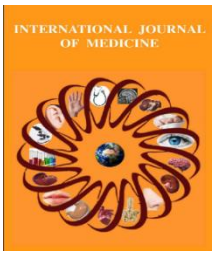
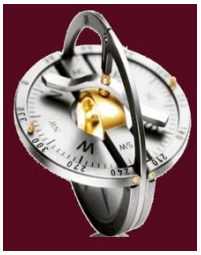


International Journal of Medicine
ISSN (P): 1468-3814; ISSN (e): 2667-7008

https://www.theinternationalmedicine.com



Volume: 7(12) 2025

Original Research

Study on Assessing Risk of Amputation in Diabetic Foot Ulcer by Using WIFi Scoring System.

Sridhar M,[1] Subash Chandrabose G, [2] Sadeesh kumar B [3]*

[1]*Assistant Professor, Department of vascular surgery, Government Vellore Medical College and Hospital, Tamil Nadu, India*
[2]*Assistant Professor, Department of Cardiology, Government Vellore Medical College and Hospital, Tamil Nadu, India*
[3]*Assistant Professor, Department of Plastic surgery, Government Vellore Medical College and Hospital, Tamil Nadu, India*

Received: 04-11-2025 / Accepted: 15-12- 2025

Abstract

Introduction: Foot ulcers and their complications are among the leading contributors to the increased morbidity and mortality among the diabetic patients. The WIFi scoring system stratifies on the basis of perfusion, extent of wound and infection to provide composite score which guides further management and predicts final prognosis *Materials and Methods:* This study was a hospital based cross-sectional study conducted in Department of Plastic surgery, Government Vellore Medical College and Hospital, Tamil Nadu, India. The study was conducted among 96 cases with post burn contracture of elbow or knee. *Results:* In the present study, 96 diabetic patients with diabetic foot ulcers of more than two weeks' duration. The study population consisted predominantly of males. Majority belonged to the 41-60-year age group, comprising 54 (56.2%) patients. We observed that the 96 patients underwent amputation, whereas 51 (53.1%) patients did not undergo amputation. We observed a significant increase in the incidence of amputation among patients with higher WIfI scores. *Conclusion:* The WIfI scoring system can be a useful clinical tool for stratifying the severity of diabetic foot ulcers and identifying patients at increased risk of amputation. Patients with higher WIfI severity require particularly careful evaluation and timely multidisciplinary management to reduce the risk of limb loss.

Keywords: *Diabetic Foot Ulcer, Ischemia, Amputation, Risk Stratification, WIFi Scoring*.

Introduction

Diabetes mellitus has become one of the world's most major health problems affecting more than half a billion adults, with an estimated 640 million cases by 2030. Over the past few decades, factors like rapid unplanned urbanization, sedentary lifestyles, dietary changes, and increased aging populations have been attributed to an increase in the prevalence of diabetes. India is currently among one of the leading contributors to the diabetes disease burden. The long-term burden of diabetes mellitus is caused by its chronic consequences, which significantly hinder day-to-day functioning and lower survival. Among the most serious of these problems are diabetic foot ulcers (DFUs), which affect 15-25% of diabetic individuals at some point in their lives and are responsible for more than 80% of lower limb amputations connected to diabetes.[1-3]

Foot ulcers and their complications are among the leading contributors to the increased morbidity and mortality among the diabetic patients. Critical limb ischemia among diabetic foot patients has been defined as the clinical syndrome of ischemic pain at rest and/or ischemic tissue loss such as non-healing ulcers or gangrene for more than 2 weeks. The extent of the wound and associated infections significantly impacts the affected limb. The WIFi scoring system stratifies on the basis of perfusion, extent of wound and infection to provide composite score which guides further management and predicts final prognosis.[4-8]

Early calculation of the WIfI score is useful to the clinicians in identifying high-risk limbs. This is essential in the planning of management protocols including surgical debridement and/or revascularization. The WIfI scores help in mitigating the risk of amputation risk and conservative wound care. The present study was undertaken to assess the outcome of diabetic foot ulcer by using WIfI scoring system.

