Asian J Biol Life Sci., 2025; 14(2):259-264.
https://ajbls.com

Research Article

A Cross-Sectional Study on Assessment of Severity of Foot Ulcers in Patients Attending Tertiary Care Hospitals of Khammam Region

Mohd Sanawar Baba[1], Rompicherla Usha Sree[1], Nenavath Naresh Nayak[1], Thirunagiri Praveen Kumar[2,*]

[1]Department of Pharmacy Practice, Anurag Pharmacy College (Affiliated to JNTU Hyderabad), Ananthagiri, Kodad, Telangana, INDIA.
[2]Department of Pharmaceutics, Anurag Pharmacy College (Affiliated to JNTU Hyderabad), Kodad, Telangana, INDIA.

ABSTRACT

Aim: The goal of this research was to evaluate the severity of foot ulcers in patients visiting the tertiary care facilities of Khammam region. **Materials and Methods:** The research design implemented a retrospective cross-sectional method to study for 6 months starting from August 2024 until January 2025 with a sample size of 235 patients. The study obtained data through medical records together with clinical assessment results. **Results:** We have analyzed how infection severity is affected by major risk elements involving age, smoking patterns, alcohol use, SES, alongside diabetic complications including glycemic control. Patients who had diabetes on its own or had diabetes combined with cardiovascular diseases developed more significant foot ulcers than those without such health conditions. **Conclusion:** Results from the study prove that integrating diabetes and comorbidity management approaches remains essential to reduce the foot ulcer revalence in patients.

Keywords: Diabetic foot ulcers, Comorbidities, Risk factors, Cross-sectional study, Integrated care.

Correspondence:
Mr. Thirunagiri Praveen Kumar
Department of Pharmaceutics, Anurag Pharmacy College (Affiliated to JNTU Hyderabad), Kodad, Telangana, INDIA.
Email: praveensuri1@gmail.com

Received: 18-02-2025;
Revised: 08-04-2025;
Accepted: 27-06-2025.

INTRODUCTION

Foot ulcers develop due to 3 main factors such as poor circulation together with neuropathy and insufficient foot treatment whereas diabetic patients and those suffering from peripheral vascular disease frequently face heightened risk of ulcer development.[1,2] Patients need to understand foot ulcer pathophysiology because it shows complex interactions between these risk factors and healing processes which cause different levels of ulcer development severity.[3] To properly manage foot ulcers health professionals must implement an integrated strategy that handles both the active ulcer and primary conditions and risk elements which cause pain development.[4] Complete foot ulcer management requires patients with diabetes to check their blood glucose frequently coupled with circulation-enhancing physical therapy and correct foot hygiene maintenance to stop additional complications from developing. Using education that combines self-care skills with timely medical intervention as strategies will boost both outcome results and patient independence in treating their foot health conditions.[5,6] This research evaluates the different risk elements impacting foot ulcer intensity within populations consisting of patients with no preexisting health conditions and diabetic patients as well as diabetic patients with CVD. Our research examines three patient groups to discover treatment-relevant differences in ulcer formation and healing between populations so we can create specialized care plans for every patient group. These differential factors will strengthen treatment approaches and advance the general knowledge about how systemic conditions affect wound recovery processes.

Existing studies often focus on FUs in diabetes without exploring the combined impact of comorbidities. Comparative research between diabetic patients who have comorbidities versus those who do not have such complications is insufficient thus impeding our understanding of FU progression. The research gaps should be filled to enhance risk assessment methods and develop individualized therapies which will result in better clinical results.

