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Research Article

Validation of diabetic ulcer severity score

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ABSTRACT

Background: To assess the efficacy of Diabetic Ulcer Severity Score (DUSS), a wound-based clinical scoring system for diabetic foot ulcers in anticipating the clinical outcomes. Design: Prospective study.
Methods: Total of 200 Diabetic patients with foot ulcers attending surgical outpatient clinic or admitted into the hospital, irrespective of duration of ulcer from February 2014 to November 2015 were included in the study. Necessary data was collected. DUSS score was calculated for each patient and analysis was done using SPSS package version 17.
Results: Most commonly ulcers were of DUSS Score of 2 and 3. Overall 107 of 200 people had amputations in our study. Amputations were more common in patients with DUSS score 4 followed by 3. Major amputation was common in patients with DUSS score 4, none of the patients with score 0, 1 and 2 had major amputation, minor amputations were more common in patients with DUSS score of 3. The probability of healing without amputation with score 0 was 100% and decreases to 5.71% with score 4.
Conclusions: DUSS scoring system provides an easy diagnostic tool for anticipating probability of healing /amputation and need for surgery by combining four clinically assessable wound based parameters. It can be very helpful for the stratification of study groups depending on severity of ulcers and it provides a simple, streamlined approach in a clinical setting that requires no investigative equipment although subsequent adequate Wound care is an indispensable prerequisite to the DUSS being a valid diagnostic tool.

Keywords: DUSS, Diabetic foot, Amputation

INTRODUCTION

Foot ulcers are a common complication of diabetes and represent a major source of morbidity. Approximately 15% of diabetics develop foot ulcers during their life time, and 70% of healed ulcers are estimated to reoccur in 5 years.[1,2] In the years between 1958 and 1993, the number of people diagnosed with Diabetes multiplied fivefold.[3] By the year 2025, it is estimated that this figure would increase to more than 300 million.[4] Peripheral neuropathy, peripheral vascular disease, abnormal plantar pressure load, and infection are accepted as the main risk factors for the development of diabetic foot ulcers and amputations.[5,6]

Since diabetic foot wounds and amputations account for a significant part of diabetic related health care costs, several attempts have been made to establish classification systems that help assess the severity of disease.[7,8] According to the international working group on diabetic foot, a classification system appropriate for clinical practice should facilitate communication between health care providers, influence daily management, and provide information about the healing potential of an ulcer.[9]A number of foot ulcer classification systems for example, the Wagner system and the University of Texas (UT) systems have been devised in an attempt to categorize ulcers more effectively and thereby, allow effective comparison of the outcome of routine

management in different centers and treatment strategies. These systems are variously based on the site of ulcer, its depth, presence /absence of neuropathy, infection and peripheral arterial disease and have been used to compare the outcomes. In contrast to classification systems a clinical severity score should be based on a standardized clinical assessment of wound-based parameters facilitating the categorization of wounds into specific severity subgroups for comparison of outcome with respect to the clinical course of wound repair. Diabetic ulcer severity score (DUSS) is one of the latest wound based scoring system which needs to be validated.[10]

Aim of the study was to analyze the efficacy of DUSS scoring system in diabetic foot ulcers for prediction of clinical outcomes on the surgical patients and its applicability in day-to-day practice.

Inclusion criteria

All patients between 20-80 years suffering from diabetes mellitus, who have foot ulcers.

Exclusion criteria

Patients with venous ulcer; who lost follow up or only two follow up and all non-diabetic ulcer.

METHODS

Patients presenting with diabetic foot ulcer were properly scrutinized with detailed history clinical examination, extent of tissue loss, DUSS Score, GRBS, duration of diabetes.

Before any surgical intervention wounds were graded by below given grading system. Ulcers were labelled infected, if a purulent discharge was present with two of the local signs mentioned below. Wound depth was evaluated using a sterile blunt probe. The ability to probe bone with the presence of local inflammation (warmth, erythema, lymphangitis, lymphadenopathy, edema, pain) or signs of systemic infection and suggestive radiological features provided a clinical diagnosis of osteomyelitis.[52] Sharp debridement was done in necessary cases.

