Outpatient Department of the Abia State University Teaching Hospital (ABSUTH), Aba, from January 2009 to December 2012, after approval by the ethics committee of the hospital.

Participants: One hundred and seven (107) diabetic patients with foot ulcer/gangrene were involved in the study.

Study procedure: Case files of all patients with an admission diagnosis of diabetic foot ulcer/gangrene were used for this study. The files were retrieved and information obtained with regard to ages, sex, duration of DM, precipitating factors of DFU, length of hospitalization and outcome of the ulcer/gangrene. Investigations done on the patients included wound and urine microscopy, culture and sensitivity.

Statistical Analysis: Data analysis was done using the SPSS version 10. Comparison of mean was done using the student t-test. The level of statistical significance was taken as $p \leq 0.05$.

RESULTS

A total of 107 diabetic patients with foot ulcers/gangrene were studied. There were 71(66.3%) males and 36 (33.6%) females, with a male preponderance in the ratio of 1.9:1. The mean age was 54.9 $\pm$ 5.6 years, mean DM duration was 6.8 $\pm$ 3.7 years. The mean length of stay in the hospital was 28.6 $\pm$ 6.7 days while the number of amputees was 26(24.3%).

Table 1: Age distribution of patients with DFU

Age	Males	Females	Total (%) N = 107
<20	0	0	0
20-29	4	2	6 (5.6)
30-39	7	4	11 (10.3)
40-49	13	6	19 (17.7)
50-59	22	10	32 (29.9)
60-69	15	5	22 (20.5)
70-79	7	6	13 (12.1)
80-89	3	1	4 (3.7)
Total	71	36	107 (100.0)

Figure 1 show the ages and sex distribution of the patients. The ages ranged from 28 to 88years. The highest proportion of admission was in the 51-60 years age group (32%), followed by 61-70 years group (22%). There was a progressive increase in the number of admissions with each increasing age group, up to the 51-60 years age group, and a progressive decline thereafter.

Figure 2 shows the frequency of occurrence of the identified precipitating factors of DFU in this study. Spontaneous blisters accounted for 51.0% of cases, puncture injuries 19.3%, burns/scalds 5.4%, trauma 11.8%, ill-fitting foot wear 6.2%, Tinea pedis (fungal infection) 5.1% and rat bite 1.6%. The micro organisms isolated from the ulcer included Escherichia Coli (Coliforms) (6O%), Staphyloccocus aureas(30%) and Klebsiella(10%).

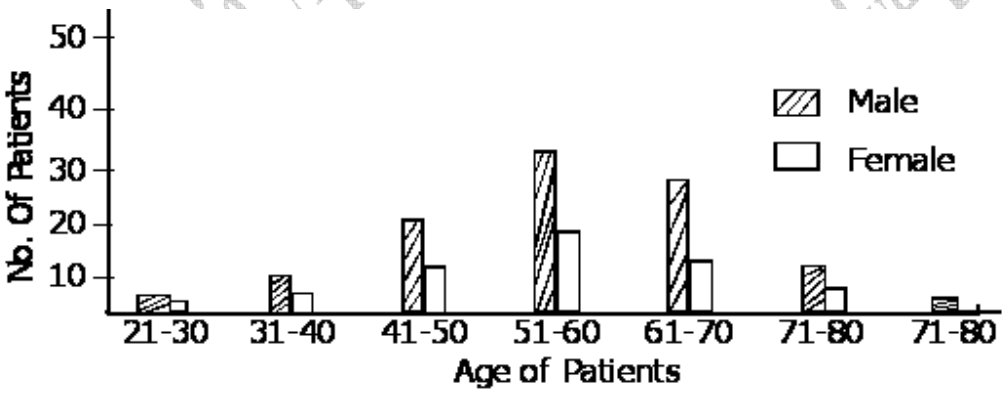

Figure. 1 Age and sex distribution of the sampled DFU patients

Table 2: Frequency of occurrence of the identified precipitating factors of DFU

Sex	No. of Amputees	Total (%) N = 107
Male	18	16.8
Female	8	7.4

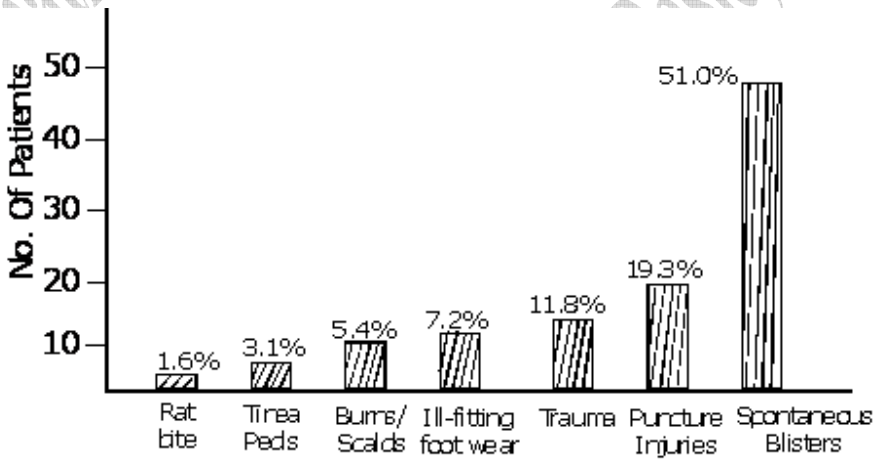

Figure 2. Precipitating events of DFU in the sampled patients

DISCUSSION

The results of this study confirms the observation that diabetic foot complications are the most common cause of non traumatic lower extremity amputations in the industrialized world (Lavery et al., 1996). In fact, the risk of lower extremity amputations is 15 to 46 times higher in diabetics than in persons who do not have diabetes mellitus (DM) (Armstrong et al., 1997). In other words, diabetic foot ulcer (DFU) remains a major complication of DM, and probably the major component of the diabetic foot; occurring in 15 percent of all patients with diabetes and precedes 84 percent of all lower leg amputations in United States (Brem and Tomic–Cank, 2007).

