



To Study The Use Of Sinbad Classification And Scoring System In Predicting The Outcome In Patients With Diabetic Foot Ulcers

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Abstract

Introduction: Diabetic foot ulcer contributes to a significant degree of morbidity for diabetic patients. The annual incidence of Diabetic foot ulceration varies from 2% to 5% and the risk throughout the patients' lifespan can vary from 15-20%. 5-year survival after the initial presentation of a diabetic foot ulcer can be as high as 50-60% which is worse than most common malignancies. SINBAD score is one of the latest wound-based systems of classification which needs to be validated in our setup. The application of this scoring system has not been studied in Indian patients. As this scoring system can predict amputation rates, it will be a very useful tool for decision-making in patients requiring amputations. Patients with SINBAD scores of 5 and 6 usually undergo major amputations.

Aim & Objectives: To find out the efficacy of SINBAD score in our tertiary care hospital. To evaluate the usefulness of the SINBAD score in predicting amputation rates in diabetic foot ulcers and validate the score in our hospital setup.

Methods: This descriptive longitudinal study was diabetic patients with diabetic foot ulcers admitted to, Government Tiruvannamalai medical college, Tiruvannamalai, Tamil Nadu, India In the year 2021. 100 patients were included in the study. The study was done after obtaining a detailed history, complete general physical examination, and systemic examination. The patients were subjected to relevant and routine investigations like Hb, TC, urea, creatinine, serum electrolytes, and blood and wound culture. Ulcer characteristics were graded according to the SINBAD classification system. All investigations and surgical procedures were carried out with proper informed written consent. They were treated with appropriate antibiotics.

Results: As per SINBAD classification of diabetic ulcer 25% belonged to grade 3, 24% belonged to grade 4, 18% belonged to grade 6, 13% belonged to grade 2, 12% belonged to grade 5, 8% belonged to grade 1. Amputations were done for grades 4, 5, 6 ulcer patients. None of the disarticulations occurred in grades 1 and 2. As per the Sinbad scaling of wound score, 1 had 100% healing, and score 2 had 85.7% healing. Score 3 had a 72% healing score, score 4 had a 57% healing score, score 5 had a 9.1% healing score and score 6 had a 5.2% healing score. This suggests that early amputation can be provided to patients with lesions belonging to grades 5 and 6.

Conclusion: Grading the diabetic foot lesions according to the SINBAD classification helps in choosing the appropriate treatment for the grade. Patient education and strict glycemic control can reduce the burden of diabetic foot. Early diagnosis and hospitalization, and appropriate treatment including medical and surgical treatment according to the grade can reduce morbidity mortality and improve the outcome of the disease

Keywords: Diabetic foot ulcer, SINBAD score, Early amputation

Introduction

In the surgical ward, one of the most common causes of frequent admission is a non-healing ulcer, among them, diabetic foot ulcer is the most common cause. In most cases, staying in a medical institution for many weeks is required. [1] In many instances, they in the end pick out amputation. wounds are tough to deal with if coexisting elements like diabetes and different infections stop everyday wound recovery. [2] Diabetic foot ulcer contributes to a significant degree of morbidity for diabetic patients. The annual incidence of Diabetic foot ulceration varies from 2% to 5% and the risk throughout the patient’s lifespan can vary from 15-20%. 5-year survival after the initial presentation of a diabetic foot ulcer can be as high as 50-60% which is worse than most common malignancies. [3] Recent data has shown that the association of diabetic foot ulcers with mortality is greater than that seen with any other macrovascular disease.[4] Diabetic peripheral neuropathy commonly affects the nerve endings of the fingers and toes after multiple episodes of prolonged hyperglycemia. Early screening of diabetic patients who are at high risk for diabetic foot ulceration gives way to optimal management through lifestyle modifications and intervention.[5] Most of the limited research regarding tools for screening for diabetic neuropathy revolves around expensive and nonportable nerve conduction units. [6] Different parameters are incorporated into these scoring systems such as ulcer depth, its site, Presence or absence of infection, neuropathy, and arterial insufficiency. All these scoring systems are complex and do not predict long term outcomes.[7] SINBAD score addresses these shortcomings by being easy enough to be applied in day-to-day clinical practice. SINBAD score is one of

the latest wound-based systems of classification which needs to be validated in our setup. The application of this scoring system has not been studied in Indian patients.[8] As this scoring system can predict amputation rates, it will be a very useful tool for decision-making in patients requiring amputations. Patients with SINBAD scores of 5 and 6 usually undergo major amputations. [9,10]