Peripheral vascular disease was clinically detected by the absence of pedal pulses, patients were categorized into groups having either single or multiple ulcerations on the same foot. 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.

Diabetic ulcer severity score (DUSS)

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.

Standard treatment care was given to all these patients, which included oral hypoglycemic or insulin for good control of diabetes, health education, antibiotics and regular wound care.

Dressings were done every day during the hospital stay, in few patients vacuum assisted closure was also done for faster healing. Healing was defined as complete epithelization or healing after skin grafting.

Amputation is divided into minor amputation such as toe or forefoot amputation, or major amputation such as below- or above-knee amputation. Amputation rate was defined as the percentage of patients undergoing minor or major amputation within the observation period.

Follow up: Patients were followed up in the surgical outpatient clinic for DUSS scoring once in fortnight for 1st month, then once in a month till the ulcer healed or for a minimum period of up to 6 months. Ulcer healing was assessed as follows;

- Complete healing without any surgical intervention.
- Healing with the help of any surgical intervention other than amputation.
- Amputation.

Statistical analysis

Data was entered in Microsoft Excel and analysis was done using SPSS software Version 17. Prospective analysis was done and mean, median and percentage were calculated. The association between DUSS Score and various outcomes like primary healing, need for skin grafting or minor/major amputation was calculated using 't' test and Chi square test. Kaplan-Meier method was used to calculate the probability of healing.

RESULTS

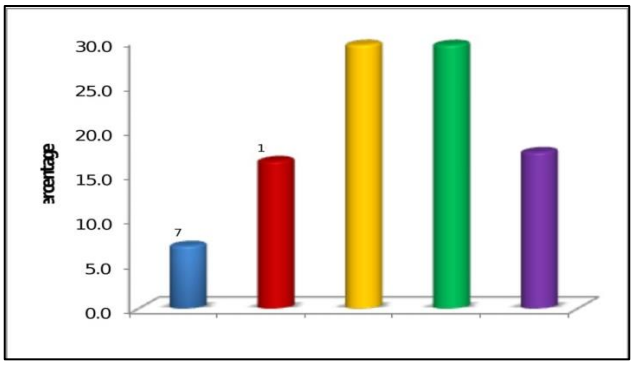

Figure 1: Percentage distribution of the sample according to DUSS score.

A total of 200 patients with diabetic foot ulcers were taken into study and DUSS score was calculated and the following results were analyzed and the probability of healing with score 0 was 100%, 78.79% with score 1, 66.10% with score 2, 20.34% with score 3, 5.71% with score 4.

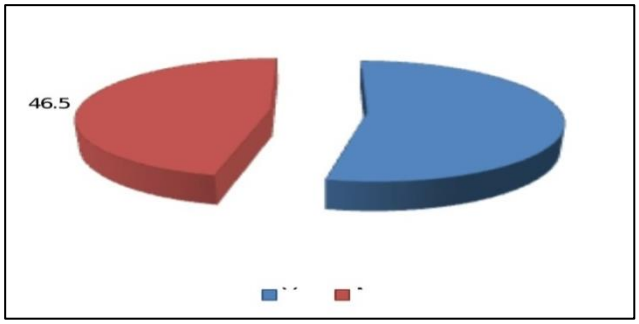

Figure 2: Percentage distribution of the sample according to amputation.

Most common age group affected with diabetic foot was between 51-60 years. Mean age group was 54.6±12.4 years. Males were commonly affected by diabetic foot ulcers accounting to 59% in our study (Figure 1). Most commonly ulcers were of DUSS score of 2 and 3 which constituted 118 of 200 patients (59%).

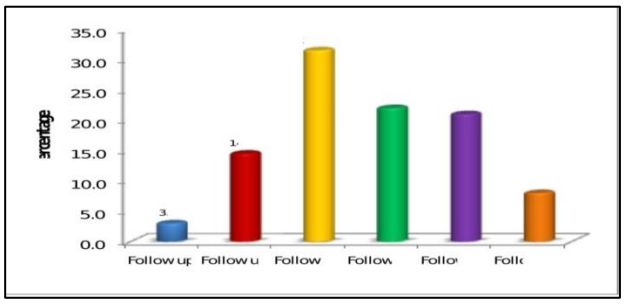

Figure 3: Percentage distribution of the sample according to healing period.

