

## A PROSPECTIVE STUDY ON OUTCOME OF DIABETIC WOUNDS BASED ON DIABETIC ULCER SEVERITY SCORE (DUSS) IN CHENGALPATTU MEDICAL COLLEGE AND HOSPITAL

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### Abstract

**Background:** Diabetic foot ulcers are hindered by poor blood flow, delicate granulation tissue, extended healing times, increased morbidity, and significant economic and personal burdens. This study aimed to predict the outcomes of foot ulcers using the DUSS scoring system. **Materials and Methods:** This prospective study included 80 patients at the Government Chengalpattu Medical College and Hospital between 2021 and 2022. Primary source data were collected, and patients with diabetic foot ulcers were categorised based on the DUSS score. They were subjected to detailed clinical examinations for wound characteristics, scheduled for surgical procedures if necessary, and followed-up during their hospital stay. **Result:** Most patients (48.8 %) belonged to the age group of 41-57 years and were male (67.5%). The maximum primary healing of diabetic foot ulcers occurred in 85.7% of the patients with scores of 0 and 1. Split-thickness skin grafting was performed in 15.2% of the patients, with a score of 2. A total of 62.5% of patients with a score of 3 underwent minor amputation. Major amputations were performed in 100% of the patients, with scores of 4. There was a significant difference in primary healing and minor and major amputation between the DUSS scores ( $p < 0.05$ ), but no significant difference in split skin graft ( $p = 0.389$ ). **Conclusion:** Diabetic foot ulcers predominantly affect males aged 41-57 years and are strongly correlated with diabetes duration. Low DUSS scores were associated with primary healing, whereas high scores predicted amputation. Regular foot examinations and effective surgical practices further enhance healing outcomes.

## INTRODUCTION

Diabetic foot disease is the most serious complication of diabetes mellitus. Diabetic foot ulcers are defined as ulcers that have delayed progression through an orderly healing process. It produces satisfactory anatomical and functional integrity or has proceeded through the repair process without producing adequate anatomical and functional results.

Diabetic foot ulcers of the lower limb are very difficult to treat and they contribute to a great account of morbidity and expenditure of human resources and manpower. Impaired vascularity and brittle granulation tissue formed during the wound-healing phase account for this. New methods are needed to overcome these factors which promote healing and lessen the hospital stay and morbidity.

Painful and lengthy hospitalisation, multiple stages of surgery, disfigurement and disability, prolonged

rehabilitation, loss of income and job and an enormous financial burden are some of the horrors looming large over a chronic ulcer victim. This study evaluated and classified diabetic wounds based on the clinical severity score assessed by the Diabetic Ulcer Severity Score (DUSS). The ease of this scoring system is based on the fact that it is clinically applicable.

### Aim

This study aimed to predict the outcome of diabetic foot ulcers based on the clinical scoring system Ulcer Severity Score (DUSS).

## MATERIALS AND METHODS

This prospective study included 80 diabetic patients treated in the Department of General Surgery, Government Chengalpattu Medical College and Hospital, between 2021 and 2022. This study was

approved by the Institutional Ethics Committee before initiation, and informed consent was obtained from all patients.

#### Inclusion Criteria

Patients with diabetic foot ulcers who were willing to provide informed consent and older than 18 years of age were included in this study.

#### Exclusive Criteria

Patients who had sepsis, were critically ill, were unwilling to provide consent, had peripheral artery occlusive disorders, had poor nutritional status, or had any evidence of underlying bone osteomyelitis or cancer were excluded from this study.

**Methods:** Primary source data were collected from a specially designed case recording proforma (CRF) about the selected patients after explaining the options of treatment to each of the patients in the language understood by them. Patients with diabetic foot ulcers were categorized based on the DUSS score using pedal pulse parameters, probing to the bone, ulcer site, and number of ulcers. They were then subjected to detailed clinical examinations with wound characteristics, posting for surgical procedures if required, and follow-up of patients during the hospital stay.

**Statistical Analysis:** Data were entered into MS Excel, analysed, and presented as frequency and percentage. Categorical variables were assessed using chi-squared tests, and statistical significance was considered at  $p < 0.001$ .

