

# Assessment of Severity of Diabetic Foot Ulcers Using Diabetic Ulcer Severity Score

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## ABSTRACT

**Objective:** Assessment of Severity of Diabetic Foot Ulcers Using Diabetic Ulcer Severity Score.

**Study Design:** A Prospective study

**Place and Duration of Study:** This study was conducted at the Department of General Surgery in Bacha Khan Medical Complex/Gajju Khan Medical College-SWABI from 1st November 2022 to 30 April 2023.

**Methods:** After taking approval from the ethical board of the institute. A total of 96 individuals were enrolled in this study and their diabetic ulcer severity score was assessed and they were followed up at three and six months. The information collected was input into a Microsoft Excel spreadsheet, and the proportion of healing or amputation was determined using percentage analysis.

**Results:** In this study a total of 96 individuals with diabetes mellitus who have foot ulcers were enrolled. Out of which 72(75%) were female and 24(25%) were male. Complete healing was experienced by 100% of individuals with diabetic ulcer severity scores of 0. While 16% people who had a diabetic ulcer severity score of 1 suffered minor amputation, 84% of them experienced ulcer healing over the 6-month follow-up period. 54% of individuals with a score of 2 achieved full ulcer healing while 29% of patients with a diabetic ulcer severity score of 2 experienced minor amputation and 17% underwent major amputation. In contrast to 6.25% of the individuals who experienced full ulcer healing throughout the follow-up period, 56.25% of participants with a diabetic ulcer severity score of 3 experienced minor amputation. Amputation was performed on all patients with a diabetic ulcer severity score of 4. When the results of the participants without pedal pulses were examined separately it became clear that majority of them (91.17%) were amputated. Active bone involvement was noticed 30% of the participants in which 68.9% have been amputated.

**Conclusion:** Our study concluded that the frequency of diabetes complications, such as the risk and occurrence of diabetic foot ulcers, has grown over the last several decades in correlation with the rising number of individuals receiving a diabetes mellitus diagnosis.

**Key Words:** Assessment; Diabetic Foot; Ulcers; Severity Score

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## INTRODUCTION

The global prevalence of diabetes mellitus is 8.8% worldwide, making it one of the most prevalent metabolic diseases. Diabetic foot is described as "an ulceration of the foot (distally from the ankle and including the ankle) associated with different grades of

ischemia associated infection and neuropathy.<sup>1</sup> It causes significant morbidity and higher mortality because of the sequelae linked to it.<sup>2</sup> It affects quality of life, and if early assistance is not received, the damaged area or limb is often amputated.<sup>3</sup> Lower limb amputations are mostly caused by ulceration, which occurs before the amputation.<sup>4</sup> Ulcers heal more quickly when glycemic management, foot infection prevention, and ischemia minimization are maintained.<sup>5</sup> Another crucial factor in the effective treatment of diabetic individuals with foot ulcers is ulcer depth.<sup>6</sup> There are several grouping approaches that take into consideration various aspects, including the ulcer's location, depth, and correlation with infection, ischemia, and neuropathy.<sup>7</sup> Deep ulcers, peripheral vascular disease, and the existence of other co-morbidities including hypertension and addictive behaviors like smoking and drinking all affect how well ulcers are managed.<sup>7</sup> Between 15 and 20 percent of diabetes individuals get foot ulcers at some point in their lives, which lowers their quality of life and causes

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serious health problems. It leads to a significant use of medical resources.<sup>8</sup> Numerous Classification and scoring approaches for foot ulcers have been created and are now in use. For instance, the Brodsky Depth Ischaemia classification, the University of Texas Diabetic Wound Classification system, and the Wagner Diabetic Foot Classification.<sup>9</sup> The aforementioned rating schemes are intricate and ineffective at forecasting patients' long-term results. The Diabetic Ulcer Severity Score (DUSS) attempts to rectify those shortcomings. Beckert et al.<sup>10</sup> proposed a novel scoring system called the Diabetic Ulcer Severity Score (DUSS). It is one of the recently developed wound-based ulcer classification systems that requires validation in our setup. This grading system will be a very helpful tool for people who need amputations to make decisions since it can anticipate amputation rates. Therefore, this study aims to evaluate the severity of diabetic foot ulcers using the diabetic ulcer severity score (first described by Beckert and colleagues) and correlate it with the results that will ultimately aid in improving the treatment and counselling of such individuals.