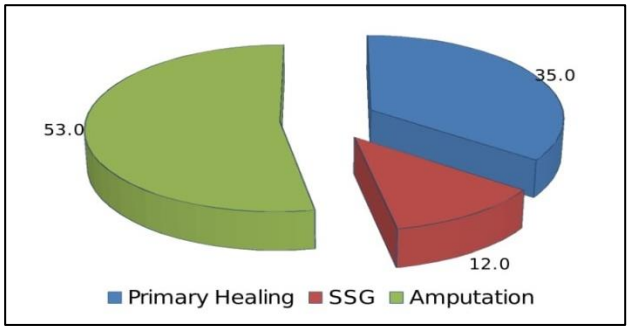

Figure 4: Percentage distribution of the sample according to healing.

Total of 107 patients underwent amputation in our study which is 53.5%. Major amputation rate was 34.6% done in 18.5%, minor amputation were 65.4% done in 35% of all patients (Figure 2).

The average follow up period to attain maximum healing is found to be up to follow up 4, followed by 5th follow up (Figure 3).

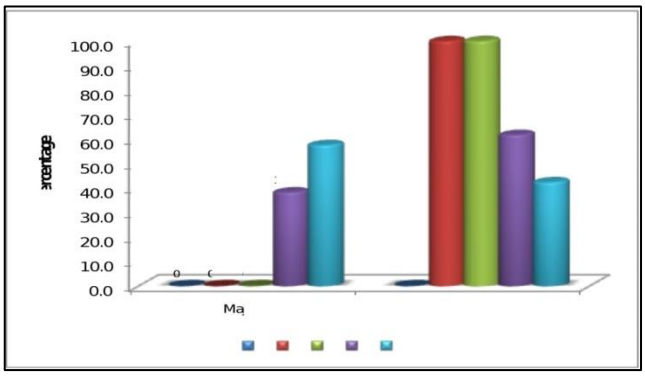

Figure 5: Comparison of type of amputation based on DUSS score.

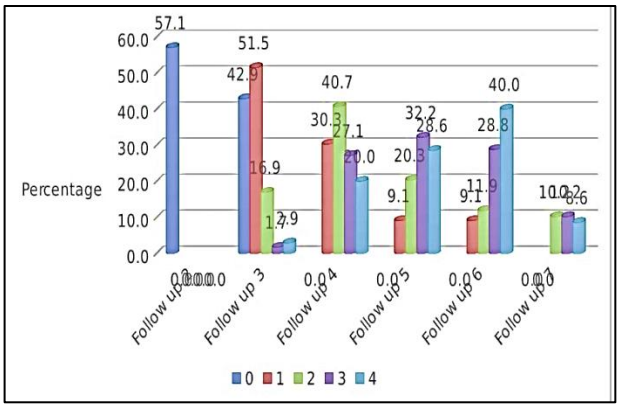

Figure 6: Comparison of healing period based on DUSS score.

Primary healing occurred in 69 patients and SSG had to be done in 24 patients and 107 patients underwent amputations irrespective of DUSS score.10% of the patients underwent above knee amputation.8.5% of patients underwent below knee amputation.9% of patients underwent forefoot - amputation.26% of the patients underwent disarticulation. The mean healing time was found to be 115.9±37.9 days (Figure 4).

Association of DUSS with selected variables

When duration of diabetes is less than 10 years most of the ulcers have a score of 1 and 2, when duration is more than 10 years most ulcers have score of 3 and 4.This difference in the DUSS score among the duration groups was found to be statistically significant (P<0.05).

