ORIGINAL ARTICLE

RISK FACTORS FOR DIABETIC FOOT ULCER

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Background: Diabetic foot is one of the common complications of diabetes mellitus. Many risk factors are involved in its causation. This study was conducted to determine risk factors responsible for foot ulcer in diabetic patients. **Methods:** A total of 196 consecutive patients with diabetic foot were included in the study. Detailed history, clinical findings and investigations were recorded. Lesions were graded according to Wagner's classification, and appropriate medical and/or surgical treatment was carried out. Patients who did not consent to participate in the study, had established gangrene of the foot, or had any medical co-morbidity especially chronic heart failure and chronic renal failure which could influence these risk factors were excluded from the study. Data were collected on a special proforma for analysis. **Results:** Out of 196 patients 80.1% were male. One hundred and forty-six (74.48%) patients were in the range of 40–70 years. Right foot was more commonly involved (65.3%), 91.3% patients had diabetes of more than 5 years duration. No treatment had been received by 47.4% patients while 41.3% were on oral anti-diabetics; 11.2% patients were on insulin. All patients had type 2 diabetes mellitus. Neuropathy was present in 51% patients, 62.8% had absent or diminished peripheral pulses, 43.4% had poorly controlled diabetes. According to the Wagner classification 30.6% patients had grade 1, 26.5% had grade 2, and 42.9% had grade 3 diabetic foot. Evidence of infection was seen in 85.7% patients; staphylococcus aureus was isolated in 43.4% patients. Osteomyelitis was present in 42.9% patients. Surgical intervention was performed in 85.7% patients. Direct relation was found between the duration of diabetes, sugar control, peripheral neuropathy, peripheral arterial disease, grade of diabetic foot, evidence of osteomyelitis, intervention and the outcome of the disease. **Conclusion:** Neuropathy, peripheral arterial disease, duration of diseases and underlying osteomylitis are the major risk factors and need to addressed while educating patients.

Keywords: Diabetic foot, Neuropathy, peripheral arterial disease, Angiopathy, Wagner classification

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INTRODUCTION

Diabetic foot ulcer is one of the major health problems that can impair the quality of life requiring prolong hospitalisation and entails high cost to the patient.[1,2] Diabetic foot disease effect 15% of the diabetic patients and people with diabetes are 15 times more likely to undergo lower extremity amputation than their non diabetic counterpart.[1,3] In another study it was estimated that 12–15% of diabetic patients develop foot ulcer in their life time and prevalence ranges from 4–10% which suggests that life time incidence may be as high as 25%.[2] In Pakistan with an approximate population of 160 million, the incidence of diabetic foot ulcer is 10%.[1] The incidence of new ulcer in western world was 2% in a community based study that rises to 5–7% in patients with risk factors such as loss of sensation, foot deformities.[4] Estimated cost for treating a diabetic foot ulcer was 28000 dollar in 1999.[2] Foot ulceration can lead to 85% of non traumatic lower extremity amputation.[1]

In order to control this problem and improve the quality of life in diabetic patients' risk factors should be identified and addressed.[1] The risk factor for foot ulceration increased in people having diabetes of more than 10 years duration, are male, have poor glycaemic control, or have cardiovascular, retinal or renal complications. Foot related risk factors are peripheral neuropathy, peripheral vascular disease and bone deformity.[1] The objective of this study was to identify risk factors and their frequency in patients presenting at Ayub Teaching Hospital, Abbottabad.

PATIENTS AND METHODS

This study was conducted at Department of Surgery, Ayub Teaching Hospital Abbottabad from July 2010 to July 2011. All diabetic patients between 20 and 80 year age with foot ulcers were included in the study. Patients with medical co-morbidity especially chronic heart failure and chronic renal failure were excluded from the study.

All diabetic patients with foot ulceration attending Ayub Teaching Hospital were admitted to surgical units. Informed consent was obtained from each patient included in the study. General physical examination with special emphasis on diabetic foot to determine the nature of the lesion, peripheral vascular pulses and peripheral neurological status was carried out. X-ray foot was advised to assess condition of underlying bones. Baseline investigations including

fasting and random blood sugar were carried out. Ulcer debris and/or ooze were sent for culture and sensitivity. Data were recorded on a pre-designed Performa and analysed using SPSS-10.

