

Validation of Diabetic Ulcer Severity Score (DUSS).

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ABSTRACT

Background: A number of foot ulcer classification systems have been devised in an attempt to categorize ulcers more effectively and allow effective comparison of the outcome of routine management. DUSS (Diabetic Ulcer Severity Score) is one of the latest wound based system of classification, which needs to be validated. **Aims and Objectives:** Our aim was validation of this diabetic ulcer severity score (DUSS), with patients outcome including healing and amputation. **Methods:** Total of 100 Diabetic patients attending surgical outpatient clinic or admitted into the hospital (BMCRI) with diabetic foot ulcers from September 2014 to September 2016 were included in the study. Necessary data was collected. DUSS score was calculated for each patient and analysis was done using SPSS package version 16. **Results:** Most common age group affected with Diabetic foot was between 41 -60 years. Males were commonly affected by Diabetic foot ulcers accounting to 68%. Most commonly ulcers were of DUSS Score of 2 followed by Score 3. Overall 50 (50.0%) of 100 people had amputations in our study. Major Amputation was done for 25% of patients. Minor Amputation was done in 25% of patients in our study. The probability of healing with score 0 was 95%, 91.6% with score 1, 85.7% with score 2, 52% with score 3, and 28.5% with score 4. **Conclusion:** DUSS scoring system provides an easy diagnostic tool for predicting probability of healing or amputation. This is a very simple and easy scoring system which needs no advanced investigation tool and can be easily followed even in busy OPDs.

Keywords: DUSS, Diabetic Foot.

INTRODUCTION

Foot is an integrated complex of bones arranged in beautiful arches. An aponeurosis nicely bow stringing the arches, long tendons traversing the leg that guy-ropes the foot and the long nerves and artery that branch and reach every minuscule of the foot. The foot and its arch helps one walk with grace and maintain the equilibrium of the biped man. In diabetic foot this amazing arch is lost and thus the equilibrium.

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The World Health Organization (WHO) defines the diabetic foot as an infection, ulceration or destruction of deep tissues associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb. The Diabetic foot is more a syndrome rather than a disease.

In India, 30 million of population are diabetic and by 2025 predicted to have 57 million. Presently India is known as the diabetic capital of the world. Every year 3 to 7% of Diabetics suffer a foot lesion for the

first time. Foot ulcers occur in approximately 15% of people with Diabetes, which accounts for 25% of all hospital admissions. More than 60% of lower extremity amputations are seen in diabetics. In 2002 globally 82,000 diabetics have undergone amputations.

Therefore, by taking simple precautionary measures in diabetics, foot complications can be prevented. If the person has already developed an ulcer, recognizing it at the earliest and by proper treatment, the limb can be salvaged. To identify this group of diabetic foot which are at risk of need for amputation many scoring systems are available, but none is being followed routinely.

This diabetic ulcer severity score (DUSS) designed by Beckert et al, defines four clinically parameters, namely palpable pedal pulses, probing to bone, ulcer location and presence of multiple ulcerations. It is a simple and easily producible scoring system. To validate this scoring system a prospective study was conducted in our institute.

MATERIALS AND METHODS

Total of 100 Diabetic patients with diabetic foot ulcers irrespective of their duration, attending surgical outpatient clinic or admitted into the

hospital were taken into the study based on the inclusion and exclusion criteria mentioned below.

- The baseline demographic data which including Age, Sex, Occupation, Education status, Habits, Socioeconomic status, Duration of diabetes and Treatment history for diabetic management were taken.
- The diabetic ulcer was thoroughly examined and following points were noted down i.e.
 1. Site of ulcer
 2. Number of ulcers(in patients with multiple ulcers, the wound with the highest grading was selected for analysis. For wounds with identical grading, the larger wound was chosen).
 3. Peripheral vascular disease was clinically detected by palpation of pedal pulses.
 4. Wound depth was evaluated using a sterile blunt probe. The ulcer which was bone depth was further assessed for bone involvement (osteomyelitis) by taking foot x-ray.
 5. Ulcers were labeled infected if a purulent discharge was present .This purulent discharge was then sent for culture and sensitivity.

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

- A baseline investigations including FBS (fasting blood glucose), PPBS (post prandial blood glucose), HbA1C (glycosylated hemoglobin), Hb (hemoglobin), TC (total count), RFT(renal function test), SE(serum electrolyte) and Foot x ray was 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.
- After assessing the ulcer, it was treated locally by chemical and sharp debridement or disarticulation of toe or amputation, as needed. Systemic treatment with antibiotics as per culture sensitivity reports and adequate analgesic care was given.

The ulcers were followed up for a minimum period of 6 months. Once a patient's ulcer had healed completely either by primary healing or skin grafting or a lower-limb amputation performed, the outcome was noted and the patient was deemed to have completed the study.

Healing was defined as complete epithelisation or healing after skin grafting. Amputation was defined as minor or major amputation. Toe disarticulation and fore foot amputation was taken as minor while above or below knee amputation as major.

Inclusion criteria:

1. Age limit: 20-80 years.
2. All subjects suffering from Diabetes mellitus as per WHO criteria with foot ulcers
 - a) Symptoms of Diabetes plus random blood sugars >200mg/dl.
 - i. Or
 - ii. Or
 - b) Fasting blood sugars >126mg/dl
 - c) Two hour plasma glucose levels >200 mg/dl.
3. All diabetic foot ulcers irrespective of its duration.

