

## A Study of Risk Factors of Diabetic Foot Ulcers

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### ABSTRACT

**Background:** Diabetes mellitus is rapidly increasing at alarming rate.<sup>1</sup> Diabetic foot ulceration is the most common complication of diabetes. Multiple risk factors are involved in its development.

**Aim:** To evaluate the risk factors responsible for foot ulceration in diabetic patients.

**Methods:** A total of 127 patients with foot ulcers were included in this study. Through history, clinical, finding & investigations were recorded. Foot lesions were graded as Wagner's classification. Appropriate medical and/or surgical treatment was given. Data were collected on special proforma for analysis.

**Results:** Out of 127 patients 74% were male. Right foot was more commonly involved in 66.9% of the patients. 61.4% had diabetes of more than 10 years. Neuropathy was present in 88.97% patients. 70.86% had poorly controlled diabetes. According to Wagner's classification 74.01% patients had grade 1, 7.08% had Grade 2(4.72%) had Grade 3(11.81%) had Grade 4 and 2.36% had Grade 5. Soft tissue infection was present in 74% patients; most common organism cultured was staphylococcus aureus was isolated in 73.2% patients. Osteomyelitis was found in 13.38% patients. Surgical intervention was performed in 83.46% patients. Healing was done in 16.53% after local wound care. Amputation was done in 15.74% patients.

**Conclusion:** Lack of awareness, male sex, older age, bare foot walking, peripheral neuropathy, neuroischemia and longer duration of diabetes all are major risk factors in the development of diabetic foot ulcers. Patient's education about these risk factors remains paramount importance in controlling the disease

**Keywords:** Diabetic foot, ulcers, neuropathy, osteomyelitis

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### INTRODUCTION

Diabetes is a Global epidemic of the 21<sup>st</sup> century<sup>2</sup>. Currently, worldwide 366 million people are suffering from diabetes and this number is expected to exceed half a billion by 2030<sup>2</sup>. Diabetic effects various system of the body, one of those is foot. "A *diabetic foot ulcer (DFU) is any full-thickness wound below the ankle in a diabetic patient, irrespective of duration*"<sup>3</sup> Estimated life time risk of developing DFU's is 25%<sup>3,4</sup>. In Pakistan, with an approximated population of 160 millions, incidence of foot ulcers is 10%<sup>5,6</sup>. People with diabetes are 15 times more likely to undergo a lower-extremity amputation than their non-diabetic counterpart.<sup>6</sup> It has been estimated that every 20 seconds a lower limb is amputated due to complications of diabetes.<sup>7</sup> It causes tremendous burden on health care system. Diabetic foot problem cause increase morbidity and mortality. Incident of Diabetic foot can be reduced by identifying various risk factors and by patient's education. The aim of the study was to identify risk factors and their frequency in diabetic patients with foot ulcers.

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### MATERIAL AND METHOD

This descriptive study conducted at surgical department of Akhtar Saeed trust teaching hospital, Lahore from Feb 2014 to Feb 2017. A total of 127 diabetic patients with foot ulcers were included in this study. Detailed history and general physical examination done with special focus was given on foot examination in order to determine risk factors in diabetic foot ulcers. Foot ulcer recorded according to the Wagner's grade. Foot deformity was recorded. The neurological assessment of the foot had done by 10g monofilament, vibration using 128-HZ tuning fork, pinprick sensation and ankle reflexes. Vascular status of the foot was assessed. Pulses in posterior tibial artery, dorsalis pedis artery were recorded. Flow in clinically palpable foot arteries were checked by hand held vascular Doppler. Ankle brachial pressure index (ABPI) was calculated. Radiograph of the foot was taken to assess underlying bone involvement. Baseline investigations were carried out. Culture swab was taken and sent for culture and sensitivity before starting any treatment. Wound debridement done under suitable anesthesia to clear the wound from debris and promote wound healing. On pre-designed proforma data was collected and analyzed.

