

**To Evaluate the Diabetic Foot Using Diabetic Ulcer Severity Score in GMC Kadapa****R. Pushpalatha<sup>1</sup>, B. Nageswara Rao<sup>2</sup>, U. Harshini<sup>3</sup>, M. Vijay Kumar<sup>4</sup>**<sup>1</sup>MS, Associate Professor, Department of Surgery, GMC, Kadapa<sup>2</sup>MS, Associate Professor, Department of Surgery, ACSR, Nellore<sup>3</sup>Post Graduate, Department of Surgery, GMC, Kadapa<sup>4</sup>Assistant Professor, Department of Surgery, GMC, Kadapa

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Conflict of interest: Nil

**Abstract:**

**Background:** In Diabetic foot ulcers early expert assessment and treatment are required to reduce the impact of the condition on the patient and to reduce the incidence of major amputation. The incidence of major amputation has been described as 'a marker not just of disease, but also of disease management'. So a classification system that is easy to apply and robust enough to permit should be available in routine practice.

The Aim of the study was undertaken to analyze the efficacy of DUSS scoring system in diabetic foot ulcers for prediction of clinical outcomes.

**Materials And Methods:** Prospective Observational Study in GMC Kadapa over one year period in the Department of General surgery, in 100 cases that were randomly selected.

**Conclusion:** DUSS scoring system provides an easy diagnostic tool for know the probability of healing and amputation. It combines four clinically assessable wound based parameters peripheral pulses, bone probing, number and site of ulcers giving 0 and 1 score for each parameter. DUSS score helps us to stratify patients based on score. It is a simple, streamlined approach in a clinical setting without any investigations. So this can be used in any setup to assess the diabetic ulcers. Lower DUSS score was strongly associated with healing and higher score with amputation.

**Keywords:** Diabetic Foot, DUSS score, Amputations.

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**Introduction**

Foot ulcers are a common complication of diabetes and represent a major source of morbidity. The incidence of foot ulcers with diabetes is around 2% per year. [1] Foot ulceration is due to peripheral neuropathy, peripheral vascular disease, foot deformities, external trauma and Peripheral odema. [2] Up to 70% all non-traumatic amputations in the world occur in diabetics. [3]

Many of these amputations are preventable as 85% are preceded by a foot ulcer. In Diabetic foot ulcers early expert assessment and treatment are required to reduce the impact of the condition on the patient and to reduce the incidence of major amputation. The incidence of major amputation has been described as 'a marker not just of disease, but also of disease management'. So a classification system that is easy to apply and robust enough to permit should be available in routine practice. [4]

According to 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 potential healing of ulcer. [5] Many classification systems have been proposed in the past. Some are based on extensive diagnostic work up and complex grading or scoring schedules, while others do not include all diabetic foot complications. Wagner system and the University of Texas systems have been devised in an attempt to categorize ulcers more effectively and thereby, allow effective comparison of the outcome of routine management. However, they have their own pros and cons and are not capable of predicting long-term outcome. [6] Diabetic ulcer severity score (DUSS) was designed by Beckert et al [7] considering the four clinically defined parameters, namely palpable pedal pulses, probing to bone, ulcer location and presence of multiple ulcerations to outcome this problem, and have found that healing was independently associated with Peripheral arterial disease, ulcer depth & site and ulcer number.

According to Beckert et al [7] a lower DUSS score was strongly associated with healing and it is simple, provides an easy diagnostic tool for predicting probability of healing or amputation, which can be applied in daily clinical practice without need of any advanced investigative tool.

Diabetic Ulcer Severity Score is one of the latest simple wound based clinical score which needs to be evaluated for its effectiveness in predicting the outcome of foot ulcers in patients with diabetes.

#### Aim of the study:

This study was undertaken to analyze the efficacy of DUSS scoring system in diabetic foot ulcers for prediction of clinical outcomes

#### Materials & Methods:

Prospective Observational Study in GMC Kadapa over one year period in the Department of General surgery, in 100 cases who were randomly selected. Male and female patients between age group 20-80 years with diabetic foot were included and established gangrene at the time of admission were excluded. History, clinical examination, investigations, course in hospital and during

follow-up was entered into data collection forms. Diabetic Ulcer Severity Score was calculated for all cases and noted. Peripheral vascular disease was clinically detected by the absence of both pedal pulses.

Wound depth was evaluated using a sterile blunt probe. The ability to probe to bone with local inflammation gives a clinical diagnosis of osteomyelitis.<sup>8</sup> Number of ulcers, site and size of ulcers noted. Surgical debridement and dressing was done in cases accordingly.

Once healthy granulation tissue appeared patients are discharged and followed up as scheduled. If the ulcer progresses and need intervention amputations were planned. Patients were followed up for 15 days once in first 2 months, once in a month in next four months, (total of 8 follow ups). A descriptive statistics based were expressed in percentages. Baseline characteristics were expressed as median and range. Kaplan-Meier method was used to calculate the probability of healing. Cox regression was used to find the correlation between DUSS and healing.