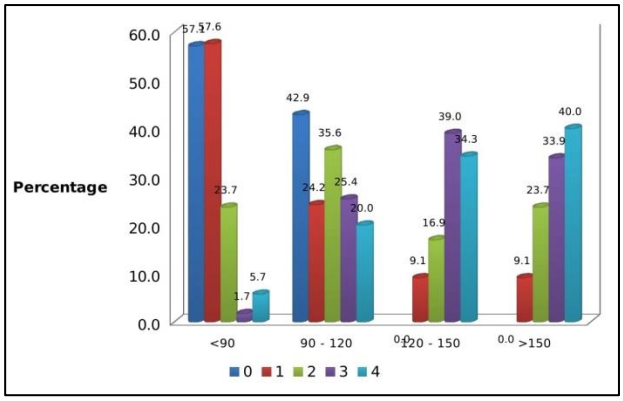

Figure 7: Comparison of healing time based on DUSS score.

0 out of 14 people with score 0 had amputations, 7 (21.2%) out of 33 people with score 1 had amputations, 20 (33.9%) out of 59 people with score 2 had amputations, 47 (79.7%) out of 59 people with score 3 had amputations, 33 (94.3%) out of 35 people with score 4 had amputations. Overall 107 (55.0%) of 200 people had amputations.

Table 1: Diabetic ulcer severity score.

Parameter	Score 0	Score 1
Palpable Pedal Pulses	Present	Absent
Probing to Bone	No	Yes
Ulcer Site	Toes	Foot
Ulcer Number	Single	Multiple

Table 2: Ulcer grading.

Ulcer grade	Wound depth measured by sterile blunt probe
Grade 1	Dermis
Grade 2	Subcutaneous tissue
Grade 3	Fascia
Grade 4	Muscle
Grade 5	Bone

Total of 18 (38.3%) of 59 people with score 3 had major amputations; 19(57.6%) out of 35 people with score 4 had major amputations in our study. None of the patients with score 0, 1 and 2 had major amputation (Figure 5).

Table 3: Comparison of amputation based on DUSS score.

Amputation	0	1	2	3	4	χ^2	p
Yes	0 (0)	7 (21.2)	20 (33.9)	47 (79.7)	33 (94.3)	78.68**	0.001
No	14 (100)	26 (78.8)	39 (66.1)	12 (20.3)	2 (5.7)		

**Significant at 0.01 level

Table 4: Comparison of healing based on DUSS score.

Healing	0	1	2	3	4	χ^2	p
Primary healing	12 (85.7)	18 (54.5)	31 (54.2)	8 (13.6)	0 (0)		
SSG	2 (14.3)	7 (21.3)	9 (15.3)	4 (6.8)	2 (5.7)	82.9**	0.001
Amputation	0 (0)	8 (24.2)	19 (30.5)	47 (79.6)	33 (94.3)		

**Significant at 0.01 level

None with score 0 underwent minor amputation. 7 patients with score 1, 20 patients with score 2, and 29 patients with score 3, 14 patients with score 4 underwent minor amputation.

Table 5: Distribution of ulcers (DUSS score 0-4) with study endpoints.

Healing	0	1	2	3	4	Total	χ^2	p
Primary healing	12 (85.7%)	18 (54.5%)	31 (54.2%)	8 (13.6%)	0 (0)	69 (35%)		
SSG	2 (14.3%)	7 (21.3%)	9 (15.3%)	4 (6.8%)	2 (5.7%)	24 (12%)	82.9**	0.001
Amputatin	0 (0)	8 (24.2%)	19 (30.5%)	47 (79.6%)	33 (94.3%)	107 (53%)		
Total	14 (100%)	33 (100%)	59 (100%)	59 (100%)	35 (100%)	200 (100%)		

**Significant at 0.01 level

Ulcers with DUSS score 0.8 out of 14 (57.1%) ulcers got healed by 2nd follow up, remaining 6 healed by 3rd follow up. No patents underwent amputation. 2 patients underwent SSG. Ulcers with DUSS score 1. Majority of ulcers i.e. 17 (51.5%) healed by 3rd follow up, 10 got healed by 4th follow up, 3 healed by 5th follow up and remaining 3 healed by 6th follow up.