Methods: This descriptive longitudinal study was diabetic patients with diabetic foot ulcers admitted to, Government Tiruvannamalai medical college, Tiruvannamalai, Tamil Nadu, India In the year 2021. 100 patients were included in the study. The study was done after obtaining a detailed history, complete general physical examination, and systemic examination. The patients were subjected to relevant and routine investigations like Hb, TC, urea, creatinine, serum electrolytes, and blood and wound culture. Ulcer characteristics were graded according to the SINBAD classification system. All investigations and surgical procedures were carried out with proper informed written consent. They were treated with appropriate antibiotics. Inclusion criteria: All individuals of both sexes aged 20 – 80 years. All subjects suffering from Diabetes Mellites as per WHO criteria who have foot ulcers. Symptoms of Diabetes + random blood sugar > 200 mg/dl.Fasting blood sugar > 126 mg/dl.2 hour plasma glucose level > 200 mg/dl.All diabetic lower limb ulcers irrespective of ulcer duration.Exclusion criteria: Venous stasis ulcer with diabetes mellitus.Ulcers located above the ankle.Malignant ulcers.Nondiabetic neuropathic ulcers. Ulcers with evidence of gangrene.

Statistical Analysis: Data was entered in Microsoft excel and analyzed using SPSS Version 20.

Results

Table 1: Age-wise distribution of study participants

Age in Years	Frequency	Percentage	Mean±S.D
≤ 40	8	8	
41-50	14	14	

51-60	23	23	51.35±10.35
61-70	36	36	
>70	19	19	
Total	100	100	

Table :1 In our study majority of the study participants were in the age group of 61- 70(36%) followed by 51-60 years (23%). About 14% were in the age group of 41-50 years. Nearly 19% were in the age group of more than 70 years. Only 8% were under 40 years. The mean age is 51.35 and the standard deviation is 10.35. In our study 69% were males and 31% were females.

Table 2: Duration of diabetes

Duration	frequency	percentage
<1 year	10	10
1-5 years	36	36
6-10 years	16	16
11-20 years	32	32
>20 years	6	6
Total	100	100

In our study 36% had 1-5 years of diabetes,32% had 11-20 years of diabetes,16% had 6-10 years of diabetes,10% had diabetes in less than 1 year and 6% had diabetes for more than 20 years

Table 3: Comorbid conditions

comorbid conditions	frequency	percentage
Hypertension	66	66
Respiratory illness	14	14
Cardiac disease	14	14
liver disease	6	6
Thyroid disease	2	2
Neurological disease	2	2
Renal failure	1	1

Table :3 In our study 66% had hypertension,14% had respiratory illness,14% had cardiac disease,6% had liver disease,2% had thyroid disease,2% had neurological disease,1% had renal failure

Table 4: Classification of cases based on SINBAD classification

SINBAD classification	frequency	Percentage
Grade 1	8	8
Grade 2	13	13
Grade 3	25	25
Grade 4	24	24
Grade5	12	12
Grade 6	18	18
Total	100	100

Table :4 As per SINBAD classification of diabetic ulcer 25% belonged to grade 3,24% belonged to grade 4,18%belonged to grade 6 ,13% belonged to grade 2,12% belonged to grade 5,8% belonged to grade1.

Table 5 Outcome of wounds based on SINBAD classification

Grade	Amputation	Disarticulation	Nonhealing	Healing/healed
1	0	0	0	8
2	0	0	2	12
3	0	5	2	18
4	6	2	2	13
5	3	2	5	1
6	11	2	5	1
Total	20	11	16	53

Table:5 Amputations were done for grades 4,5,6 ulcer patients. None of the disarticulations occurred in grades 1 and 2.