## RESULTS

Out of 127 patients 94 patients (74%) were male and 33 patients (26%) were females. Mean age of the patients was  $59 \pm 10$  years. Right foot was involved in 85 patients (66.9%). 2 patients (1.57%) had type I Diabetes and 125 patients (98.4%) had type II diabetes. 90 Patients (70.86%) had BMI over 25. 47 patients (37%) had the habit of barefoot walking. 54 patients (42.51%) were smokers. 90 patients (70.8%) had no awareness about foot problems. 35 patients (27.55%) had diabetes less than 5 years. 15 patients (11.8%) had diabetes more than 5 years but less than 10 years. 78 patients (61.41%) had diabetes more than 10 years of age. 90 patients (70.86%) had poor drug compliance and inadequate treatment. 56 patients (44%) were taking oral hypoglycemic drugs with diet control, 71 patients (55.9%) were taking insulin. 94 patients (70.86%) had Wagner's Grade 1 ulcer, 09 patients (7.08%) had Grade 2, 06 patients (4.72%) had Grade 3, 15 patients (11.81%) had Grade 4 and 03 patients (2.36%) had Grade 5. 35 patients (27.5%) had a previous history of ulcerations. Foot deformities were present in 17 patients (13.38%). Distal neuropathy was present in 113 patients (88.97%) out of which 07 patients (5.51%) had neuroischemic ulcers. No pure ischemic was found. Soft tissue infection was present in 94 patients (74%). Multiple organisms were isolated from the ulcers; predominantly Staph Aureus 73.2%. Osteomyelitis was found in 17 patients (13.8%). Surgical intervention was performed in 106 patients (83.46%). Healing was done in 21 patients (16.53%) after local wound care. Amputation was done in 20 patients (15.74%).

## DISCUSSION

Foot ulceration is one of the disabling complications of diabetes mellitus. DFU's frequently progress to loss (amputation) of digits and limbs makes it a more serious issue<sup>8</sup>.

Mean age of the patients was  $59 \pm 10$  years which is comparable with international studies.<sup>5</sup> Older age poses the risk of diminished ability for self-care because of poor vision and impaired mobility<sup>9</sup>. The absence of these factors in younger patients may make them less susceptible to foot trauma. Male predominance was seen in our study probably due to greater exposure to external environment and trauma. Our findings are consistent with local<sup>5,6</sup> regional<sup>10</sup> and international data<sup>5,11,12</sup>.

Barefoot walking is another common factor, which can result in damage to the feet by sticks and thorns. This is very common in rural areas especially in farmers. In neighboring country some people,

especially monks and devotees, also walk barefoot on roads as part of a religious ritual<sup>10</sup>. This leads to burns, especially on the feet of diabetic patients, resulting in to chronic ulcers. In present study 37% of patients had the habit of barefoot walking.

Lack of awareness of foot care was found in 70.8% of our patients. Patient's education is the most important element for the management of diabetes and its related complications<sup>10</sup>. Poor glycemic control due to poor compliance or resistance of diabetes and duration of diabetes had direct adverse impact on the outcome of the disease resulting in non-healing ulcer or amputation<sup>5</sup>. Such patients had more prevalence of neuropathy and angiopathy. Hence they are more prone to develop foot ulcers. Risk of amputation is also increased 2-4 folds with advance age and long standing diabetes<sup>6,13</sup>. In our study 70.86% patients had poor glycemic control and 61.41% had diabetes more than 10 years.

Diabetic neuropathy is the most common factor in the development of diabetic foot ulcers. Diabetic neuropathy leads to loss of the protective sensation of pain, pressure & heat which in turn puts the patient's feet at increased risk for mechanical and thermal trauma. Many studies show wide variations in the percentage of sensory neuropathy in patients with diabetic foot ulcerations. Fisher TK et al, reported to be 20-40%. Recently published study by Maria Teresa VQ et al reported 91%<sup>2</sup>. We have found sensory loss in 88.97% of the patients which is consistent with other studies<sup>2,14,15,16</sup>.

Patient with history of previous ulceration possess all the risk factors necessary to produce another ulceration. It is an important risk factor for further development of ulcers.<sup>6</sup> It is estimated that between 20-58% of such patients develop another ulcer within a year after healing of wound<sup>15</sup>. Finding of the present study is consistent with international literature<sup>2,17</sup>.

Diabetic patients are 15 times more likely to undergo lower extremity amputation than their non-diabetic counterpart<sup>4,18</sup>. In time proper care of DFU's can reduce rate of amputation by 80%<sup>2</sup>. In current study (15.74%) of our patients were treated by amputation.

## CONCLUSION

Lack of awareness, male sex, older age, bare foot walking, peripheral neuropathy, neuroischemia and longer duration of diabetes all are major risk factors in the development of diabetic foot ulcers. Patient's education about these risk factors remains paramount importance in controlling the disease. This helps in early detection of diabetic foot ulcers and

timely intervention not only decrease the morbidity but also reduce the rate of amputation.

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