Address for Correspondence Dr. Sadeesh kumar B, Assistant Professor, Department of Plastic surgery, Government Vellore Medical College and Hospital, Tamil Nadu, India. E mail: sadeeshkapv@gmail.com

DOI: 10.61336/im/25 -12- 81

Materials and Methods

This present study was a hospital based cross-sectional study conducted in Department of Surgery /Vascular surgery, Government Vellore Medical College, Vellore. The study was conducted on 96 diabetic patients with more than 2 weeks of diabetic foot ulcers. Patients aged less than 18 years and more than 70 years and patient with conditions like acute limb ischemia, venous ulcers, Acute trauma and neoplasms were excluded from the study. The wound component was assessed by examining the depth of the ulcer, tissue loss, and presence of gangrene. The ischemia component was evaluated using Ankle-Brachial Pressure Index (ABPI) and toe pressure measurements to assess limb perfusion. The foot infection component was assessed based on clinical signs of local inflammation such as erythema, warmth, tenderness, and purulent discharge, as well as systemic signs of infection. Patients were stratified into two groups: Group 1 (Stages 1-3) and Group 2 (Stage 4). Demographic, clinical, and laboratory data were collected. Amputation outcomes were assessed. Data were entered and analyzed using SPSS version 26 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as frequencies and percentages and compared using chi-square tests. Continuous variables were presented as mean ± standard deviation (SD) and analyzed using independent t-tests. A p-value of <0.05 was considered statistically significant.

Results

The present hospital-based cross-sectional study included 96 diabetic patients with diabetic foot ulcers of more than two weeks' duration. The study population consisted predominantly of males, with 72 (75.0%) males and 24 (25.0%) females.

Majority belonged to the 41-60-year age group, comprising 54 (56.2%) patients. This was followed by patients aged more than 60 years, comprising 33 (34.4%) participants. Only 9 (9.4%) patients were between 20 and 40 years of age.

Majority of patients had diabetes mellitus for 5-10 years, accounting for 52 (54.2%) participants. Patients with diabetes for more than 10 years constituted 28.1% of the study participants, while 17 (17.7%) had a duration of less than 5 years. Poor glycemic control was commonly observed among the study participants. Seventy-five (patients had HbA1c levels greater than 8% constituted 78.2% of the study participants, whereas 21 (21.8%) patients had HbA1c levels of 8% or less.

Dyslipidaemia was the most frequently observed comorbidity, present in 69 (71.8%) patients, followed by hypertension in 62 (64.6%) patients. Anaemia was present in 34 (35.4%) patients, while chronic kidney disease was observed in 29 (30.2%) patients.

With regard to BMI, 40 (41.7%) patients were overweight with a BMI of 25-29.9 kg/m², while 31 (32.3%) patients were obese with a BMI of ≥30 kg/m². Twenty-one (21.8%) patients had a BMI between 18.5 and 24.9 kg/m², while 4 (4.2%) patients were seen to be underweight with a BMI below 18.5 kg/m².

The WIfI scoring system showed that 34 (35.4%) patients were classified into WIfI Group 1, while 62 (64.6%) patients were classified into WIfI Group 2. The wound, ischemia and infection components demonstrated a clear difference between the two WIfI groups. In Group 1, 28 patients had a wound score of 1-2 and 6 patients had a wound score of 3. In contrast, all 62 patients in Group 2 had a wound score of 3. Regarding ischemia, 24 patients in Group 1 had an ischemia score of 0-1 and 10 patients had a score of 2. All 62 patients in Group 2 had an ischemia score of 3. Similarly, 26 patients in Group 1 had an infection score of 0-2, while 8 patients had an infection score of 3. In Group 2, all 62 patients had an infection score of 3.

We observed that 45 (46.9%) of the 96 patients underwent amputation, whereas 51 (53.1%) patients did not undergo amputation. We observed a significant increase in the incidence of amputation among patients with higher WIfI scores. Among patients belonging to WIfI Group 1, only 2 of 34 patients (5.9%) underwent amputation, while 32 (94.1%) did not undergo amputation. We also noted that 43 of 62 patients (69.4%) belonging to WIfI Group 2 underwent amputation, while 19 (30.6%) did not. The risk of amputation was approximately 11.8 times higher in WIfI Group 2 compared with Group 1 based on the observed proportions. The corresponding odds of amputation were approximately 36 times higher in Group 2.

