EVALUATION OF DIFFERENT DIABETIC FOOT ULCER GRADES

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ABSTRACT
Diabetic Foot Ulcer subjects (DFUS) were clinically examined in the urban areas of Karachi. There is a diverse range of risk factors responsible for causing foot ulcers in diabetics, like neuropathy, peripheral vascular disease, foot deformity and improperly fitted shoes can make a diabetic person at risk of foot ulcer. In the present study two groups of subjects were investigated, one is diabetic foot ulcer subjects (DFUS) and other is normal diabetic patients (NDP). A total of randomly selected subjects N= 59; male=33, female=26 (DFUS: n=41; male=22, female=19; NDP: n=18; male=11, female=7). In this study we took into account the “International Consensus on the Diabetic Foot classification of foot wound infections” in order to divide the subjects into 4 different grades. Grade 1 having no symptoms was taken as control. NDP were included in this grade. While DFUS were placed in grade 2-4, categorized according to their level of symptoms severity. The study had shown that most patients were suffering from grade 3 DFU, out of which 33% were males and 42% were females; grade 2 was found among 24% males and 27% females. Grade 4 was found among 9% males and 4% females.

KEYWORDS
Diabetic Foot Ulcer subjects, neuropathy, normal diabetic patients, International Consensus on the Diabetic Foot classification of foot wound infections, grade, symptoms.

INTRODUCTION
The triad of neuropathy, deformity, and trauma is present in almost two-thirds or patients with foot ulcers (Boulton, 2004). Ill-fitting shoes are a common mechanism for the pathogenesis of foot ulcerations and pain. (Most, 1989). When diabetic patients also have peripheral arterial disease, their capillaries become fragile. Fragile capillaries can be subject to micro-hemorrhages, which could be the reason that infection spreads through the tissues (Lavery, 2008). It was abundantly apparent that the actual cause of the perforating ulcer was peripheral nerve degeneration and that diabetes itself played an active part in the causation of the perforating ulcer (Younger, 1998; Zacur, 2002). Infection of the foot in diabetic patients presents a severe threat to the affected limb and should be evaluated and treated without delay (Armstrong, 1998; Sorensen, 2002). Infection is diagnosed by the presence of signs and symptoms of inflammation, but these may be blunted by neuropathy or ischemia, and systemic findings (e.g., fever, increased white blood count) are often absent. (Pecoraro, 1990). Infections should be classified as mild (superficial with nominal cellulitis), moderate (deeper or more extensive), or severe (accompanied by systemic signs of sepsis). If not properly treated, infection can spread to underlying tissues, including the bone. Mild (superficial and limited) infection is usually caused by aerobic Gram-positive cocci, especially Staphylococcus aureus. Chronic infections and infections that are more severe are often polymicrobial with aerobic Gram-negative rods and anaerobes (Bakker, 2012).

Different types of infections occurring in DFUS like superficial infections occupy tissue layers above the superficial fascia and present in the form of acute bacterial cellulitis. Deep infections occupy the superficial fascia, muscles or bones and joints. Cellulitis is a bacterial infection of the subdermis (Reiber, 1999). Necrosis occurring as necrotizing cellulitis which is characterized by tissue necrosis of the subdermis and then the dermis. Necrotizing fasciitis corresponds to involvement of the superficial fascia, presenting in the form of sloughing of the skin and a violaceous color of the integument without pus or abscess (Reddy, 1989). Rapid deterioration of the general status, development of renal failure, sudden extension of the lesions, cutaneous sensory loss and the presence of skin detachment constitute warning signs of necrotizing fasciitis. Regarding the prevalence foot complications are exceedingly common with an estimation that more than 5% of diabetic patients will have a history of foot ulcers whilst the increasing lifetime risk of foot ulceration may be as high as 25% (Singh, 2005; Steed, 2008). While in Pakistan there will be an estimated 248000 new DFU patients each year and estimated national annual cost of ulcer management is 6.9 billion rupees (50 million pounds) (Ali, 2008). The aim of present study is to divide diabetic patients in different grades with the view to examine diabetic foot ulcer and its severity.