#### Results

**Table 1: DUSS Score**

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

**Table 2: Age Distribution**

Age in years	Number of patients	Percentage
21-35	13	13
36-50	34	34
51-65	37	37
66-80	16	16
Total	100	100

**Table 3: Distribution of DUSS Score among Study Population**

DUSS Score	Number of patients	Percentage
0	9	9
1	21	21
2	24	24
3	32	32
4	14	14
Total	100	100

51 cases had amputations and 15 were major and 36 were minor among them. Major amputation was done for 15 cases, Above Knee Amputation in 2 and Below Knee Amputation in 13 cases. Minor Amputation was done for 36 cases, Fore Foot Amputation in 27 and Toe disarticulation 9 cases. With DUSS score 0, in 9 ulcers, 78% got healed by 3rd follow up, 22% healed by 4th follow up. With DUSS score 1, in 21 ulcers, 57% got healed by 3rd, 24% healed by 4th, 9% healed by

5th and 4% healed by 6th follow ups. 4% cases had amputation at 4th follow-up. With DUSS score 2, in 24 ulcers, 4% at 4th, 29% at 6th, 25% at 7th follow ups had healed ulcers. 4% at 4th, 25% at 5th, 4% at 6th and 8% at 7th follow-up had amputation. With DUSS score 3, in 32 ulcers, 2% at 6th, 3% at 7th, 6% at 8th follow ups had healed ulcers. 13% at 4th, 28% at 5th, 9% at 6th and 28% at 7th, 3% at 8th follow-up had amputation. With DUSS score 4, in 14 ulcers, 14% at 4th, 21% at 5th,

36% at 6th, 14% at 7th and 8th follow-ups had amputation.

**Table 4: DUSS Score Type of Amputation Cross Tabulation**

DUSS Score		Type of Amputation				Total
		Above Knee	Below Knee	Fore Foot	Toe Disarticulation	
0	No of cases	0	0	0	0	0
	% within DUSS score	0	0	0	0	0
	% within Type of Amputation	0	0	0	0	0
1	No of cases	0	0	0	1	1
	% within DUSS score	0	0	0	100%	100%
	% within Type of Amputation	0	0	0	11%	2%
2	No of cases	0	0	3	7	10
	% within DUSS score	0	0	30%	70%	100%
	% within Type of Amputation	0	0	11%	78%	20%
3	No of cases	0	7	18	1	26
	% within DUSS score	0	27%	70%	3%	100%
	% within Type of Amputation	0	54%	67%	11%	51%
4	No of cases	2	6	6	0	14
	% within DUSS score	14%	43%	43%	0	100%
	% within Type of Amputation	100%	46%	22%	0	28%
Total	No of cases	2	13	27	9	51
	% within DUSS score	4%	26%	53%	17%	100%
	% within Type of Amputation	100%	100%	100%	100%	100%

Chi-Square value = 37.514, P Value < 0.0001 (Very High significant)

**Table 5: Distribution of Ulcers (DUSS Score 0-4) With Study Endpoint**

DUSS score		End Points			Total
		Amputation	Secondary healing	Split Skin Grafting	
0	No of cases	0	7	2	9
	% within DUSS score	0	78%	22%	100%
1	No of cases	1	17	3	21
	% within DUSS score	5%	81%	14%	100%
2	No of cases	10	9	5	24
	% within DUSS score	42%	37%	21%	100%
3	No of cases	26	1	5	32
	% within DUSS score	81%	3%	16%	100%
4	No of cases	14	0	0	14
	% within DUSS score	100%	0	0	100%
Total	No of cases	51	34	15	100
	% within DUSS score	51%	34%	15%	100%

Chi-Square value = 61.62, P Value < 0.0001 (Very High significant)

**Table 6: Distribution of Ulcers (DUSS Score 0-4) With Duration of Diabetes**

DUSS score		Diabetic group			Total
		1-5 Yrs	6-10 Yrs	>11 Yrs	
0	No of cases	7	2	0	9
	% within DUSS score	78%	22%	0	100%
1	No of cases	11	9	1	21
	% within DUSS score	52%	43%	5%	100%
2	No of cases	3	19	2	24
	% within DUSS score	13%	79%	8%	100%
3	No of cases	2	18	12	32
	% within DUSS score	6%	56%	38%	100%
4	No of cases	0	6	8	14
	% within DUSS score	0	43%	57%	100%
Total	No of cases	23	54	23	100
	% within DUSS score	23%	54%	23%	100%

**Table 7: KAPLAN-MEIER**

<b>Case Processing Summary</b>				
<b>DUSS score</b>	<b>No of cases</b>	<b>No of Events</b>	<b>Censored</b>	
			<b>No</b>	<b>Percentage</b>
1	9	0	9	100.0%
2	21	1	20	95.2%
3	24	10	14	58.3%
4	32	26	6	18.8%
Overall	14	14	0	0.0%

The probability of healing with score 0 was 100.0%, 95.20% with score 1, 58.3% with score 2, 18.8% with score 3 and nil with score 4.