Out of 33 ulcers 7 healed after minor amputation and 7 healed after SSG. Ulcers with DUSS score 2.10 ulcers out of 59 (16.9%) healed by 3rd follow up, 24 (40.7%) healed by 4th follow up, 12 healed by 5th follow up, 7 healed by 6th follow up and 6 healed by 7th follow up.

Out of 59 ulcers 20 healed after minor amputation and 8 healed after SSG. Ulcers with DUSS score 31 ulcer out of 59 healed by 3rdfollow up, 16 (27.1%) healed by 4th follow up, 19 (32.2%) healed by 5th follow up, 17 (28.8%) healed by 6th follow up and 6 healed by 7th follow up. Out of 59 ulcers 47 healed after amputation (18 major and 29 minor) and 4 healed after SSG. Ulcers with DUSS score 4 33 (94.3%) 0f 35 ulcers with score 4 healed after amputation, 1 of them by 3rd follow up, 7 (20%) by 4th follow up, 9 (25.7%) by 5th follow up, 13 (37.1%) by 6th follow up and 3 by 7th follow up. 1 healed after SSG in 5th and 6th follow up respectively (Figure 6).

Table 6: Kaplan-Meier analysis for DUSS scores.

	Number of events [a]		Number censored [b]		
Factor	**N**	**%**	**N**	**%**	**Total sample size**
0	0	0.00	14	100.00	14
1	7	21.21	26	78.79	33
2	20	33.90	39	66.10	59
3	47	79.66	12	20.34	59
4	33	94.29	2	5.71	35
Overall	107	53.50	93	46.50	200

The above table shows that ulcers with lower score healed earlier when compared to those ulcers with higher scores. Majority of ulcers with score 0 healed by the end of 2nd follow up, most ulcers with score 1 healed by 3rd or 4th follow up, most ulcers with score 2 healed by 5th follow up. Patients with Score 3 and 4 healed mostly after surgical intervention by repeated surgical debridement or either after amputation or SSG.

Comparison of amputation based on DUSS score

No above knee amputation was done when the DUSS scores were 0,1,2 and 8 patients which is 13.6% of the patients with duss score 3 underwent above knee amputation and 12 patients which is 34.3% of patients with DUSS score 4 underwent above knee amputation.No below knee amputation was done when the DUSS scores were 0,1,2 and 1- patients which is 16.9% of the patients with duss score 3 underwent below knee amputation and 7 patients which is 20% of patients with DUSS score 4 underwent below knee amputation. No patients with DUSS score 0 underwent forefoot amputation, 1 patient with DUSS score 1 which is 3% of the patients with DUSS score 1, and 2 patients with DUSS score 2 which is 3.4% of the patients with DUSS score 2, and 7 patients with DUSS score 3 which is 11.9% of the patients with DUSS score 3, and 8 patients with DUSS score 4 which is 22.9% of the patients with DUSS score 4 underwent forefoot amputation. No patients with DUSS score 0 underwent disarticulation, 6 patients with DUSS score 1 which is 18.2% of the patients with DUSS score 1, and 18 patients with DUSS score 2 which is 30.5% of the patients with DUSS score 2, and 22 patients with DUSS score 3 which is 37.3% of the patients with DUSS score 3, and 6 patients with DUSS score 4 which is 17.1% of the patients with DUSS score 4 underwent disarticulation (Figure 7).When DUSS score is low most of the diabetic foot ulcers healed within 120 days and when the DUSS score is high it took greater time for healing >120 days.

Majority of foot ulcers among study population with DUSS score 0, 1 and 2 healed by primary intention or skin grafting i.e., 12 (85.7%), 18 (54.5%) and 32 (52.9%) respectively. However among those with score 3 and score 4 majority required amputation i.e., 47 (79.6%) and 33 (94.3%) respectively. This difference in the DUSS score among these groups was found to be statistically significant (P<0.001).

The probability of healing with score 0 was 100%, 78.79% with score 1, 66.10% with score 2, 20.34% with score 3, 5.71% with score 4.