RESULTS

Total 196 patients were included in the study, 145 (74%) were admitted through OPD and 51 (26%) were admitted through emergency department. Mean age of the patients was 58.09±11 years. Male patients were 157 (80.1%) and female were 39 (19.9%). Out of 196 patients, 100 (52%) patients were suffering from diabetes for more than 10 years, 75 (39%) patients were of duration between 5 and 10 years, and only 17 (9%) patients were of duration less than 5 years. Mean duration of diabetes was 11.4 years. Minimum duration of disease was 3 years and maximum was 25 years. Out of 196 patients, 14 (7.1%) had good sugar control, 97 (49.5%) had fairly controlled sugar, and 85 (43.4%) had poorly controlled sugar. Twenty-two patients were on insulin, 81 were on oral hypoglycaemic and 93 were getting no treatment.

Right foot only was involved in 128 (65.3%) patients, left foot only was involved in 62 (31.6%) patients, and both feet were involved in 6 (3.1%) patients. The foot lesions were graded according to Meggit and Wegner classification. Sixty (30.6 %) were in Grade I, 52 (26.5%) in Grade II and 84 (42.9%) in Grade III.

In 73 (37.2%) patients both distal pluses, i.e., dorsalis pedis and posterior tibial were palpable. In 19 (9.7%) patients only posterior tibial was palpable and in 123 (62.8%) patients both distal pluses were absent. Twenty (10.2%) patients had complete sensory loss, 80 (40.8%) patients had partial sensory loss and 96 (49%) patients had no sensory loss. Autonomic neuropathy was present in 102 patients, 84 (42.9%) patients had osteomyelitis, and 168 (85.7%) patients showed evidence of infection. Multiple organisms were detected but *Staphylococcus aureus* was the most common organism isolated from foot wounds. One hundred and thirty-four (68.4%) patients had healed and 18 (9.2%) had unhealed ulcers. Amputation was done in 41 (20.9%) patients while 3 (1.5%) patients died during study. (Table-1).

Table-1: Organisms isolated from ulcers

Organism	Frequency	Percentage
Staphylococci	85	43.37
Proteus	42	21.43
E. Coli	28	14.28
Klebsiella	14	7.14
None	27	13.78
Total	**196**	**100**

DISCUSSION

Diabetes is a growing problem across the world and described as a global epidemic of the 21st century. Developing countries harbour majority of diabetic people; more than 70% of the 171 million people with diabetes in year 2000 lived in developing countries. The WHO estimates that by 2030 number of people with diabetes will increase to 366 million.[5]

Diabetic foot is a major health problem that can impair the quality of life, requiring prolong hospitalisation and entails high cost to the patient.[1,6,7] Diabetic disease affects 15% of the diabetic foot related problems and people suffering from uncontrolled diabetes are 15 times more likely to undergo amputation than non-diabetic counter part.[1]

Mean age of our patients was 58.09 years, the youngest being 29 years and oldest being 76 years, which is comparable with the study of Veves *et al*[7] who reported mean age 53.3 years in patients presented with diabetic foot. Male patients were predominant in this study, probably due to greater exposure to external environment and trauma. These findings are consistent with national (87%) and international (77%) studies.[8,9]

A multi-centre study conducted in India, Germany and Tanzania on 613 patients showed that neuropathy was common in all centres. We found sensory loss in 51% of our patients. Many national and international studies showed wide variations in the percentage of sensory neuropathy in patients with diabetic foot ulcer. In a study it is reported to be 20–40%[10], while Ali *et al*[4] found it in 44% of their patients. Poorly controlled blood sugar, due to poor compliance or resistance of diabetes, had a direct effect on the outcome of the disease resulting in amputation or non-healing ulcer. Duration of diabetes also had a direct effect on the outcome of the disease. Patients with longer duration of diabetes had more prevalence of neuropathy and angiopathy and were more prone to development of foot ulcer.

Researchers[11] have reported that up to 28% diabetic foot end up with amputation; 20.9% of our patients had to be treated with amputation.

Peripheral arterial disease was a frequent risk factor for foot ulcer in Germany (48%), in India and Tanzania it was 12% and 13% respectively.[2] In our study distal pulses were completely absent in 62.8% patients, comparable with the data available showing 50% of cases having peripheral vascular disease.[5] Infection was seen in 85.7% of our patients which is consistent with a study conducted in India.[5]

A community based patients cohort study[12] revealed that the main cause of foot ulceration in diabetic patients was pressure from footwear (55%) but we did not assessed this factor in over study.

CONCLUSION

Peripheral neuropathy, peripheral arterial disease, poor sugar control, poor footwear, underlying infection and duration of diabetes are recognised risk factors for foot

ulceration. These risk factors should be taken into consideration while educating diabetic patients.

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