MATERIAL AND METHODS

Subjects
A total of N=59 diabetic patients were selected to participate in the study. Male and female both are include, having ages between 35-81 years.

Clinical protocol
The research was carried out in urban regions of Karachi (Pakistan). A questionnaire comprising queries concerning demographic details, preventive measure scale, associated symptoms, management and family history of DFU was filled voluntarily by the patients. Physical measurements of the subjects like B.P, weight, height were also done during study. The test reports assessed in the study includes: complete blood test report, blood glucose level (mg/dl), Hb level (g/dl), blood group and a list of prescribed drugs/pills were also taken into consideration. In this study we took into account the “International Consensus on the Diabetic Foot classification of foot wound infections” in order to divide the subjects into 4 different grades. Grade 1 having no
symptoms was taken as control. Total controls were n=18 out of which n=11 were male and n=7 were female. While subjects placed in grade 2-4 were the DFU patients, categorized according to their level of symptoms severity. Total patients were n=41, out of which n=22 were male and n=19 were female. According to the “International Consensus on the Diabetic Foot classification of foot wound infections”, the four grades differing according to their symptoms are as follows.

<table>
<thead>
<tr>
<th>Grade 1</th>
<th>No symptoms, no signs of infection</th>
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<tbody>
<tr>
<td>Grade 2</td>
<td>Lesion only involving the skin (without involvement of deeper tissues nor systemic signs)</td>
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<tr>
<td>Grade 3</td>
<td>Infection involving structures deeper than skin and subcutaneous tissue, such as deep abscess, osteomyelitis, septic arthritis or fasciitis. Localized gangrene is sometimes observed in this category.</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Any foot infection, in the presence of a systemic inflammatory. Extensive gangrene involving the whole foot.</td>
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RESULTS

Comparing the grades of DFU showed that 34% of males belonged to grade 1, 24% to grade 2, 33% to grade 3, and 9% to grade 4. (Figure 1). In females 27% were in grade 1 & 2 (each), 42% in grade 3 and 4% in grade 4. (Figure 2)
DISCUSSION

The keen aspire of our study is to assess the grades and associated symptoms of DFU and alongside as a secondary concern we also outlined the approaches made for its prevention and management. In this article the parameter taken was grades in DFUS (Rivner, 2001). The intensity of the infection varies with the grades with the most intense and lethal effects and symptoms occurring in grade 4. Of course there are certain risk factors and causes leading to foot ulcers in diabetics; like peripheral neuropathy, PAD, charcot foot and some mechanical factors like poorly fitting shoes, nail infection, edema and continued weight bearing (Chidiac, 2007).

Many wound classifications have been proposed. The University of Texas classification (UT classification) is easy to use and should now be used as the reference wound classification. It comprises four grades according to depth. A complementary classification of wound infections has been defined by the International Consensus on the Diabetic Foot. This classification comprises four grades, from grade 1 (no infection) to grade 4 (severe sepsis).

In a study grade 1 ulcer was found in 33.3%, Grade 2 in 35%, Grade 3 in 20%, Grade 4 in 1.6% of the subjects (Zubair, 2010). According to another study majority of the patients presented advanced DFU with 25 % in grade 2, 30 % in grade 3 and 21 % with grade 4 disease (Rooh-Ul-Muqim, 2003).

In our study of male patients, 24% were in grade 2, 33% were in grade 3 and 9% were of grade 4. On the contrary in female patients an advanced DFU with 25 % in grade 2, 30 % in grade 3 and 21 % in grade 4 was observed. Similarly, in our study 24% were in grade 2, 33% were in grade 3 and 4% were in grade 4. The control subjects, having no signs and symptoms of foot ulcer, were placed in grade 1, among them 33% were male and 27% were female.

REFERENCES