JOURNAL OF SCIENCE & DISEASES

Determinant related to amputation and mortality among patients with diabetic foot at Yaoundé central Hospital

Déterminant lié à l'amputation et à la mortalité chez les patients atteints du pied diabétique à l'hôpital central de Yaoundé

Ekani Boukar M[1], Mokake D[1], Mbelle RII[2], Wagnoun Y[1], Ousmana O.[3], Savom Ec[2], Nana T[1], Ngwane A.[1], Bang GA[2], Chichom M.[1], Essomba A[2], Ngowe[2]

Original Article

1. Faculty of Health Sciences, University of Buea, Cameroon
2. Faculty of Medicine and Biomedicals Sciences, University of Yaounde 1, Cameroon
3. Faculty of Medicine and Biomedicals Sciences, University of Garoua

Corresponding author: Ekani Boukar Mahamat, Faculty of Health Sciences, University of Buea, Cameroon, Email : boukaryoussouf@gmail.com , Tel : (+237) 677569797

Keywords: Amputation and mortality related to diabetic foot outcomes, risk factors, Yaoundé, Cameroon.

Mots-clés : Amputation et mortalité liées au pied diabétique ; Facteurs de risque ; Yaoundé ; Cameroun.

Date de soumission: 03/09/2025
Date d'acceptation: 03/12/2025

ABSTRACT

Background: Diabetic foot complications (DFC) are a significant cause of morbidity and mortality worldwide, often leading to amputations and death. This study aimed to identify the determinants of amputation and mortality outcomes among diabetic foot patients at the Yaoundé Central Hospital in Cameroon.

Methods: This was a retrospective descriptive study of medical records for 329 patients with diabetic foot admitted between January 2019 and December 2021. We collected data on patient demographics, comorbidities, laboratory findings, and clinical presentation using the Wagner classification. The primary outcomes were lower-limb amputation and mortality. We performed a multivariate logistic regression to identify factors associated with amputation and mortality related to diabetic foot outcomes.

Results: The mean age of the patients was 57.9 years, with 66% having type 2 diabetes. The most common comorbidities were heart failure (38%) and hypertension (33.7%). The study found a high rate of poor outcomes, with 75 patients (22.8%) undergoing amputation and 77 patients (23.4%) dying. Multivariate analysis revealed that dyslipidemia (adjusted odds ratio [aOR]: 2.942) and a Wagner classification ≥ 4 (aOR: 0.053) were significant, independent predictors of adverse outcomes.

Conclusion: The presence of dyslipidemia and a high-grade Wagner classification are critical determinants of poor outcomes in diabetic foot patients at Yaounde central hospital. These findings underscore the urgent need for enhanced screening, aggressive lipid management, and timely, specialized care for severe diabetic foot disease to reduce the high rates of amputation and mortality.

RESUME

Introduction : Les complications du pied diabétique représentent une cause majeure de morbidité et de mortalité dans le monde. Le but de l'étude était d'identifier les déterminants liés à l'amputation et la mortalité chez les patients présentant un pied diabétique à l'Hôpital Central de Yaoundé.

Méthodes : Il s'agissait d'une étude rétrospective descriptive portant sur 329 patients hospitalisés pour pied diabétique entre janvier 2019 et décembre 2021. Les données démographiques, cliniques, biologiques et la classification de Wagner ont été collectées. Les issues défavorables retenues étaient l'amputation du membre inférieur et la mortalité. Une régression logistique multivariée a été utilisée pour identifier les facteurs associés.

Résultats : L'âge moyen des patients était de 57,9 ans ; 66 % présentaient un diabète de type 2. Les comorbidités les plus fréquentes étaient l'insuffisance cardiaque (38 %) et l'hypertension artérielle (33,7 %). Les résultats ont montré un taux élevé d'issues défavorables : 22,8 % d'amputations (75 patients) et 23,4 % de décès (77 patients). L'analyse multivariée a révélé que la dyslipidémie (OR ajusté : 2,94) et une classification de Wagner ≥ 4 (OR ajusté : 0,053) étaient des prédicteurs indépendants significatifs des issues défavorables.

Conclusion : La présence de dyslipidémie et un stade avancé de la classification de Wagner constituent des déterminants critiques des issues défavorables du pied diabétique à l'Hôpital Central de Yaoundé.

DOI : https://doi.org/10.64294/jsd.v3i4.189

Introduction

The diabetic foot is one of the most severe and debilitating complications of diabetes mellitus, representing a major cause of morbidity, disability, and mortality worldwide. It is defined as infection, ulceration, or destruction of tissues of the foot associated with neuropathy and/or peripheral arterial disease. Beyond its clinical burden, the diabetic foot leads to prolonged hospitalizations, repeated surgical interventions, and high healthcare costs, thereby constituting a substantial socioeconomic challenge. Epidemiological data suggest that 15 to 25% of diabetic patients will develop a foot ulcer during their lifetime, and among them, 20% will ultimately require amputation of a lower limb segment [1]. In sub-Saharan Africa, the situation is even more alarming due to late diagnosis, limited access to specialized care, and poor availability of podiatric and vascular services. Consequently, rates of amputation remain disproportionately high, with significant excess mortality [2]. These factors contribute to amputation rates that are up to 10 times higher than those in high-income countries [3]. In Cameroon, although the diabetic foot is a frequent reason for hospitalization among diabetic patients [4], studies remain scarce and are mostly descriptive. Very few have specifically assessed the predictors of adverse outcomes such as amputation or death. Identifying these determinants is crucial to improving patient management, guiding preventive measures, and reducing the devastating impact of this condition.