MATERIALS AND METHODS

The six-month research period (August 2024-January 2025) was conducted in tertiary care hospitals situated in Khammam. Under random sampling, we selected 235 patients who received FUs diagnosis. We have categorised patients according to age, gender comorbidities, Socioeconomic Status (SES), and disease duration. We have initiated the study after getting the approval from

OPEN ACCESS
ScienScript

DOI: 10.5530/ajbls.20251463

Publishing Partner : ScienScript Digital. [www.sciencript.com.sg]

institutional ethics committee. All participants received informed consent to begin the data collection stage. We have extracted clinical and demographic data points from patient records using consent as their authorization process. Inlow's 60-Sec Diabetic Foot Screen Test evaluated FU severity by assessing patient risk factors and skin condition and any active infections. For the evaluation between FUs and comorbid conditions descriptive statistics including mean values and distribution frequencies combined with *t*-tests (comparing No risk to risk group) were used. The research utilized a significance level of α=0.05 to maintain statistical reliability in the study.[7-10]

RESULTS

Of the reported cases 28.09% belong to the 51-60 age and 32 patients are in the high-risk category. The 61-70 years age population has 21.70% of cases along with 23 high-risk cases among them. A total of 55 high-risk cases account for 56.70% of all 97 high-risk patients who belong to the 51-60 and 61-70 age cohorts. Severe ulcers occur in 42.86% of patients under thirty years old as this group demonstrates the most no-risk cases among 14 examined cases. A statistical test based on the test method determined significant differences between no risk and risk groups (*p*-value- 0.0042-significant).

A substantial proportion of 86.38% of the research participants identify as male with 13.62% represented by female participants. Foot ulcers appear more frequently in male subjects when compared to females in this population. Among male participants the high-risk category accounts for 83 patients which comprise 40.39% of the total male population.

Most of the study subjects live in rural areas (88.94%) along with 11.06% who live in urban areas. The higher foot ulcer rates in rural populations together with location demographics probably explain these statistics. The rural population contains the majority of moderate to high-risk foot ulcer patients (83.7%, 84 out of 209 participants). Among the study sample urban inhabitants present with half (13 of 26 cases) of all high-risk diagnoses despite making up just a smaller percentage of the population.

The research established that participants who smoked cigarettes made up 51.91% of the sample population while non-smokers accounted for 48.09% of the study. People who smoked cigarettes included greater numbers in the high-risk category with 54 individuals whereas non-smokers included 43 participants in this group. The severity assessment for high-risk findings was higher in smokers than in non-smoking participants (Table 1). Among the participants surveyed 76.17% had alcohol consumption but 23.83% stated they did not drink. Of all alcohol users who took part in the study 77 individuals were classified in the high-risk category compared to non-drinkers at 20 individuals. Alcohol consumers show significantly higher numbers in both moderate-risk (76 cases) and high-risk (77 cases) categories compared to non-drinkers. Non-drinkers have a relatively lower distribution across all risk levels (Table 1).

The patient cohort consisted of 67 individuals (28.5%) who maintained good glycemia while 32 patients had mild FUs and 16 had moderate FUs in addition to 19 patients with severe FUs. Of the patients exhibiting poor glycemic control (71.4%), severe FUs made up 57.1% of all cases (96 patients) among this group. Out of the 238 participants 60 demonstrated normal blood pressure distribution among mild FUs 36 patients while severe FUs also had 8 participants and the remaining 16 patients presented with moderate FUs. Elevated blood pressure was found in 175 patients (74.4%), with a greater prevalence of severe FUs (102 cases, 58.3%).

Pain, swelling, discharge, discoloration of ulcers were the most reported complaints from the participants. The Prevalence of Risk Levels in our study was observed as moderate risk cases as the most common, accounting for 42.13% of the population. High-risk cases follow closely at 41.28%, indicating a nearly equal distribution between high and moderate risk. Only 16.60% of individuals fall under the no-risk category, underscoring the significant prevalence of ulcer severity (Figure 1). The large proportion of high-risk cases suggests delays in diagnosis or ineffective management of early stages. The nearly equal distribution between high and moderate risk implies that early-stage moderate-risk cases can easily progress to high-risk if not adequately managed. Early screening, lifestyle modifications, and patient education are essential.

The majority of participants fall under the upper-lower socioeconomic class (75.74%), while the upper middle class constitutes the smallest proportion (2.13%). The lower socioeconomic class accounts for 14.47%, with the lower-middle class comprising 7.66%. The upper-lower SES class has the highest number of participants across all risk categories, with a significant proportion in the high-risk category (70 cases, 39.33% of the group). The lower SES class shows a disproportionately high percentage of high-risk cases (17 cases, 50% of the group). Participants from lower and upper-lower SES classes show a higher prevalence of moderate- and high-risk FUs, likely due to limited access to healthcare, poor glycemic control, and inadequate wound care (Table 2).