## RESULTS

The maximum (48.8%) number of patients belonged to the age group of 41-57 years. The minimum number of patients included in the study (6.3%) was > 75 years of age. Most of the patients (67.5%) were male. Many of the patients were homemakers (30%), followed by daily wage workers (20%), and drivers (16.3%). Most patients (55.5 %) were non-smokers

and 32.5% were female. A total of 35 patients (43.8%) did not consume alcohol [Table 1]

Among the study population, 47.5% had diabetes for 6-10 years presenting with foot ulcers. Only 2.5% of the patients had diabetes for over 16-20 years. The DUSS was categorised with a majority (41.3%) score of 2. 45% of patients' wounds were healed by primary healing. Split skin grafting was performed in seven patients (8.8%). Minor amputation was performed in 35% of the patients. Major amputation was the outcome management in approximately 9 (11.2%) patients [Table 2].

The outcomes considered were primary healing, SSG, minor amputations, and major amputations. Only 45% of the patients experienced primary healing, whereas the majority (55%) did not achieve primary healing. 35% of the patients needed minor amputation, whereas 65% did not require minor amputation and 11.2% required major amputation. The least common outcome was the need for a split skin graft, occurring in 8.8% of patients [Table 3].

Primary healing of foot ulcers occurred in 85.7% of patients with a score of 0, 85.7% of patients with a score of 1, 51.5% of patients with a score of 2, 4.2% of patients with a score of 3, and no primary healing in patients with a score of 4, which was statistically significant ( $p < 0.001$ ). Split-thickness skin grafting was performed in 14.3% of patients with a score of 0, 15.2% of the study population with a score of 2, 4.2% of the study population with a score of 3, and no split-thickness skin grafting in patients with scores of 1 and 4 and was statistically significant ( $p = 0.389$ )

Only 14.3% had a score of 1, 33.3% had a score of 2, and 62.5% had a score of 3. No minor amputation was performed in patients with a score of 0 or 4, and the difference was statistically significant ( $p = 0.004$ ). Major amputations were performed in the study population for 29.2% of patients with scores of 3, 100% of patients with scores of 4, and none of the patients with scores of 0, 1, and 2 underwent major amputation, which was statistically significant ( $p < 0.001$ ) [Table 4].

**Table 1: Demographic and lifestyle characteristics of the study population.**

		Frequency (%)
Age in years	< 40	7 (8.8%)
	41-57	39 (48.8%)
	58-74	29 (36.3%)
	> 75	5 (6.3%)
Gender	Male	54 (67.5%)
	Female	26 (32.5%)
Occupation	Cook	6 (7.5%)
	Cooly	16 (20%)
	Daily wage worker	13 (16.3%)
	Driver	8 (10%)
	Farmer	6 (7.5%)
	Homemaker	24 (30%)
	Housekeeper	1 (1.3%)
	IT tech	1 (1.3%)
	Security	2 (2.5%)
	Teacher	3 (3.8%)
Smoking	Yes	36 (45.5%)
	No	44 (55.5%)
Alcoholic	Yes	45 (56.3%)
	No	35 (43.8%)

**Table 2: Clinical characteristics and outcomes in diabetic patients with foot ulcers**

		Frequency (%)
Diabetes duration (years)	Up to 5	20 (25%)
	6 - 10	38 (47.5%)
	11 - 15	20 (25%)
	16 - 20	2 (2.5%)
DUSS score	0	7 (8.8%)
	1	14 (17.5%)
	2	33 (41.3%)
	3	24 (30%)
	4	2 (2.5%)
Primary healing	Yes	36 (45%)
	No	44 (55%)
Split skin graft	Yes	7 (8.8%)
	No	73 (91.3%)
Minor amputation	Yes	28 (35%)
	No	52 (65%)
Major amputation	No	71 (88.8%)
	Yes	9 (11.2%)
Palpable pedal pulse	Present	67 (83.8%)
	Absent	13 (16.3%)
Probing to bone	No probing	38 (47.5%)
	Yes	42 (52.5%)
Ulcer location	Toe	25 (31.3%)
	Foot	55 (68.8%)
Number of ulcers	Single	30 (37.5%)
	Multiple	50 (62.5%)