DISCUSSION

Total of 200 diabetic patients with foot ulcers irrespective of duration of ulcers attending surgical outpatient clinic or admitted into the hospital were recruited into the study based on the inclusion and exclusion criteria mentioned earlier. Most common age group affected with diabetic foot was between 51-60 years. Mean age group was 54.6±12.4 years. A study undertaken in the USA in 2004 through the 2002 National Hospital Discharge Survey, evaluated 275,000 in patient records from 500 hospitals from1996 onwards. This study revealed that elderly diabetics had twice the risk of developing a foot ulcer, three times the risk of developing a foot abscess and four times the risk of developing osteomyelitis.[11]

Toe amputations comprise the majority of Diabetes-related lower limb amputations. The age-adjusted Lower Extremity Amputation rate (LEA) in year 2002 among persons with Diabetes was highest for toe level amputation (rate of 2.6 per 1,000 persons), followed by below-knee amputation (rate of 1.6 per 1,000 persons). Both the age adjusted fore foot amputation rate and above-knee amputation rate was 0.8 per 1,000 persons. Generally, the lower extremity amputation rate is 15 to 40 times higher in the diabetic versus non diabetic populations, and the amputation rate is at least 50% higher in men compared to women. Lower extremity amputation rate among diabetic men was 7.0 per 1,000 persons compared with the rate among diabetic women reported at 3.3 per 1000 persons.[12] In our study toe amputation was done in total of 26% of patients, fore foot amputation was done in total of 9% of patients, below

knee amputation was done in total of 8.5% of patients, above knee amputation was done in total of 10% of patients.

Other than the original study there are no studies done on DUSS scoring system. It was done by Beckert et al and was a prospective study done with 1000 patients with diabetic foot ulcers.[10]

Overall 107 (53.5%) of 200 people had amputations in our study. Major amputation (below or above knee amputation) was done for 18.5% of patients in our study. Minor Amputation (toe or forefoot amputations) was done in 35%. In our study on Kaplan Meier analysis the probability of healing with score 0 was 100%, 78.79% with score 1, 66.10% with score 2, 20.34% with score 3, 5.71% with score 4. In our study there was 100% probability of healing for score 0, decreasing to 5.71% with score 4 (p=0.080), similar to as shown by the study conducted by Beckert et al.[10] They noted that a lower DUSS score was strongly associated with healing. Although the DUSS system makes no distinction between neuropathic and neuro ischemic ulcers, there was a93% probability of healing for uncomplicated ulcers (score 0), decreasing to 57% for ulcers with a severity score of 4 (P =0.0001) according to Kaplan Meier analysis.

Beckertet al reported primarily healing of 74% (n=1,000), Prompers et al 77% (n=1,229), Oyibo et al 65% (n=194), Jeffcoate et al 66% (n=449) and Gul et al 72%(n=200).[10,13-16]

In the more than 10-year follow-up study conducted by Margolis et al a cohort of24,616 individuals with a diabetic neuropathic foot ulcer treated within a multicenter wound care network were studied.[17] Total of 1653 (6.7%) individuals had an amputation and 46.3% of these amputations were of a toe or ray (minor amputation). The percentage of those who had an amputation varied from 5.6% to 8.4%. Of those who had an amputation, the percentage that had a minor amputation increased over time from 4.0% int he earlier years to more than 60% in the later years of observation.

In our study 107 patients underwent amputation of which 70 (65.4%) were minor amputations 37 (34.6%) were major amputations.

When the DUSS score was compared with the proportion of individuals undergoing amputation it was noted that a total of 18 (30.5%) of 59 people with score 3 had major amputations, 19 (54.3%) out of 35 people with Score 4 had major amputations in our study. None of the patients with score 0, 1 and 2 had major amputation. No patients with score 0 had minor amputation; 7 (21.2%) of 33 patients with score 1 had minor amputation, 20 (33.9%) of 59 patients had minor amputation, 29 (49.2%) of 59 patients with score 3 had minor amputations, 14 (40%) of 35 patients with score 4 had minor amputations. Minor amputations were more common in patients with DUSS score of 3 in our study.