Diabetes (37.87%) is the most common condition in the study. Patients with no comorbidities make up 28.09%, while diabetes with Cardiovascular Disease (CVD) accounts for 19.15%. CVD alone is the least represented group at 14.89%. High Risk is most pronounced in patients with diabetes (47 individuals), moderate Risk is consistently distributed, with diabetes (34 individuals) and diabetes + CVD (24 individuals) showing a significant share. Patients with no risk are most prevalent in the group with no comorbidities (18 individuals). Diabetes is a leading contributor to the severity of foot ulcers, with the highest percentage of

individuals (52.81%) in the moderate and high-risk categories combined. Statistical analysis was done using test by comparing between no risk and risk groups (*p*-value- 0.0169- significant) (Table 2).

DISCUSSION

The analysis shows that foot ulcers become more serious as people age. Young adults usually maintain no-risk status yet foot ulcer risk elevates steeply after age 51 until 70. Similar results were reported in a study conducted by Wong ND and Sattar N in 2023.[11] The age ranges between 51-70 years old need specific intervention strategies by medical professionals by conducting regular foot ulcers screenings as they maintain the highest combined incidence of moderate and high-risk foot ulcer cases.[12]

The FUs impact male patients more than female patients according to statistical results which demonstrate this gender-based difference. The differences in lifestyle and health care delays and occupational risks may account for the observed gender disparity in the study findings. The predominance of male patients in the moderate-risk category demands special preventive measures for stopping the progression toward severe ulcer status. This patient population benefits from early screening combined with better blood glucose management because it reduces associated complications.[13] Early detection needs to become a primary element of preventive care since male patients consist of the majority in moderate and high-risk severity groups.[14]

Regional populations face higher rates of FUs because they encounter limited healthcare access while simultaneously dealing with failed public education efforts regarding FUs and delayed medical diagnosis. Urban citizens form a higher percentage of patients with high-risk factors even though their population size remains lower than rural residents. The specific condition demonstrates that urban populations delay visits to medical facilities or their medical state differs from rural residents due to lifestyle habits and secondary health conditions. Research data emphasizes immediate action must be taken to establish outreach activities within rural populations which should include mobile healthcare facilities and cheap foot care services as well as educational training sessions.

Table 1: Distribution of Risk Levels Across Age, Gender, Residence, and Lifestyle Factors.

Age	Number	%	No Risk	Moderate Risk	High Risk	*p*-value
Less than 30	14	5.96	6	5	3	0.0042
31- 40	29	12.34	5	13	11	
41-50	47	20.00	8	26	13	
51-60	66	28.09	9	25	32	
61-70	51	21.70	8	20	23	
Greater than 70	28	11.91	3	10	15	
Gender						
Female	32	13.62	5	12	15	0.391
Male	203	86.38	34	87	82	
Residence						
Rural	209	88.94	36	89	84	0.414
Urban	26	11.06	3	10	13	
Smoking						
Yes	122	51.91	21	47	54	0.0018
No	113	48.09	18	52	43	
Alcohol						
Yes	179	76.17	26	76	77	0.292
No	56	23.83	13	23	20	
Glycemic control						
Good	67	28.5	32	16	19	0.358
Poor	168	71.4	15	57	96	
Blood Pressure control						
Normal	60	25.5	36	16	8	0.465
Elevated	175	74.4	25	48	102	

Scientific studies have proven that smoking results in detrimental effects on wound healing as well as peripheral arterial disease and microvascular complications leading to worsened foot ulcers. Systemic inflammation together with oxidative stress generated by smoking endangers wound healing and requires inclusion in complete treatment plans.[15,16] The number of high-risk foot ulcers was higher among smokers since smoking proves detrimental for ulcer severity. The absence of smoking behavior led to slightly fewer high-risk FUs in non-smokers indicating smoking acts as a risk factor for poorer foot ulcer development. The study results indicate that programs to assist patients in quitting smoking must be fundamental for treating foot ulcers.