In Nigeria, diabetic foot lesions are indeed, the major causes of morbidity and mortality among diabetics (Dagogo-Jack, 1991; Ehusani et al; 1999, Akanji and Adetuyibi, 1990, Umebese and Ogbemudia, 1998). Obviously, the mean age of affected patients, as well as the male preponderance and the predominance of type 2 DM, are all similar to the figures stated previous reports (Eregie and Edo, 2008, Ehusani et al; 1999, Akanji and Adetuyibi, 1990, Boyko et al, 1999); suggesting that the male preponderance in this study, may decrease family income since they are the major bread winners.

Comparatively, spontaneous blisters and puncture injuries were the commonest precipitating factors observed in this study, and this is similar to that reported by Ogbera (2002). But, unlike the reports by Eregie and Edo, (2008) in which 14.3% of DFU was precipidated by burns/scalds, our findings showed that only a small number (5.4%) of DFU was precipidated by burns/scalds, as previously reported by Dagogo-Jack (1991), Akanji and Adetuyibi (1990). In addition, unlike the reports by Eregie and Edo (2008), in which 2% of DFU was precipidated by tinea pedis (fungal infection), a larger number of DFU observed in this study was precipidated by tinea pedis. Of interest also, is the fact that two case of DFU recorded in this study was precipidated by rat bite as similarly reported by Eregie and Edo (2008) and Dagogo-Jack (1991). Thus, there is indeed a need to ensure that education on personal hygiene and care of the environment is included in all health talks to diabetic patients, in order to avoid similar occurrence in the future (Eregie and Edo, 2008).

On the other hand, the observed mean length of hospitalization for the diabetic patients in this study (31.6±8.6) and the number of amputees (26; 24.3%) is considered high. This is a great economic burden as most men are becoming handicapped and can no longer carter for their families. Another significant observation that was the most frequent reason for diabetic patients' hospitalization in this study is foot complications, which has been reported to account for up to 25 percent of all diabetic admissions in the United States and Great Britain (Gibbons and Eliopoules, 1984, Pecoraro et al., 1990, Reiber et al., 1992).

Furthermore, our findings indicate that the vast majority of diabetic foot complications resulted in amputation begin with the formation of skin ulcers. Undoubtedly, early detection and appropriate treatment of these ulcers may prevent up to 85 percent amputations (NIH, 1987, Edmonds, 1987). Family physicians have an integral role in ensuring that patients with diabetes receive early and optimal care for skin ulcers. Unfortunately, several studies (Wylie-Rosset et al., 1995, Bailey et al., 1985), have found that primary care physicians infrequently perform foot examination in diabetic patients during routine office visits. The feet of hospitalized diabetics may also be inadequately evaluated (Edelson et al., 1996). Careful inspection of the diabetic foot on a regular basis is one of the easiest, least expensive and most effective measures for preventing foot complications. Appropriate care of the diabetic foot requires recognition of the most common risk factors for limb loss. Many of these risk factors can be identified based on specific aspects of the history and a brief but systematic examination of the foot.

Available evidence shows that the common risk factors for amputation of the diabetic foot include peripheral neuropathy, structural foot deformity, ulceration, infection and peripheral vascular disease (Pecoraro et al; 1990). Risk factors implicated in the development of DFU include diabetic neuropathy, peripheral vascular disease, cigarette smoking, poor glycaemic control, previous foot ulcerations and amputations, diabetic nephropathy, and ischaemia of small and large blood vessels (WU et al; 2007). Diabetic patients often suffer from diabetic neuropathy due to several metabolic and neurovascular factors. Peripheral neuropathy causes loss of pain or feeling in the toes, feet, legs and arms due to distal nerve damage and low blood flow. This complication occurs in up to 58 percent of patients with long standing disease (Harati, 1994) and in more than 82 percent of patients with foot wounds (Pecoraro et al; 1990). Also, peripheral arterial occlusive disease of the foot/leg which is worsened by smoking, hypertension and hyperlipidaemia, is four times more prevalent in diabetics than in non-diabetics (Kannel and Mc Gee, 1979). Such arterial occlusion typically involves the tibial and peroneal arteries but spares the dorsalis pedis artery (Logerfo and Coffman, 1984).

By and large, DFUs require multi disciplinary assessment, usually by diabetic specialists and surgeons. Frequent chiropody review, good foot hygiene, use of diabetic socks and shoes, as well as avoiding injuries has also been suggested. Most importantly, foot-care educators combined with increased surveillance can as well reduce the incidence of serious foot ulcers (Litzelman et al., 1993). In Particular, special footwear should be used by DM patients with prior ulcer, foot deformities or neuropathy as has been acknowledged by the American National Institute for Health and Clinical excellence (NIH, 2003).

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AUTHOR(S) CONTRIBUTION

Ngwogu K. O, Umez-Emeana E.C, and Ngwogu A.C. contributed to the successful completion of this study. Their carrier background played important roles.