Most commonly ulcers were of DUSS Score 2 and 3. Mean score was2.340±1.145. None out of 14 people with score 0 had amputations, 7 (21.2%) out of 33 people with score 1 had amputations, 20 (33.9%) out of 59 people with score 2 had amputations, 47 (79.7%) out of 59 people with score 3 had amputations, 33 (94.3%) out of 35 people with score 4 had amputations. This shows that minor amputations are most commonly done amputations in patients with DUSS score 2 and 3 and major amputations were done mostly in patients with DUSS score 3 and 4.

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 a7.7%, patients with a score of 3 had an 11.2%, and patients with a score of 4 had a3.8%.In comparison in our present study none of the patients with score 0, 1 & 2 had major amputation, 18(30.5%) of 59 people with score 3 had major amputations;19(54.3%) out of 35 people with score 4 had major amputations.[10]

Our study showed that ulcers with lower score healed earlier when compared to those ulcers with higher scores. 17 (51.5%) of ulcers with DUSS score 1 healed by 3rd follow up, among ulcers with DUSS score 2, 10 ulcers out of 59 (16.9%) healed by 3rd follow up, 24 (40.7%) healed by 4th follow up. Among ulcers with DUSS score 3, Out of 59 ulcers 47 healed after amputation (18 major and 29 minor) and 4 healed after SSG, 16 (27.1%) healed by 4th follow up, 19 (32.2%) healed by 5th follow up, 17 (28.8%) healed by 6th follow up**.** Among ulcers with DUSS score 4, 33 (94.2%) of 35 ulcers with score 4 healed after amputation, 1 of them by 3rd follow up, 9 (25.7%) by 5th follow up, 13 (37.1%) by 6th follow up. So basing on DUSS score evaluation probability of hospitalization and surgical procedures could be anticipated. Patients with a high DUSS were more likely to undergo surgery and hospitalization.

Original study by Beckertet al also showed patients with a high DUSS were more likely to undergo surgery and hospitalization.[10]

Among various studies on diabetic foot ulcers, higher costs were observed among younger patients, patients with inadequate vascular status, and patients whose ulcer progressed to a higher severity level. Costs averaged $4,465 higher for patients less than 65years compared with older patients.[18] In our study mean age group was found to be 54.6±12.4years.

A Swedish study investigated costs for managing deep foot infections in 220 patients and categorized them according to clinical outcome.[19] Mean healing time for patients who did not need an amputation was 29 weeks;

for those who required minor or major amputation, it was 52 weeks and 38 weeks, respectively.