Patients who consume alcohol habitually develop poor blood sugar control and face impaired nerve health and delayed wound recovery which deepens foot ulcer complications. The results of this study revealed higher rates of serious foot ulcers in people who consume alcohol therefore suggesting alcohol independently worsens ulcer severity. High-risk foot ulcers were fewer among non-drinkers probably due to their superior health management strategies and better metabolic regulation. Frequent diabetic patients with poor blood sugar management experience worsened FU severity and should adopt strict diabetic control practices to minimize complications.[17] Public health programs should implement awareness campaigns which demonstrate the effects of alcohol consumption on diabetes-associated complications. A multidisciplinary strategy stands necessary for appropriate treatment of foot ulcers according to the data analysis results. A combined approach of endocrinology care with vascular treatment and wound care strategies works to decrease the number of high-risk cases. The acquired data serves as a starting point for examining risk factors behind extensive cases and examining the effectiveness of preventive solutions in controlling severity burden.

The economic situation of a person compromises diabetes management when patients either fail to follow medical guidance and need treatment or experience delayed care and intake improper nutrition. High-risk FUs occur least often in the upper-middle SES group because all members benefit from quality healthcare services as well as educational resources and preventive medical care. Health outcomes for diabetic foot ulcers depend heavily on economic level and social conditions according to this research. The strategies for lower SES groups should aim to enhance healthcare accessibility as well as deliver diabetic foot care education and reduce treatment expenses.[18]

Community-based efforts to overcome economic obstacles show strong potential to minimize FUs seriousness and their associated problems. Health policy solutions should target the elimination of unequal diabetes care outcomes between different social

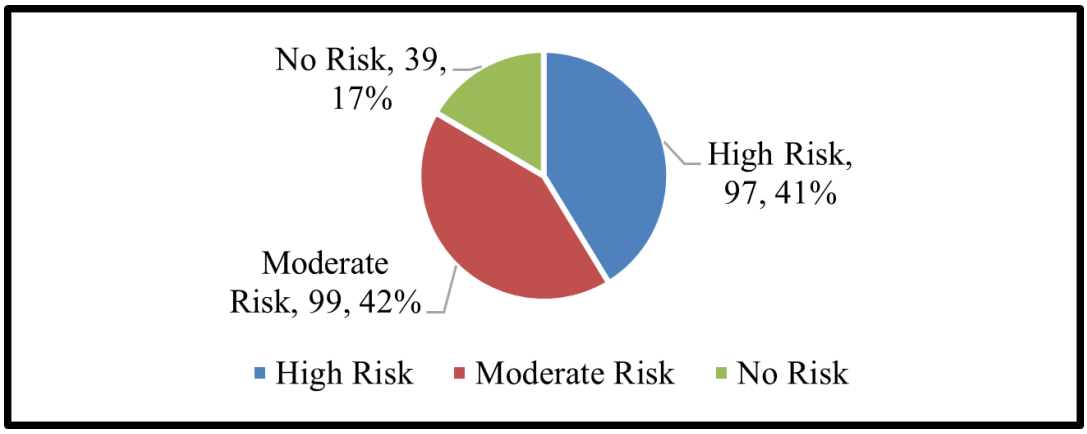

Figure 1: Severity of foot ulcers in participants.

Table 2: Risk Level Distribution by Socio-economic Status and Comorbidities.

SES CLASS	Number	%	No Risk	Moderate Risk	High Risk	*p* value
Upper middle	5	2.13	1	3	1	0.109
Upper lower	178	75.74	32	76	70	
Lower middle	18	7.66	1	8	9	
Lower	34	14.47	5	12	17	
Comorbidities	Number	%	No Risk	Moderate Risk	High Risk	
Diabetes	89	37.87	8	34	47	0.0169
Diabetes + CVD	45	19.15	4	24	17	
CVD	35	14.89	9	15	11	
No comorbidities	66	28.09	18	26	22	

classes. Outreach programs supported by subsidized healthcare delivery to both rural areas and low-income communities would help decrease the incidence of FUs among those of lower socioeconomic status.[19] The research outcome demonstrates how economic standing strongly influences both the development and treatment of diabetic foot ulcers. Better outcomes and earlier intervention become possible for at-risk populations when SES-related barriers receive attention. Foot ulcer management requires a multidisciplinary approach because patient data has shown its importance particularly for diabetics and heart patients. Routine screening and educational efforts aimed at patients serve as crucial elements in controlling the high-risk ulcer burden.[20]