**METHODS**

The current prospective study was conducted at the department of general surgery in Bacha Khan Medical Complex/Gajju Khan Medical College-SWABI from 1st November 2022 to 30 April 2023 after taking approval from the ethical board of the institute. A total of 96 individuals were enrolled in this study and their diabetic ulcer severity score was assessed and they were followed up at three and six months. Individuals with diabetes mellitus who have one or more foot ulcers and all diabetic foot ulcers were included while Individuals with diabetes who have foot venous ulcers were excluded. Each the individual's diabetic ulcer severity score was determined using the formula as shown in table 1. The Diabetic Ulcer Severity score was determined by adding the four individual values. A subject may receive a minimum score of 0 and a maximum score of 4. Two follow-up visits were conducted at three and six months to evaluate the ulcer's healing, determine if it has healed or not, to find whether the patient has had amputation earlier (at which point each participant will be considered to have accomplished this study). Epithelialization of the ulcer with primary intention or skin grafting was defined as healing. Amputations above or below the knee were considered significant, whilst amputations to the toe or forefoot were considered minor. The information collected was input into a Microsoft Excel spreadsheet, and the proportion of healing or amputation was determined using percentage analysis.

**RESULTS**

In this study a total of 96 individuals with diabetes mellitus who have foot ulcers were enrolled .Out of which 72(75%) were female and 24(25%) were male (Fig 1). The mean age of the study participants was 59.6 years (range 35-90 years).The most prevalent age group among the participants were 55 to 60 years (20.8%).Age wise distribution of the study population is represented in table 2.