Methods

We conducted a cross sectional with retrospective data collection study at the Central Hospital of Yaoundé from January 2019 to December 2021. All diabetic patients aged ≥18 years, hospitalized for diabetic foot complications with complete medical records within the 30 days following admission, were included. Diabetic patients with traumatic foot or swelling red leg and those with incomplete records as absence of biological and/or clinical characteristics and outcomes, were excluded. Data collected included sociodemographic, clinical, and biological characteristics, as well as the Wagner classification of diabetic foot lesions. The outcomes of interest were lower limb amputation (minor or major) and in-hospital mortality. Data analysis was performed using SPSS version 25. Qualitative variables were expressed as frequencies and compared using the Chi-square test. Quantitative variables were analyzed using the Student's t-test or the Mann–Whitney U test as appropriate. Multivariate logistic regression was applied to identify independent predictors of adverse outcomes. A p-value < 0.05 was considered statistically significant. Ethical approval was obtained from the institutional ethics committee of the Central Hospital of Yaoundé, and patient confidentiality was strictly respected.

Results

A total of 329 diabetic foot patients were included in the study. The mean age of participants was 57.9 years (± 13.5). The majority of participants (66.0%) were diagnosed with type 2 diabetes (Table 1).

Table 1: demographic characteristics of patients admitted to the YCH diabetic unit.

Demographic characteristics	Frequency	Proportion (%)
Mean age (years)	57.9 ± 13.5	
BMI		
Normal	154	46.8
Overweight	126	38.3
Obese	49	14.9
Type of Diabetes		
DM Type II	217	66.0
DM Type I	112	34.0
Wagner Classification		
< 4	249	75
≥ 4	80	25

Most patients were on treatment; 237 (72%) were on at least one treatment modality, with 121 (36.8%) on insulin only, 63 (19.1%) on orals, and 53 (16.1%) on both (Table 2).

Table 2: Distribution of Patients According to Type of Antidiabetic Treatment

Type of Treatment	Frequency	Proportion (%)
Insulin only	121	36.8 %
Oral antidiabetic drugs only	63	19.1 %
Combined (Insulin + Oral)	53	16.1 %
Total on treatment	237	72 %
Untreated	92	28 %
Overall total	329	100 %

Among the comorbidities recorded, heart failure was the most prevalent (38.0%), followed by hypertension (33.7%) and chronic kidney disease (26.7%) (Table 3).

Table 3: population comorbidities

Comorbidities	Frequence	Proportion (%)
Hypertension	102	33.7
Heart failure	115	38.0
Chronic Kidney Disease	81	26.7
Osteoarthritis	1	0.3
Chronic Obstructive Pulmonary Disease	1	0.3
Liver cirrhosis	1	0.3
Tuberculosis	1	0.3

The study found that 90.4% of participants had HbA1c levels greater than 7%, and 25% of the

Citation as J Sci Dis 2025, Vol 3 (4): 49 - 52

patients had a Wagner classification of four or higher (Table 1). In terms of outcomes, the study recorded 75 amputations (22.8%) and 77 deaths (23.4%) (Table 4).

Table 4: outcomes

Outcomes	Frequency	Proportion (%)
Amputation	75	22.8
Death	77	23.4
Unidentified outcomes	5	1.5

Multivariate logistic regression identified two significant factors associated with poor outcomes: dyslipidemia (aOR: 2.942) and a Wagner classification greater than or equal to four (aOR: 0.053) (Table 5 and Table 6).

Table 5: factors associated with poor outcome

Variable	Category	Alive n (%) N= 252	Dead n (%) N= 77	p-value
Lipid profile	Normal	125 (83.3)	25 (16.7)	0.008
	Dyslipidemia	127 (70.9)	52 (29.1)	
BMI	Normal	121 (78.6)	33 (21.4)	0.007
	Overweight	102 (81.0)	24 (19.0)	
	Obese	29 (59.2)	20 (40.8)	
Wagner class	< 4	116 (61.4)	73 (38.6)	<0.001
	≥ 4	136 (97.1)	4 (2.9)	
Amputation	Yes	74 (96.1)	3 (3.9)	<0.001
	No	178 (70.6)	74 (29.4)	

Table 6 : multivariate logistic regression

Variables	Alive n (%)	Dead n (%)	p-value	aOR	95% CI (lower-upper)
Lipid profil					
Normal	125 (83.3)	25 (16.7)	0.006	1	1.369 – 6.324
Dyslipidemia	127 (70.9)	52 (29.2)	--	2.942	--
Wagner Classification					
< 4	116 (61.4)	73 (38.6)	<0.001	1	0.018 - 0.155
≥ 4	136 (97.1)	4 (2.9)	--	0.053	--

Discussion

This study demonstrates that diabetic foot remains a major cause of disability and death in Cameroon, with unacceptably high rates of amputation (22.8%) and mortality (23.4%). These results underscore persistent challenges in early detection, glycemic control, and access to multidisciplinary care.