Exclusion criteria

1. Venous stasis ulcers with Diabetes mellitus.
2. All patients with less than two follow up visits during observation period.
3. Non diabetic neuropathic ulcers.
4. Ulcers above the ankle.
5. All non-Diabetics with foot ulcers.
6. With evidence of gangrene

Ulcers were scored by the below mentioned variables. Diabetic Ulcer Severity Score (DUSS) was calculated by adding these separate scored variables to a theoretical maximum of 4.

Table 1: DUSS scoring system

Variables	Score 0	Score 1
Palpable Pedal pulses	Presence	Absence
Probing to bone	No	Yes
Ulcer site	Toes	Foot
Ulcer number	Single	Multiple

This score obtained was then compared with the final outcome to validate the prediction of DUSS score.

Statistical analysis: Baseline characteristics were expressed as mean, median and inter quartile range. Kaplan Meir was used to find the correlation between DUSS score and probability of healing.

RESULTS

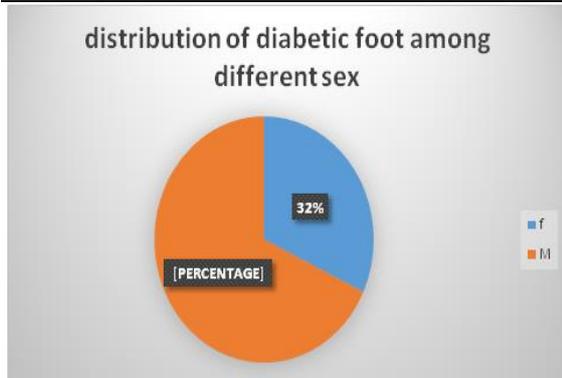
100 patients with diabetic foot were included in our study. The following are our observations. The most commonly affected age group was 41-60 yrs, with mean age of 52±=2

Table 2: Age wise distribution of diabetic foot ulcer in study population.

Age in years	No of patients	Percentage
21-40	9	9%
41-60	55	55%
61-80	36	36%

Males were most commonly affected accounting to 68%.

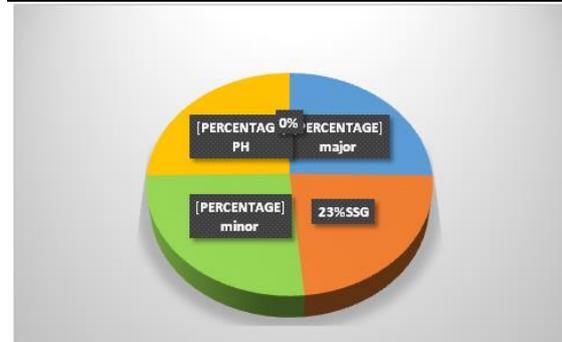
Table 3: Distribution of sex among the study group.



Out of 100 patients, 25% of patients had major amputation i.e. above knee and below knee amputations, while 26% of them underwent minor amputations i.e. toe disarticulation or fore foot amputation. 25% and 23% of ulcers healed by primary intention and split skin graft respectively. Most of the ulcers were given DUSS score of 1(24% of patients), followed by DUSS score of 0 (22% of patients). Among 46 patients with DUSS score 0 and 1; 50% of ulcers healed by primary intention, 37% of

patients underwent split skin graft, 6.5% underwent minor amputation and 6.5% had major amputation. 3 out of 21(14%) patients with DUSS score of 2 underwent major amputations. while 9 out of 19 with DUSS score of 3 and 10 out of 14 with DUSS score of 4 had major amputations.

Table 4: Distribution of diabetic foot outcome in study population.



The probability of healing with DUSS score was analysed using Kaplan meirstatistics. The probability of healing with score of 0 was 95%, with score 1- 91.6%, with score 2-85.7%, with score 3-52.7% and with score 4- 28.5%.

Table 5: Kaplan Meier analysis for DUSS score

DUSS score	Total N (total no of patients)	N of events (no of amputation)	Censored	
			N (no of healing)	Percentage
0	22	1	21	95%
1	24	2	22	91.6%
2	21	3	18	85.7%
3	19	9	10	52.6%
4	14	10	4	28.5%

DISCUSSION

Other than the original study there are no studies done on DUSS scoring system. It was done by Beckert et al and it was a prospective study done with 1000 patients with diabetic foot ulcers.

Overall 52 of 100(46%) people had amputations in our study. Major amputation (below or above knee amputation) was done for 25% of patients in our study. Minor Amputation (toe or forefoot amputations) was done in 27% of patients in our study.

In our study on Kaplan Meier analysis the probability of healing with score 0 was 95%, 91.6% with score 1, 85.7% with score 2, 52.6% with score 3, 28.5% with score 4. In our study there was 95% probability of healing for score 0, decreasing to 28.5% with score 4(p=0.049), similar to as shown by the study

conducted by Beckert et al. It is noted that a lower DUSS score was strongly associated with healing.

In the original study by Beckert et al Patients with a score of 0 had no risk of major amputation, while patients with a score of 1 had a 2.4%, patients with a score of 2 had a 7.7%, patients with a score of 3 had an 11.2%, and patients with a score of 4 had a 3.8%. In comparison in our present study 1 out of 22 with score 0, 2 out of 24 with score 1, 3 out of 21 with score 2, 9 out of 19 people with score 3 and 10 out of 14 people with score 4 had major amputations.

CONCLUSION

DUSS scoring system provides an easy diagnostic tool for predicting probability of healing or amputation by combining four clinically assessable wound based parameters. It is very simple and easy to reproduce. The study groups can be stratified

depending on severity of ulcers and thus can help provide a simple, streamlined approach in clinical setting without need of any advanced investigative tool, but it does not alter the procedure of wound management.

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