



E-ISSN: 2616-3470

P-ISSN: 2616-3462

© Surgery Science

www.surgeryscience.com

2021; 5(1): 31-35

Received: 15-11-2020

Accepted: 23-12-2020

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Establishing a wound-based clinical scoring system (DUSS) for diabetic foot ulcer as daily clinical practice: A prospective observational study at tertiary care hospital

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DOI: <https://doi.org/10.33545/surgery.2021.v5.i1a.584>

Abstract

Background: A number of scoring systems and classifications are available for diabetic foot ulcers with intention to compare the treatment modalities and future outcomes. Many of them are complex and don't predict future outcome within the patients. The aim of this study was to establish a wound-based clinical scoring system (DUSS) for diabetic foot ulcer as daily clinical practice with clinically defined and easily assessable wound-based parameters.

Aims and Objective: To establish a wound-based clinical scoring system (DUSS) as daily clinical practice by assessing the efficacy of Diabetic Ulcer Severity Score.

Methods: A total of 73 diabetic patients with foot ulcers were included in this prospective observational study conducted at Dr S.N. Medical College, Jodhpur and attached hospitals from July 2018 to August 2020. Ulcers were assessed and DUSS score created. Patients were followed up for six months or until healing or amputation if earlier.

Results: In this prospective study of 73 patients with diabetic foot ulcers, males were commonly affected accounting for 76.71% of all patients. Most common age group affected was between 51-70 years. Mean age group was 58.57 ± 12.66 years. Mean duration of diabetes was 7.61 ± 5.72 years. Most commonly ulcers were of DUSS score 2. Mean DUSS score was 1.97 ± 1.15 . Overall 25 (34.25%) out of 73 patients had amputation, in which 12 (16.44%) had major amputation while 13 (17.81%) had minor amputation.

Conclusion: This is a very simple scoring system that provides an easily accessible and a streamlined approach in the clinical setting without need of any advanced investigative equipment. Hence this can be applied in any set up, even in busy outdoor patient departments to assess the patients with diabetic foot ulcer.

Keywords: Diabetic foot ulcers, diabetic ulcer severity score, wound-based parameters

Introduction

Diabetes Mellitus (DM) is a chronic disease and complex lifelong condition affecting 8.3% of the world's population globally. It is characterized by a heterogenous group of metabolic disorders resulting in an abnormal increase of blood glucose level due to absolute or relative deficiency in insulin secretion and/or action or both^[1].

India has been called "*the diabetes capital of the world*" and "*every fifth diabetic in the world is an Indian*"^[2]. The World Health Organization reports show that 72 million people had diabetes in India in the year 2017 and this number is likely to be 109 million in 2035. Hence for developing countries like India "*Sugar is now more dangerous than gunpowder*".

Diabetic foot illness, often leads to ulceration and possible subsequent limb amputation. It is one among the foremost costly complications of diabetes and may end in a crucial economic, social, and public health burden; especially in developing countries like India. It results in major consumption of healthcare resource.

There are various scoring systems and classification of diabetic foot ulcers. Their intention is to compare the treatment modalities and outcome in patients with diabetic foot ulcers. Different parameters are incorporated into these scoring systems such as ulcer depth, its site, presence or absence of infection, neuropathy, arterial insufficiency, bone involvement and bony deformities. In 1975, Meggit described a wound classification that was further popularized by Wagner in 1981.

The Meggit-Wagner system assessed ulcer depth alone without considering ischemia or pressure load and presently it is widely used. University of Texas classification improved the classification of foot ulcers by including ischemia and infection. All these scoring systems are complex and don't predict future outcome within the patients. Therefore a classification system for diabetic foot ulcer appropriate for clinical practice should facilitate communication between health care providers, influence daily management and give information about the potential healing of ulcer [3].

Diabetic Ulcer Severity Score (DUSS) addresses these shortcomings by being easy enough to be applied in daily clinical practice. In the wound based system of classification, DUSS is one of the latest classification. This DUSS by Beckert *et al* [4] ranges from 0 to 4. It is a simple and easily producible scoring system which needs to be validated in our setup.

Material and Methods

Total of 73 Diabetic patients with diabetic foot ulcers irrespective of their duration, attending surgical outpatient clinic or admitted into the general surgery department in Dr S N Medical College, Jodhpur and attached hospital were taken into the study based on the inclusion and exclusion criteria mentioned below.

Inclusion criteria

Patients with diabetes mellitus as per WHO criteria (Symptoms of Diabetes + random blood sugar > 200 mg/dl or Fasting blood sugar > 126 mg/dl and 2 hour post prandial glucose level > 200 mg/dl) and more than fifteen years of age presented with lesions of foot i.e. ulcer, cellulitis, abscess and neuropathic ulcers irrespective of duration of lesion of foot with consent to participate and follow up, were included in the study.

Exclusion criteria

Patients with foot ulcers due to cause other than Diabetes mellitus, with severe medical illness, the patients unfit for surgery, receiving immunosuppressive agents, radiation or chemotherapy were excluded. Venous stasis ulcer with diabetes mellitus, ulcers located above the ankle and ulcers with evidence of gangrene were also excluded from study.