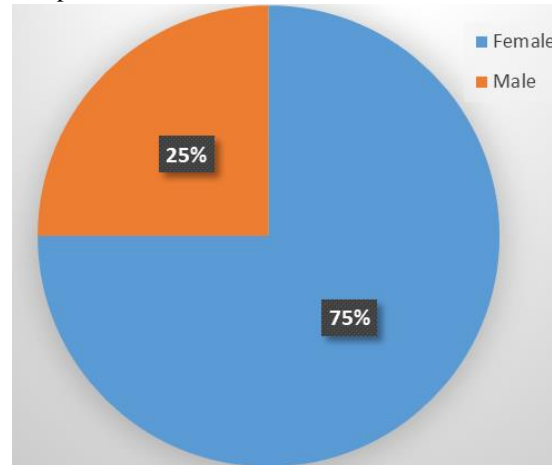


Figure No. 1: Percentage of female and male

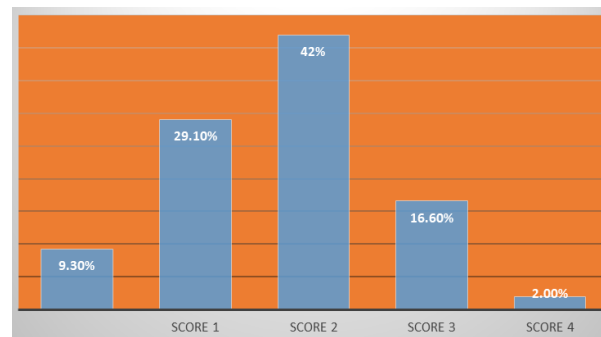


Figure No. 2: Diabetic ulcer severity score of the individuals of the study

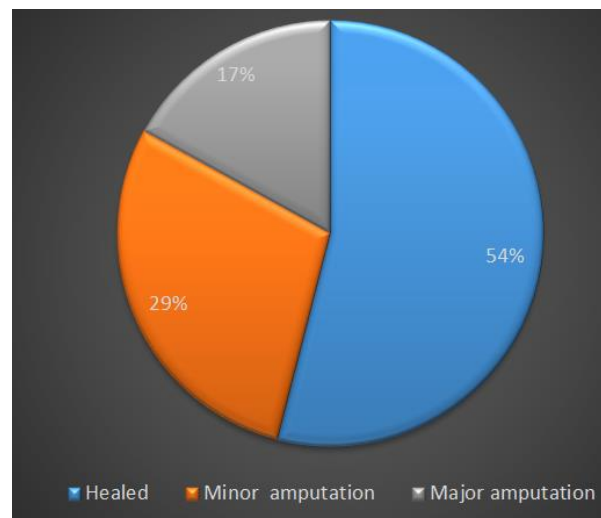


Figure No. 3: Depiction of the study population with respect to outcome

The study revealed that 42% of the participants had a diabetic ulcer severity score of 2, followed by individuals with scores of 1 (29.1%), 3, (16.6 per cent), 0 (9.3%) and score 4 (2.0%) (Figure 2). Complete healing was experienced by 100% of individuals with diabetic ulcer severity scores of 0. While 16% people who had a diabetic ulcer severity score of 1 suffered minor amputation, 84% of them experienced ulcer healing over the 6-month follow-up period. 54% of individuals with a score of 2 achieved full ulcer healing while 29% of patients with a diabetic ulcer severity score of 2 experienced minor amputation and 17% underwent major amputation. (figure 3) In contrast to 6.25% of the individuals who experienced full ulcer healing throughout the follow-up period, 56.25% of participants with a diabetic ulcer severity score of 3 experienced minor amputation. Amputation was performed on all patients with a diabetic ulcer severity score of 4. When the results of the participants without pedal pulses were examined separately it became clear that majority of them (91.17%) were amputated (table 3). Active bone involvement was noticed 30% of the participants in which 68.9% have been amputated (table4)

**Table No. 1: Each individuals diabetic ulcer severity score**

Features	Score of zero	Score of 1
Site of ulcer	Toe	Foot
Number of ulcer	Single	Multiple
Peripheral pulses /Doppler	Present	Absent
Osteomyelitis X-ray foot	Absent	Present

**Table No. 2: Age distribution of the study population**

Age in years	N(%)
35 to 40	6(6.25)
40 to 45	5(5.20)
45 to 50	6(6.25)
50 to 55	12(12.5)
55 to 60	20(20.8)
60 to 65	16(16.66)
65 to 70	12(12.5)
70 to 75	12(12.5)
75 to 80	5(5.20)
80 to 85	1(1.04)
85 to 90	1(1.04)
Total	96(100)

**Table No. 3: Distribution of Study population based on absent pedal pulses t and its outcomes**

Results	N (%)
Healed	3(8.8)
Minor amputation	19(55.88)
Major amputation	12(35.29)
Total	34

**Table No. 4: Distribution of Study population based on bone involvement and its outcomes**

Results	N (%)
Healed	9(31)
Minor amputation	15(51)
Major amputation	5(17.2)
Total	29

## DISCUSSION

In Germany in 2006. Beckert and his colleagues first introduced the diabetic ulcer severity score as a prognostic scoring system for diabetic foot ulcers. Their research came to the conclusion that the main reasons this score matters are to enhance communication between medical professionals and to enable an appropriate course of therapy in relation to ulcer grading.<sup>11</sup> In this study a total of 96 individuals with diabetes mellitus who have foot ulcers were enrolled. Out of which 75% were female and 25% were male. A study was conducted by Kumar, Shiva, et al<sup>12</sup> in their study majority participants were male (81%) this is not similar to our study. In the current study the most prevalent age group among the participants were 55 to 60 years (20.8%) which is similar with the findings of the previous study.<sup>12</sup> The study revealed that 42% of the participants had a diabetic ulcer severity score of 2, followed by individuals with scores of 1 (29.1%), 3, (16.6 per cent), 0 (9.3%) and score 4 (2.0%) these findings are similar with the previous studies<sup>13</sup> Of all the patients included in this study, 54% had a probability of ulcer healing. This contrasted with the study by Beckert et al<sup>11</sup>, which showed 57% recovery for score 4 and 93% healing for score 0. However, the outcome was similar to research, which was carried out in Bangalore by Shashikala et al.<sup>14</sup> 31% of the patients studied experienced some sort of amputation, with 51% experiencing minor amputation and 17% undergoing severe amputation. The study's findings indicated that the disease's outcome gets worse as the score increases, which is consistent with previous studies.<sup>11,15</sup> When the results of the participants without pedal pulses were examined separately it became clear that majority of them (91.17%) were amputated. This is crucial to understand since the results suggest that a patient's outcome is affected if they have a component of peripheral vascular disease. Vasculopathy is recognized to result from diabetes mellitus effects on the vasculature. In the present study Active bone involvement was noticed 30% of the participants in which 68.9% have been amputated. Therefore, this research highlights even more how crucial it is to identify osteomyelitis or bone involvement in Individuals with diabetic foot, since this ultimately influences the prognosis.

## CONCLUSION

Our study concluded that the frequency of diabetes complications, such as the risk and occurrence of diabetic foot ulcers, has grown over the last several decades in correlation with the rising number of individuals receiving a diabetes mellitus diagnosis.

### Author's Contribution:

Concept & Design of Study: Aamir Ali Khan  
 Drafting: Muhammad Kashif, Zia Ullah  
 Data Analysis: Muhammad Ali, Muhammad Ibrahim Shuja, Faiz ur Rahman  
 Revisiting Critically: Aamir Ali Khan, Muhammad Kashif  
 Final Approval of version: By all above authors

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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