The study demonstrates essential information about how existing conditions together affect the occurrence and intensity of foot ulcers. This research clarifies that an integrated care model becomes crucial because it recognizes how diabetes and cardiovascular diseases affect each other. Failures to identify how risks distribute by comorbidities should direct resource management while prioritizing interventions toward vulnerable populations. Clinical data proves that organizations should begin screening and treating patients who have diabetes or multiple medical illnesses because this strategy improves both patient outcomes and reduces serious complications.

CONCLUSION

The research identifies how FU severity develops through multiple interactions of medical conditions combined with individual life habits together with age demographics and social economic factors. A specific intervention system that tackles multiple risk elements leads to improved results while lessening treatment complications and lowering the total impact of diabetic foot ulcers on patients. The management of FUs requires healthcare systems to establish targeted public health policies along with integrated care delivery approaches to handle disparities in medical care.

ACKNOWLEDGEMENT

The writers extend appreciation to all study participants. The authors express gratitude to M. Chinnaeswaraiah who serves as the Principal of Anurag Pharmacy College Kodad for his ongoing support in finishing the research project.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

FU: Foot ulcers; **CVD:** Cardiovascular diseases; **SES:** Socioeconomic status.

ETHICAL APPROVAL

The research work has been carried out after taking the permission form institutional ethical committee.

SUMMARY

A six-month research study was conducted in Khammam tertiary hospitals with 235 patients who had Foot Ulcers (FUs) and categorised according to their demographics, comorbidities, residential location, income status and risk factors. Males together with rural inhabitants and smokers and alcohol users revealed the highest incidence of high-risk FUs. Poor glycemic control among diabetic patients made their FUs more severe and contributed to diabetes being the major comorbidity (37.87%). People with lower socioeconomic statuses developed more severe foot ulcer outcomes compared to higher status patients. The statistical data analysis confirmed through p value of <0.05 showed substantial distinctions between risk groups. The research study recommends quick screening methods and integrated patient care alongside lifestyle adjustments to handle FUs and their health complications specifically in medically vulnerable groups.