Table 1 Characteristics of the study participants (n=96)

Parameters	Category	Frequency (n)	Percentage (%)
Age Group	20-40 years	9	9.4
	41-60 years	54	56.2
	>60 years	33	34.4
Gender	Male	72	75.0
	Female	24	25.0
Duration of Diabetes	<5 years	17	17.7
	5-10 years	52	54.2
	>10 years	27	28.1
HbA1c	≤8%	21	21.8
	>8%	75	78.2
Comorbidities	Hypertension	62	64.6
	Dyslipidemia	69	71.8
	Anemia	34	35.4
	Chronic Kidney Disease	29	30.2
BMI Category	<18.5 kg/m²	4	4.2
	18.5-24.9 kg/m²	21	21.8
	25-29.9 kg/m²	40	41.7
	≥30 kg/m²	31	32.3
Amputation	Yes	45	46.9
	No	51	53.1
WIfI Group	Group 1	34	35.4
	Group 2	62	64.6
Total	–	**96**	**100.0**

Table 2 WIFi scoring among the study participants (n=96)

Parameters	Category / Score	WIfI Group 1 (n=34)	WIfI Group 2 (n=62)
Wound Score	1-2	28	0
	3	6	62
Ischemia Score	0-1	24	0
	2	10	0
	3	0	62
Infection Score	0-2	26	0
	3	8	62

Table 3 Correlation between WIFi scoring and amputation among the study participants (n=96)

Amputation	WIfI Group 1 (n=34)	WIfI Group 2 (n=62)	p-value
Yes	2	43	<0.0001*
No	32	19	
Total	34	62	
Total Amputation	2 (5.9%)	43 (69.4%)	<0.0001*

* p value of 0.05 was considered to be statistically significant

Discussion

Diabetic foot ulcer is a major complication of diabetes mellitus and may progress to tissue loss, infection, critical limb ischemia and ultimately limb amputation. The prognosis of a diabetic foot ulcer depends on several interacting factors, particularly the severity of the wound, degree of ischemia and presence and severity of infection. The WIfI classification system combines these three important components into a comprehensive clinical assessment tool and can therefore assist in estimating the threat to the limb.[9]

The present study evaluated 96 patients with diabetic foot ulcers using the WIfI scoring system. The study population was predominantly male, with males constituting 75% of the participants. More than half of the patients belonged to the 41-60-year age group. The predominance of patients in the middle and older age groups is clinically relevant because increasing duration of diabetes and accumulation of vascular and metabolic complications may contribute to the development and progression of diabetic foot disease.[10]

In the present study, 54.2% of patients had diabetes for 5-10 years and another 28.1% had diabetes for more than 10 years. Therefore, a substantial proportion of the study population had a prolonged duration of diabetes. Chronic diabetes is associated with progressive vascular and neuropathic complications, which can adversely affect wound healing and increase the risk of severe diabetic foot disease.[10,11]

A total of 75 (78.2%) patients had HbA1c values greater than 8%. Persistent hyperglycaemia can adversely influence immune response, tissue repair and vascular function and may contribute to poor healing of established diabetic foot ulcers. The high proportion of patients with elevated HbA1c in the present study indicates that poor metabolic control was common among patients presenting with diabetic foot ulcers.[10-12]

The prevalence of comorbidities was also considerable. Dyslipidaemia was present in 71.8% and hypertension in 64.6% of patients. Anaemia and chronic kidney disease were present in 35.4% and 30.2%, respectively. These associated conditions may further compromise tissue perfusion, wound healing and the patient's ability to recover from severe diabetic foot infection.[10-11]

The most important observation was the relationship between WIfI group and amputation. Overall, 45 (46.9%) patients underwent amputation. However, the distribution of amputations differed markedly between the two WIfI groups. Only 2 of 34 patients (5.9%) in Group 1 underwent amputation, whereas 43 of 62 patients (69.4%) in Group 2 underwent amputation. Conversely, 94.1% of Group 1 patients did not undergo amputation compared with only 30.6% of Group 2 patients. This represents an approximately 11.8-fold higher observed risk of amputation among patients in WIfI Group 2 compared with Group 1. The odds of amputation were approximately 36 times higher in Group 2. The association was highly statistically significant, with a p value of <0.0001. This finding strongly supports the usefulness of WIfI classification in identifying patients with diabetic foot ulcers who are at substantially increased risk of limb loss.[10-14]

The strong association observed in the present study is biologically plausible because WIfI incorporates the three major determinants of threatened limb status: wound severity, ischemia and infection. A patient with extensive tissue loss, significant ischemia and severe infection has a substantially greater likelihood of progression to tissue necrosis, failure of wound healing and major or minor amputation than a patient with a limited wound and less severe ischemia or infection.