### Discussion

**Table 8: Comparison of Age Incidence**

<b>Study group</b>	<b>Common age group affected</b>	<b>Mean age</b>
Present study	51-65 Y	53 ±14 Y
Kumar ST. et al [9]	51-60 Y	57+/- 12 Y
Kummankundath SA et al [10]	51-60 Y	54.6+/- 12.4 Y
Shashikala et al [11]	41-60 Y	52+/- 2 Y

**Table 9: Comparison of Sex Incidence**

<b>Study</b>	<b>Male (%)</b>	<b>Female (%)</b>
Present study	59	41
Mohit Sharma et al [12]	68	32
Harindranath H.R et al [13]	61.5	38.5
kumar ST et al [9]	81	19
Kummankundath SA et al [10]	59	41
Shashikala et al [11]	68	32
Beckert et al [7]	67.5	32.5

**Table 10: Comparison of Amputation Distribution**

<b>Study</b>	<b>Major amputation</b>	<b>Minor amputation</b>	<b>Total amputation</b>
Present study	15%	36 %	51%
kumar ST. et al [9]	11%	34%	45%
Kummankundath SA et al [10]	18.5%	35%	53.5%
Shashikala et al [11]	25%	27%	52%
Beckert et al [7]	2.6%	9.9%	12.5%

**Table 11: Comparison of DUSS Score (0-4) Amputation (Major+Minor) (%)**

<b>Score</b>	<b>Present study</b>	<b>Mohit Sharma et al [12]</b>	<b>Kumar ST. et al [9]</b>	<b>Kummankundath SA et al [10]</b>
0	0	0	0	0
1	1	0	9.4	24.2
2	10	22.22	25.5	30.5
3	26	77.78	90.6	79.6
4	14	100	100	94.3

**Table 12: Comparison of DUSS Score (0-4) With Major Amputation (%)**

<b>Score</b>	<b>Present study</b>	<b>Mohit Sharma et al [12]</b>	<b>Kumar ST. et al [9]</b>	<b>Kummankundath SA et al [10]</b>	<b>Harindra nat h H.R et al [13]</b>	<b>Shashik ala et al [11]</b>	<b>Becke rt et al [7]</b>
0	0	0	0	0	0	4.5	0
1	0	0	0	0	0	8.3	2.4
2	0	0	14.28	0	0	14.2	7.7
3	7	11.11	28.57	30.5	9	47.3	11.2
4	8	26.09	57.14	54.3	21	71.4	3.8

**Table 13: Comparison of DUSS Score (0-4) With Minor Amputation (%)**

Score	Present study	Harindranath H.R et al [13]	MohIt Sharma et al [12]	Kum ar ST. et al [9]	Kummankundath SA et al [10]
0	0	0	0	0	0
1	1	0	0	15.90	21.2
2	10	0	22.22	66.66	33.9
3	19	40.2	55.56	71.42	49.2
4	6	37.2	34.78	42.850	40

**Table 14: Comparison of DUSS Score with Probability Of Healing**

Score	Present study	Shashikala et al [11]	Kum ar ST. et al [9]	Kummankundath SA et al [10]
0	0	95	100	100
1	1	91.6	84	78.79
2	10	85.7	19	66.10
3	19	52.6	0	20.34
4	6	28.5	0	5.71

From the present study it was noted that a lower DUSS score was strongly associated with better healing, do the same with other studies. The probability of healing with score 0 was 100.0%, 95.20% with score 1, 58.3% with score 2, 18.8% with score 3 and nil with score 4 according to Kaplan Meier analysis.

Although the DUSS system makes no distinction between neuropathic and neuroischemic ulcers, there was a 100% probability of healing for uncomplicated ulcers (score 0), decreasing to 0% for ulcers with a severity score of 4 according to Kaplan Meier analysis.

Probability of healing was zero with score 4 in the present study similar to Kumar ST et al [9] study, but it was 28% in Shashikala et al [11], 5.7 % in Kummankundath SA et al [10] study. In the present study as the DUSS score increased, the percentage of amputations increased.

### Conclusion

DUSS scoring system provides an easy diagnostic tool for know the probability of healing and amputation. It combines four clinically assessable wound based parameters peripheral pulses, bone probing, number and site of ulcers giving 0 and 1 score for each parameter. DUSS score helps us to stratify patients based on score. It is a simple, streamlined approach in a clinical setting without any investigations. So this can be used in any setup to assess the diabetic ulcers. Lower DUSS score was strongly associated with healing and higher score with amputation.

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