The baseline demographic data were taken and relevant investigations were done. As per physician opinion the diabetes was treated using OHA (oral hypoglycemic agent) or insulin, based on the blood sugar levels to obtain optimal control of blood sugars.

These ulcers were given a score, based on the defined parameters of DUSS.

Table 1: Diabetic ulcer severity score (DUSS)

S. No.	Parameter	Scoring	
		0	1
1	Palpable pedal pulses	Present	Absent
2	Probing of bone	Absent	Present
3	Ulcer location/site	Toes	Foot
4	Ulcer number	Single	Multiple

Standard treatment care given to all the patients, like oral hypoglycemic or insulin for good control of diabetes, health education, antibiotics and regular wound care. Healing was defined as complete epithelisation or healing after skin grafting. Amputation rate was defined as the percentage of patients undergoing either minor (i.e. toe or forefoot) amputations or major (i.e. below or above knee) amputation within the observation period.

Follow up

Patients were followed up in the surgical outpatient clinic on regular basis and any surgical intervention done with them were noted. They were followed up for six months or until healing or amputation. Ulcer healing was assessed as complete healing without any surgical intervention or healing with the help of any surgical intervention other than amputation or amputation. Those patients who lost follow up for six months or without healing were excluded from study.

Observations and Results

In this study of 73 patients with diabetic foot ulcers, 56 (76.71%) were male and 17 (23.29%) were females i.e. males were commonly affected with diabetic foot ulcers.

In this study of 73 patients with diabetic foot ulcers, maximum no of patients were in the age group between 51-70 years accounting for 42 (57.53%) followed by age group 31-50 years accounting for 19 (26.3%). The mean age group was 58.57±12.66 years and Median age is 60.

Table 2: Gender-wise distribution of study population

Gender	No. of patients	Percentage (%)
Male	56	76.71
Female	17	23.29
Total	73	100.00

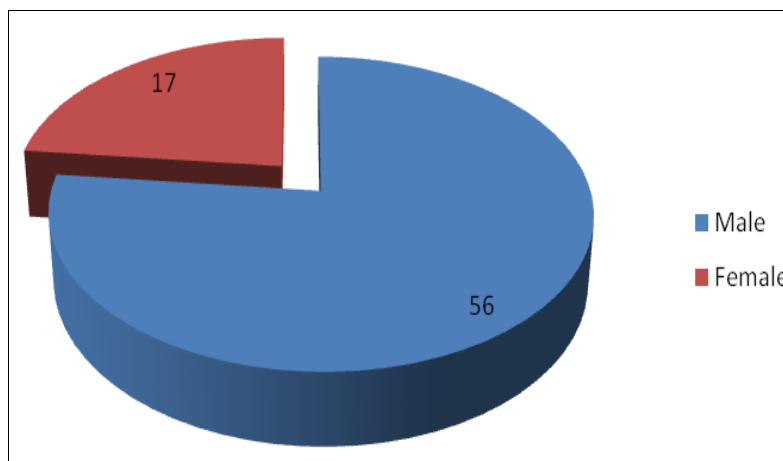
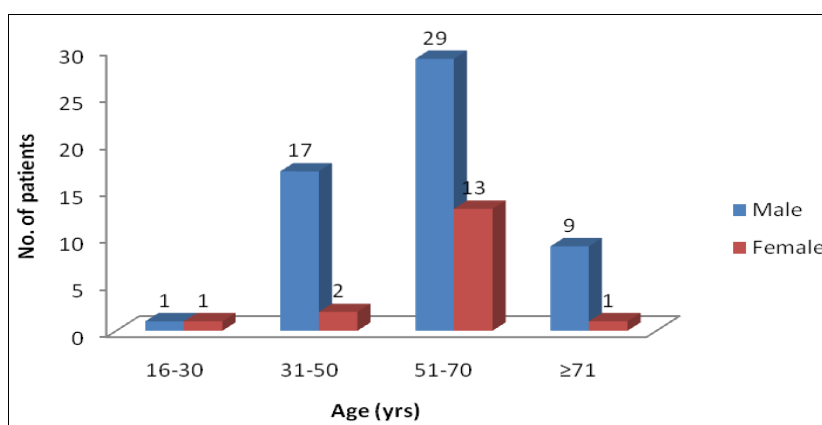


Table 3: Age-wise distribution of study population

Age range in years	Male		Female		Total	
	N	%	N	%	N	%
16-30	1	50.00	1	50.00	2	2.74
31-50	17	89.47	2	10.53	19	26.03
51-70	29	69.05	13	30.95	42	57.53
≥71	9	90.00	1	10.00	10	13.70
Total	56	76.71	17	23.29	73	100.00

Chi square 4.900, P value 0.179



In this study of 73 patients with diabetic foot ulcers, 35 (47.95%) patients underwent for conservative management by wound debridement, 13 (17.81%) patients for skin grafting and remaining 25 (34.25%) patients underwent for amputation.