Overall, the present study indicates that the WIfI scoring system can be a useful clinical tool for stratifying the severity of diabetic foot ulcers and identifying patients at increased risk of amputation. Patients with higher WIfI severity require particularly careful evaluation and timely multidisciplinary management to reduce the risk of limb loss.

Conclusion

The WIFi scoring system is a robust and reliable tool for risk stratification among diabetic patients with diabetic foot ulcers. Incorporating WIfI staging into routine clinical practice can facilitate timely interventions and help reduce the burden of limb loss, especially in resource-constrained healthcare settings. This scoring system served as a good predictor of amputation risk in our study population. We observed that patients with WIFi Stage 4 were more prone for amputation. The patients with advanced WIFi stages require a tailored and aggressive management. We conclude that it is essential to include WIFi staging in the management of diabetic foot ulcers. This would significantly favor enhance positive patient outcomes and reduce preventable amputations. There is a need for multicentric studies would greatly contribute to better understand the effect of WIFi scores in amputation risk assessment.

Acknowledgement:
We also extend our thanks to the Department of Surgery /Vascular surgery, Government Vellore Medical College, Vellore for providing specimens and permitting us to conduct the study.

Conflict of interest: None declared
Source of funding: None

References

1. Zhang P, Lu J, Jing Y, Tang S, Zhu D, Bi Y. Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis. Annals of medicine. 2017 Feb 17;49(2):106-16.
2. Viswanathan V, Madhavan S, Rajasekar S, Chamukuttan S, Ambady R. Amputation prevention initiative in South India: positive impact of foot care education. Diabetes care. 2005 May 1;28(5):1019-21.
3. Seshaan KN, Balakrishnan S, Selvaraj K, Seshaan Jr KN, Balakrishnan S. Prospective Evaluation of the Society for Vascular Surgery (SVS) Wound, Ischemia, and Foot Infection (WiFi) Classification for Predicting Amputation Risk in Diabetic Foot Ulcers at a South Indian Tertiary Care Center. Cureus. 2025 Nov 8;17(11).
4. Magliano DJ, Boyko EJ. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: International Diabetes Federation; 2021.
5. Anjana RM, Deepa M, Pradeepa R. Prevalence of diabetes and prediabetes in India: Updated estimates from the ICMR-INDIAB study. Lancet Diabetes Endocrinol. 2023;11(3):201-210.
6. Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. N Engl J Med. 2021; 384:2367-2375.
7. Bus SA, Lavery LA, Monteiro-Soares M, et al. Guidelines on the prevention of diabetic foot disease. Diabetes Metab Res Rev. 2023;39(S1):e3507.
8. Magliano DJ, Boyko EJ. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: International Diabetes Federation;

2021.
9. Seshaan KN, Balakrishnan S, Selvaraj K, SESHAAN Jr KN, Balakrishnan S. Prospective Evaluation of the Society for Vascular Surgery (SVS) Wound, Ischemia, and Foot Infection (WiFi) Classification for Predicting Amputation Risk in Diabetic Foot Ulcers at a South Indian Tertiary Care Center. Cureus. 2025 Nov 8;17(11).
10. Jude EB, Oyibo SO, Chalmers N, Boulton AJ. Peripheral arterial disease in diabetic and nondiabetic patients: a comparison of severity and outcome. Diabetes care. 2001 Aug 1;24(8):1433-7.
11. Rawshani A, Svensson AM, Rosengren A, Eliasson B, Gudbjörnsdottir S. Impact of socioeconomic status on cardiovascular disease and mortality in 24,947 individuals with type 1 diabetes. Diabetes care. 2015 Aug 1;38(8):1518-27.
12. Ramachandran A, Snehalatha C, Vijay V, King H. Impact of poverty on the prevalence of diabetes and its complications in urban southern India. Diabetic Medicine. 2002 Feb;19(2):130-5.
13. Joshi SR, Parikh RM. India; the diabetes capital of the world: Now heading towards hypertension. Journal-Association of Physicians of India. 2007 May 1;55(Y):323.
14. Viswanathan V, Rao VN. Problems associated with diabetes care in India. Diabetes Management. 2013;3(1):31.