Table 6: Healing Probabilities based on SINBAD classification

Grade	Healing probability in%
1	100
2	85.7
3	72
4	57
5	9.1
6	5.2

Table:6 As per the Sinbad scaling of the wound, score 1 had 100% healing, and score 2 had 85.7% healing. Score 3 had a 72% healing score. Score 4 had a 57% healing score. score 5 had a 9.1% healing score and score 6 had a 5.2% healing score. This suggests that early amputation can be provided to patients with lesions belonging to grades 5 and 6.

Table 7: Association between the site of the wound and wound healing

site score	healed	Non healed	total	chi-square	P value
0	24	19	43		
1	26	31	57	1.02	0.32
Total	50	50	100		

Table;7 There is no statistically significant association between the site of the wound and wound healing P >0.05.

Table 8: Association between ischemia and wound healing

Ischemia	Healed	Non healed	total	chi-square	P value
0	30	13	43		
1	20	37	57	11.79	0.0005
Total	50	50	100		

Out of 43 participants with grade 0 ischemia,30 had their ulcers healed, and 13 had a non-healed ulcer. In grade 1 ischemia out of 57, 20 had healed ulcers and 37 had a non-healed ulcer.

Table 9: Association between Neuropathy and wound healing

Neuropathy	Healed	Non healed	total	chi-square	P value
0	34	26	60		
1	16	24	40	2.66	0.102
Total	50	50	100		

Table:9 Out of 60 patients with grade 0 neuropathy,34 had healed ulcers, and 26 had non-healed ulcers. In grade 1 neuropathy 16 had healed ulcers and 24 had a non-healed ulcer. There is no statistically significant association between Neuropathy and wound healing

Table 10: Association between bacterial infection and wound healing

Bacterial infection	Healed	Non healed	total	chi-square	P value
0	23	9	32		
1	27	41	68	9.00	0.002
Total	50	50	100		

Table:10 Out of 32 who had Grade 0 bacterial infection 23 had their ulcers healed and 9 had non-healed ulcers. Out of 68 who had grade 1 bacterial infection,27 had healed ulcers and 41 had a non-healed ulcer. There is a statistically significant association between bacterial infection and wound healing. $P < 0.05$

Table 11: Association between the area of ulcer and wound healing

Area of the ulcer	healed	Non healed	total
0	22	8	30
1	28	42	70
Total	50	50	100

Table:11 Out of 30 grade 0 ulcers,22 had healed ulcers and 8 had non-healed ulcers. Out of70 grade 1 ulcers,28 had healed ulcers and 42 had non-healed ulcers. There is a statistically significant association between the area of ulcer and wound healing. $P < 0.05$

Table 12: Association between depth of the wound and wound healing

Depth of the wound	healed	Non healed	total	chi-square	P value
0	31	14	45		
1	19	36	55	11.67	0.0006
Total	50	50	100		

Table:12 Out of 45 grade 0 depth of the wound,31 had healed ulcer, and 14 had a non-healed ulcer. Out of 55 grades, 1 depth of wound 19 had healed ulcers and 36 had non-healed ulcers. There is a statistically significant association between the depth of the wound and wound healing. $P<0.05$.