Table 4: Distribution of ulcers (DUSS score 0-4) with end results of study

DUSS score	Amputation		Wound debridement		Skin grafting	
	N	%	N	%	N	%
0	1	14.29	4	57.14	2	28.57
1	1	5.26	14	73.68	4	21.05
2	3	12.00	16	64.00	6	24.00
3	11	84.62	1	7.69	1	7.69
4	9	100.00	0	0.00	0	0.00
Total	25	34.25	35	47.95	13	17.81

Chi square 46.33, P value <0.0001(S)

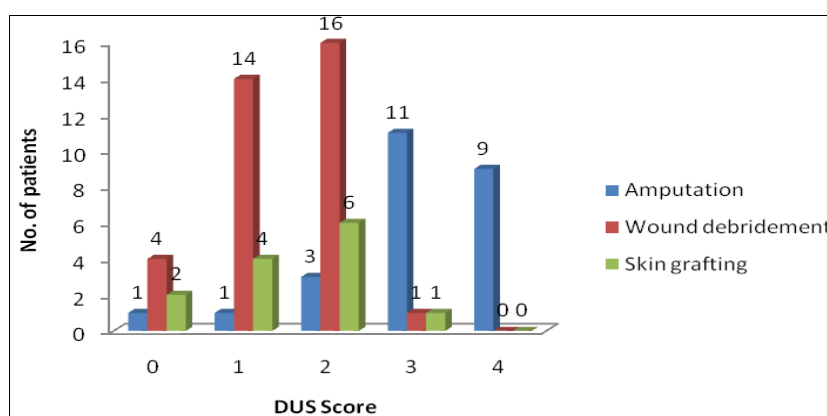


Table 5: Amputation among study population

Amputation	No. of patients	Percentage
Done	25	34.25
Not done	48	65.75
Total	73	100.00

In this study of 73 patients with diabetic foot ulcers, 25 (34.25%) patients underwent for amputation.

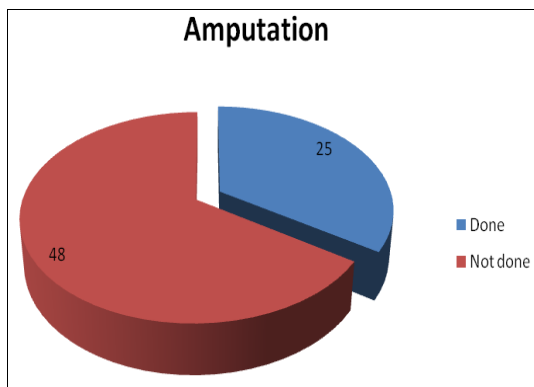


Table 6: Major amputation among study population

Amputation	Major amputation	
	No. of patients	% (Among 73 patients)
25	12	16.44

In this study of 73 patients with diabetic foot ulcers, 12 (16.44%) patients underwent for major amputation.

Table 7: Minor amputation among study population

Amputation	Minor amputation	
	No. of patients	% (Among 73 patients)
25	13	17.81

In this study of 73 patients with diabetic foot ulcers, 13 (17.81%) patients underwent for minor amputation.



Fig 1: Wound before and after grafting



Fig 2: Wound before and after grafting

Discussion

In this study of 73 patients with diabetic foot ulcer, 56 (76.71%) were male while 17 (23.29%) were female i.e. the majority of patients were male. Beckert *et al.*,^[4] studied 1000 patients and found that 675 (67.5%) were male and 325 (32.5%) were female. There were 81% male and 19% female in a study conducted by Kumar ST *et al*^[5], 68% male and 32% female in Mohit Sharma *et al.*,^[6] and Shashikala *et al*^[7].

In this study most common age group affected with diabetic foot ulcer was between 51-70 years, while isst was 51-60 years in Kumar ST *et al*^[5] and Kummarkundath SA *et al*^[8], 41-60 years in Shashikala *et al*^[7].

In this study mean age was 58.57±12.66 years when compared to other study it was 54.6±12.4 years in Kummarkundath SA *et al*, 57±12 years in Kumar ST *et al*, 52±2 years in Shashikala *et al* and 69 years in Beckert *et al*^[4]. In this study median age was 60.

A study undertaken in the USA in 2004 through the 2002 National Hospital Discharge Survey, evaluated 275,000 in patient records from 500 hospitals from 1996 onwards. In this study it was observed that the old aged cases of diabetes had two times more chances of having ulcer over foot, three times the risk of developing a foot abscess and four times the risk of developing osteomyelitis than younger diabetics^[9].

In this study, majority of the foot ulcers with DUSS score 0, 1 and 2 healed by primary intension or by skin grafting i.e. 85.71%, 94.74% and 88.00% respectively. However, among those with score 3 and 4 majority required amputation i.e. 84.62% and 100.00% respectively ($P<0.001$).

In this study, Total 25 (34.25%) out of 73 patients had amputations in which 12 (16.44%) patients underwent for major amputation while 13 (17.81%) underwent for minor amputation.

Conclusion

This is a very simple scoring system that provides an easily accessible and a streamlined approach in the clinical setting without need of any advanced investigative equipment. Hence this can be applied in any set up, even in busy OPDs to assess the patients with diabetic foot ulcer, although subsequent adequate and standardized wound care is an essential prerequisite to the Diabetic Ulcer Severity Score being a valid diagnostic tool.

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