REFERENCES

1. Balakrishnan KR, Raj DR, Ghosh S, Robertson GA. Diabetic foot attack: Managing severe sepsis in the diabetic patient. World J. Crit. Care Med. 2025; 14(1).
2. Armstrong DG, Boulton AJM and Bus SA. Diabetic foot ulcers and their recurrence. N Engl J Med. 2017; 376: 2367-75.
3. Razavi ZS, Aliniay Sharafshadehi S, Yousefi MH, Javaheri F, Rahimi Barghani MR, Afkhami H, *et al.* Application of novel strategies in chronic wound management with focusing on pressure ulcers: new perspective. Arch. Dermatol. Res. 2025; 317(1): 320.
4. Leo WZ, Ge L, Chandrasekar S, Tan E, Loh YB, Zhu J, *et al.* Diabetic foot in primary and tertiary (definite) care: an efficacious, synergistic and cost-effective multidisciplinary team model for diabetic foot care in singapore. InSeminars in Vascular Surgery 2025. WB Saunders.
5. Hijazi H, Al Abdi R, Abuhammad S, Bani Issa W, Al-Sharman A, Saadeh N, *et al.* Assessing the effectiveness of targeted educational interventions on enhancing self-efficacy and foot care practices among diabetic women in Jordan. Front. Public Health. 2025; 12: 1502781.
6. Sun S, Li T, Zheng A, Zhang Z, Wang Q, Chen C, Zeng Z. Doctor-patient-family collaboration in community-based chronic disease management to enhance multidimensional value. Patient Educ Couns. 2025; 132: 108604.
7. Folguera-Álvarez C, Garrido-Elustondo S, Rico-Blázquez M, Verdú-Soriano J. Factors associated with the quality of life of patients with venous leg ulcers in primary care: Cross-Sectional study. Int. J. Low. Extrem. Wounds. 2022; 21(4): 521-8.
8. Luo Y, Niu S, Mai L, Liu X, Yang C. Factors Associated with Infection Severity of Diabetic Foot Ulcers: A Cross-Sectional Study. Int. J. Low. Extrem. Wounds. 2022: 15347346221140164.
9. Sabah L, Burian EA, Kirketerp-Møller K, Thomsen SF, Moltke FB. Prevalence and characteristics of pain in patients with lower-extremity ulcers-A cross-sectional study. Wound Repair Regen. 2024; 32(2): 155-163.
10. Leren L, Johansen EA, Eide H, Sørum Falk R, Ljoså TM. Prevalence and factors associated with ulcer-related pain in persons with chronic leg ulcers—an explorative study. J Clin Nurs. 2021; 30(17-18): 2732-41.
11. Wong ND, Sattar N. Cardiovascular risk in diabetes mellitus: epidemiology, assessment and prevention. Nat. Rev. Cardiol. 2023; 20(10): 685-95.
12. Ding H, Yu Z, Yao H, Xu X, Liu Y, Chen M. Global burden and trends of disability-adjusted life years and mortality for decubitus ulcer: A systematic analysis. Int. Wound J. 2024; 21(2): e14604.
13. Turns M. Prevention and management of diabetic foot ulcers. Br. J. Community Nurs. 2015; 20(Sup3):S30-7.
14. Sahu SS, Chaudhary V, Sharma N, Kumari S, Pal B, Khurana N. Prevalence and risk factors associated with diabetic foot ulcer in India: a systematic review and meta-analysis. Int. J. Diabetes Dev. Ctries. 2024: 1-2.
15. Hajj J, Sizemore B, Singh K. Impact of Epigenetics, Diet, and Nutrition-Related Pathologies on Wound Healing. Int. J. Mol. Sci. 2024; 25(19): 10474.

16. Addissouky TA, El Sayed IE, Ali MM, Wang Y, El Baz A, Elarabany N, *et al.* Oxidative stress and inflammation: elucidating mechanisms of smoking-attributable pathology for therapeutic targeting. Bull Natl Res Cent. 2024; 48(1): 16.
17. Swaminathan N, Awuah WA, Bharadwaj HR, Roy S, Ferreira T, Adebusoye FT, *et al.* Early intervention and care for Diabetic Foot Ulcers in Low and Middle Income Countries: Addressing challenges and exploring future strategies: A narrative review. Health Sci. Rep. 2024; 7(5): e2075.
18. Seshadri H, Karthikeyan V, Rudrakumar M, Seshadri P, Vasudevan D, Ranganathan V, *et al.* Out-of-pocket expenditure among patients with diabetic foot ulcer in a tertiary care hospital of south India: A cross-sectional study. Int. Wound J. 2024; 21(4): e14552.
19. Swaminathan N, Awuah WA, Bharadwaj HR, Roy S, Ferreira T, Adebusoye FT, *et al.* Early intervention and care for Diabetic Foot Ulcers in Low and Middle Income Countries: Addressing challenges and exploring future strategies: A narrative review. Health Sci. Rep. 2024; 7(5): e2075.
20. Silva-Tinoco R, Cuatecontzi-Xochitiotzi T, Reyes-Paz Y, Vidal-Santos B, Galíndez-Fuentes A, Castillo-Martínez L. Improving foot ulcer risk assessment and identifying associated factors: results of an initiative enhancing diabetes care in primary settings. Diabet. Epidemiol. Manag. 2024; 14: 100195.

Cite this article: Baba MS, Sree RU, Nayak NN, Kumar TP. A Cross-Sectional Study on Assessment of Severity of Foot Ulcers in Patients Attending Tertiary Care Hospitals of Khammam Region. Asian J Biol Life Sci. 2025;14(2):259-64.