Diabetic foot ulcers are very common complication in Diabetic patients and important cause of morbidity to patient and affect quality of life and also account for a significant part of diabetes-related health care costs. Beckert et al proposed a clinical severity scoring (Diabetic Ulcer Severity Score DUSS) based on a standardized clinical assessment of wound-based parameters facilitating the categorization of wounds into specific severity subgroups for comparison of outcome with respect to the clinical course of wound repair which included: palpable pedal pulses, probing to bone, ulcer location (foot or toe ulcer). Accordingly diabetic foot ulcers were categorized to a severity score ranging from 0 to 4. Objective of this study is to assess the efficacy of DUSS, in anticipating the clinical outcomes i.e. chances for healing and risk of amputation and assess the applicability of the scoring system in day-to-day clinical practice. A prospective observational study was done which included 200 diabetic foot ulcer patients irrespective of their duration, attending surgical outpatient department or admitted into the hospital between February 2014 to November 2015 were recruited into the study, ulcers were classified by the above mentioned variables, Diabetic ulcer severity score (DUSS) was calculated by adding these separate grading to a theoretical maximum of 4, standard wound care given to all patients and they were followed up for 6 months to look for ulcer healing rate, major or minor amputation. Most common age group affected with diabetic foot was between 51-60 years, Second group being between 41-50 years. Mean age group was 54.6±12.4 years. Males were commonly affected by Diabetic foot ulcers accounting to 59% in our study. Most commonly ulcers were of DUSS score of 2 and 3 which constituted 118 of 200 patients (59%). Total of 107 patients underwent amputation in our study which is 53.5%. Major Amputation takes 34.6% (37) of all amputations done and was done in 18.5% of all patients in our study and minor amputation constitutes 65.4% (70) if all amputations and 35% of all patients in our study. Primary healing occurred in 69 patients and SSG had to be done in 24 patients irrespective of DUSS score. The mean healing time was found to be 115.9±37.9 days. When duration of DM is less than 10 years most of the ulcers have a score of 1 and 2, when duration is more than 10 years most ulcers have score of 3 and 4, emphasizing longer duration of diabetes is associated with more severe ulcers. 0 out of 14 people with score 0 had amputations, 7 (21.2%) out of 33 people with score 1 had amputations, 20 (33.9%) out of 59 people with score 2 had amputations, 47 (79.7%) out of 59 people with score 3 had amputations, 33 (94.3%) out of 35 people with score 4 had amputations. Overall 107 (55.0%) of 200 people had amputations. Total of 18 (38.3%) of 57 people with score 3 had major amputations; 19 (57.6%) out of 33 people with score 4 had major amputations in our study. None of the patients with score 0, 1 and 2 had major amputation. Majority of ulcers with DUSS 1 i.e. 17 (51.5%) healed by 3rd follow up, 10 got healed by 4th follow up, 3 healed by 5th follow up and remaining 3 healed by 6th follow up. Out of 33 ulcers 7 healed after minor amputation and 7 healed after split skin graft, rest healed primarily. 10 ulcers out of 59 (16.9%) with DUSS 2 healed by 3rd follow up, 24 (40.7%) healed by 4th follow up, 12 healed by 5th follow up, 7 healed by 6th follow up and 6 healed by 7th follow up. Out of 59 ulcers 20 healed after minor amputation and 8 healed after split skin graft. 1 ulcer out of 59 with DUSS 3 healed by 3rd follow up, 16 (27.1%) healed by 4th follow up, 19 (32.2%) healed by 5th follow up, 17 (28.8%) healed by 6th follow up and 6 healed by 7th follow up. Out of 59 ulcers 47 healed after amputation (18 major and 29 minor) and 4 healed after split skin graft. 33 (94.3%) 0f 35 ulcers with score 4 healed after amputation, 1 of them by 3rd follow up, 7(20%) by 4th follow up, 9(25.7%) by 5th follow up, 13(37.1%) by 6th follow up and 3 by 7th follow up. 1 healed after SSG in 5th and 6th follow up respectively. The above data showed that ulcers with lower score healed earlier when compared to those ulcers with higher scores. Majority of ulcers with score 0 healed by the end of 2nd follow up, most ulcers with score 1 healed by 3rd or 4th follow up, most ulcers with score 2 healed by 5th follow up. Patients with Score 3 and 4 healed mostly after surgical intervention by repeated surgical debridement or either after amputation or SSG. Time taken for healing was also found to be greater than lesser scores. When DUSS score is low most of the diabetic foot ulcers healed within 120 days and when the DUSS score is high it took greater time for healing >120 days. Majority of foot ulcers among study population with DUSS score 0, 1 and 2 healed by primary intention or skin grafting i.e., 12 (85.7%), 18 (54.5%) and 32 (52.9%) respectively. However among those with score 3 and score 4 majority required amputation i.e., 47 (79.6%) and 33 (94.3%) respectively. “p” value was found to be significant in all the analysis. The probability of healing with score 0 was 100%, 78.79% with score 1, 66.10% with score 2, 20.34% with score 3, 5.71% with score 4 on Kaplan-Meier analysis. DUSS scoring system provides an easy diagnostic tool for predicting probability of healing or amputation by combining four clinically assessable wound based parameters. 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. This new severity scoring system also provides an early idea regarding hospital admission, local surgery and health care costs. Since this scoring system can be easily applied in daily clinical practice, it may be suitable estimating putative healthcare costs.

CONCLUSION

DUSS scoring system provides an easy diagnostic tool for anticipating probability of healing /amputation and need for surgery by combining four clinically assessable

wound based parameters. It can be very helpful for the stratification of study groups depending on severity of ulcers and it provides a simple, streamlined approach in a clinical setting that requires no investigative equipment although subsequent adequate Wound care is an indispensable prerequisite to the DUSS being a valid diagnostic tool.

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