Discussion

In our study majority of the study, participants were in the age group of 61- 70(36%) followed by 51-60 years (23%). About 14% were in the age group of 41-50 years. Nearly 19% were in the age group of more than 70 years. Only 8% were under 40 years. The mean age is 51.35 and the standard deviation is 10.35. In our study 69% were males and 31% were females. In our study 47% were daily wage laborers,23% were farmers,17% were homemakers,8% were masons, and 5% were unemployed.[11]In our study 36% had 1-5 years of diabetes,32% had 11-20 years of diabetes,16% had 6-10 years of diabetes,10% had diabetes less than 1 year and 6% had diabetes for more than 20 years.[12]In our study 66% had hypertension,14% had a respiratory illness,14% had cardiac disease,6% had liver disease,2% had thyroid disease,2% had a neurological disease, and 1% had renal failure In our study 60% are alcoholics and 40% are non-alcoholics. In our study 52% were smokers, and 48% were non-smokers. As per the SINBAD classification of diabetic ulcers, 25% belonged to grade 3,24% belonged to grade 4,18% belonged to grade 6,13% belonged to grade 2,12% belonged to grade 5,8% belonged to grade 1. Amputations were done for grades 4,5,6 ulcer patients. None of the disarticulations occurred in grades 1 and 2. As per the Sinbad scaling of wound score 1 had a 100% healing score 2 had 85.7% healing. Score 3 had a 72% healing score. Score 4 had a 57% healing score. score 5 had a 9.1% healing score and score 6 had a 5.2% healing score.[13]This suggests that early amputation can be provided to patients with lesions belonging to grades 5 and 6. There is no statistically significant association between the site of the wound and wound healing $P>0.05$. Out of 43 participants in grade 0 ischemia,30 had ulcers. healed,13 had non-healed ulcers. In grade 1 ischemia out of 57,20 had healed ulcers and 37 had non-healed ulcers. [14]Out of 60 patients with grade 0 neuropathy,34 had healed ulcers, and 26 had non-healed ulcers. In grade 1 neuropathy 16 had healed ulcers and 24 had a non-healed ulcer. There is no statistically significant association between Neuropathy and wound healing. Out of 32 who had Grade 0 bacterial infection 23 had

their ulcers healed and 9 had non-healed ulcers. Out of 68 who had grade 1 bacterial infection,27 had healed ulcers and 41 had a non-healed ulcer. There is a statistically significant association between bacterial infection and wound healing. $P<0.05$. Out of 30 grade 0 ulcers,22 had healed ulcers and 8 had non-healed ulcers. Out of 70 grade 1 ulcers,28 had healed ulcers and 42 had a non-healed ulcers. There is a statistically significant association between the area of ulcer and wound healing. $P<0.05$. Out of 45 grade 0 depth of the wound,31 had healed ulcers, and 14 had a non-healed ulcer. [15]Out of 55 grades, 1 depth of wound 19 had healed ulcers and 36 had a non-healed ulcer. There is a statistically significant association between the depth of the wound and wound healing. $P<0.05$. Majority of the patients in our study population were elderly. The male gender constituted higher proportions. These findings are similar to the findings reported by Mooney JF et al, in their population-based study on diabetic feet. History of Smoking and alcohol consumption was present in a substantial number of patients.[16] In one of the multivariate analyses, the significant independent potential risk factors for recurrence of foot ulcers were smoking, poor glycemic control (HbA1c cut-off of 10 %), peripheral neuropathy with lost ankle reflex, peripheral arterial disease, and previous ulcer location.[17]SINBAD scoring system consists of 6 parameters. Presence of ischemia, bacterial infection, area >1 cm², and depth beyond the subcutaneous tissue had an impact on healing, which was proved with statistical significance. [18]Out of the 6 parameters, the site of the lesion and neuropathy had no statistical significance on healing in our study. The results are comparable with the results of the study by Ince et al, Brennan MB et al reported that the site of the wound had significant effects on healing, however, our data suggest the contrary.[19,20]

Conclusion

To conclude, diabetic foot constitutes a great burden of cases, especially in developing countries. Effective classification systems are the need of the hour to offer quick and cost-effective treatments, which are patient compliant. The present classification systems

used each have their advantages and disadvantages. The SINBAD classification is a recently described classification system and is a simplified version of the S(AD)SAD System and consists of size, ischemia, neuropathy, bacterial infection, area, and depth. The presence of each feature is given a score of 1 and the total score is calculated. SINBAD is more effective in describing the disease processes and is also simple to use in daily practice and for auditing purposes. It is also seen that four out of six parameters of SINBAD classification are statistically significant in relationship to healing. These parameters are ischemia, bacterial infection, area, and depth. Higher scores go towards nonhealing and advocate the need for early amputations.

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