**Table 3: Overall outcome distribution in the study**

	Outcomes	
	Yes	No
Primary healing	45%	55%
Split skin graft	8.8%	91.3%
Minor amputation	35%	65%
Major amputation	11.2%	88.8%

**Table 4: Comparison of DUSS score with primary healing, split skin graft, major and minor amputation**

		DUSS Score					P value
		0	1	2	3	4	
Primary healing	Yes	6 (85.7%)	12 (85.7%)	17 (51.5%)	1 (4.2%)	0	<0.001
	No	1 (14.3%)	2 (14.3%)	16 (48.5%)	23 (95.8%)	2 (100%)	
Split skin graft	Yes	1 (14.3%)	0	5 (15.2%)	1 (4.2%)	0	0.389
	No	6 (85.7%)	14 (100%)	28 (84.8%)	23 (95.8%)	2 (100%)	
Minor amputation	Yes	0	2 (14.3%)	11 (33.3%)	15 (62.5%)	0	0.004
	No	7 (100%)	12 (85.7%)	22 (66.7%)	9 (37.5%)	2 (100%)	
Major amputation	Yes	0	0	0	7 (29.2%)	2 (100%)	<0.001
	No	7 (100%)	14 (100%)	33 (100%)	17 (70.8%)	0	

## DISCUSSION

In our study, the age range between 41 and 57 years was the most prevalent, followed by that between 58 and 74 years. The average patient age was 55 years, and 67.5% and 32.5% of the patients were men and women. According to occupation, diabetic foot ulcers afflicted homemakers 30% more frequently than coolies (20%).

In our study, 45% of smokers and 55% of non-smokers had foot ulcers, indicating that smoking increased the risk of developing diabetic foot ulcers. The least affected were those with diabetes duration of 16-20 years diabetic duration (2.5%). The wound healed primarily in 80 patients, in 36 patients with foot ulcers, and in seven patients who underwent split-thickness skin grafting. Large amputations such as above- and below-knee amputations were performed in 11.3% of patients, whereas minor

amputations such as toe and forefoot amputations were performed in 35% of patients. Men have a 21% higher rate of amputation than women.

Primary healing occurred in 85.7% of the patients with DUSS scores of 0 and 1, 15.2% with scores of 2, 4.2% with scores of 3, and 0% with scores of 4. The statistical significance between the DUSS scores and primary healing yielded a p-value of < 0.001, indicating a significant association.

When comparing DUSS scores with split-thickness skin grafting (SSG), 14.3% of patients with a score of 0 received SSG, none with a score of 1, 15.2% with a score of 2, 4.2% with a score of 3, and none with a score of 4. The p-value of 0.389 shows no significant association between DUSS scores and SSG.

None of the patients with DUSS scores of 0 and 4 had minor amputations; 14.3% had a score of 1, 33.3% had a score of 2, and 62.5% had a score of 3 underwent minor amputation for diabetic foot ulcers. Statistical analysis revealed a significant association

between the DUSS score and minor amputation ( $p=0.004$ ).

None of the patients with DUSS scores of 0, 1, or 2 experienced major amputations, whereas 29.2% of the patients with a score of 3 and 100% had a score of 4. Thus, patients with DUSS scores of 3 and 4 were significantly more likely to require major amputations ( $p<0.001$ ), indicating a significant association between DUSS scores and major amputation.

## CONCLUSION

Diabetic foot ulcers are common among patients aged 41-57 years. There was also a strong relationship with the duration of diabetes. Diabetic foot ulcers have shown delayed wound healing and require active medical intervention and infection control for proper wound care. The DUSS can be used for the clinical assessment of patients with diabetic foot ulcers at the time of admission. This score helps to predict the outcome of foot ulcer management for primary healing, minor amputation, and major amputation.

Low DUSS scores were highly significant with primary healing as the outcome, and high DUSS scores were highly significant with amputation as the outcome. DUSS plays a significant role in predicting the outcome and whether the wound under assessment will lead to primary healing or amputation. Any lasting medical treatment or healing course without patient involvement was omitted. Regular foot examinations are important for detecting comorbid pre-ulcerative calluses.

Surgeons' practices, techniques, teamwork, and care strategies demonstrated the best results.

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