The mean age (57.9 years) and the predominance of type 2 diabetes are consistent with regional findings from Nigeria, Ghana, and Kenya [5–7]. This middle-aged predominance reflects the chronic evolution of diabetes in African populations, where diagnosis often occurs late. The male predominance (slightly higher though not statistically detailed) has been noted elsewhere and may reflect lifestyle and occupational exposure to trauma, as well as poorer foot hygiene practices among men [8].

The high rates of heart failure (38%), hypertension (33.7%), and chronic kidney disease (26.7%) confirm the multifactorial burden of diabetes, which accelerates vascular damage and impairs wound healing [9,10]. The identification of dyslipidemia as a major determinant of adverse outcomes aligns with findings from Saudi Arabia and India [11,12]. Dyslipidemia contributes to micro- and macroangiopathy, reducing tissue perfusion and impairing leukocyte function. This mechanism increases infection susceptibility and delays ulcer healing. Therefore, early lipid screening and management—often overlooked in African diabetic clinics—should be systematically integrated into care.

The strong association between Wagner grade ≥ 4 and poor outcomes underscores the role of lesion severity as a prognostic marker. Higher Wagner grades represent deep necrotic or gangrenous lesions, often requiring surgical debridement or amputation. These findings parallel results from studies in Ghana and Iraq, which found advanced lesion grades as independent predictors of mortality [7,13].

Late presentation remains a key challenge: over 70% of African patients consult after more than two weeks of ulcer onset [14]. This delay allows infection progression and systemic involvement. Community-level awareness and early referral strategies are therefore critical.

The amputation rate (22.8%) and mortality rate (23.4%) are comparable to those reported in Ethiopia (25%) and Nigeria (21%) [15,16]. These outcomes far exceed those in high-income countries, where mortality rarely exceeds 2–5% due to robust wound-care systems and vascular reconstruction services [17].

The high mortality may also be related to systemic sepsis and uncontrolled hyperglycemia, conditions commonly observed in this cohort. Poor access to antibiotics, delayed surgical intervention, and limited intensive care capacity further worsen outcomes.

These findings highlight urgent priorities: early detection and referral systems for diabetic foot ulcers through primary care sensitization, the integration of lipid and cardiovascular risk management into diabetic foot protocols. Multidisciplinary care units involving endocrinologists, surgeons, podiatrists, and infectious disease specialists. Training of healthcare workers in wound care and early infection recognition. Community education campaigns emphasizing foot hygiene and early consultation.

Study Limitations

This study's retrospective nature limited

Citation as **J Sci Dis 2025, Vol 3 (4): 49 - 52**

microbiological data and follow-up on long-term outcomes after discharge. Despite these limitations, the multicenter design and relatively large sample size provide valuable insights for national policy and hospital practice.

Conclusion

The present study concludes that the majority of diabetic foot patients admitted to Yaoundé Central Hospital have type 2 diabetes, poor glycemic control, and a high prevalence of comorbidities. The presence of dyslipidemia and a high-grade Wagner classification are critical factors associated with poor outcomes, emphasizing the need for enhanced management strategies to reduce morbidity and mortality.

Conflict of Interest: The authors declare that they have no competing interests.

Contribution of authors: Ekani Boukar: Conceived and designed the study, collected data, performed statistical analysis, and drafted the manuscript, Mokake: Assisted with study design, contributed to data interpretation, and critically revised the manuscript for important intellectual content, Mbelle and Wagnoun : Contributed to data collection, patient recruitment, and literature review, Ousmana, Nana, Savom, Ngwane: Contributed to literature review, Bang, Chichom, Essomba, Ngowe: Supervised the study, validated the methodology, guided the analysis, and provided final approval of the version to be published.

References

1. Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J. The global burden of diabetic foot disease. Lancet. 2005;366(9498):1719–24.
2. Kahn SE, Cooper ME, Del Prato S. Pathophysiology and treatment of type 2 diabetes. Lancet. 2014;383(9922):1068–83.
3. Alegbeleye BJ. Major limb amputations in Northwestern Cameroon. Health Sci Dis. 2020;21(2).
4. Pisoh-Tangnyin C, Farikou I, Guifo ML, et al. Epidemiology of extremity amputations in Yaoundé, Cameroon. Health Sci Dis. 2010;11(4).
5. Sarfo-Kantanka O, Sarfo FS, Kyei I, Agyemang C, Mbanya JC. BMC Endocr Disord. 2019;19(1):27.
6. Obimbo M, Njogu S. Diabetes-related amputation in rural Kenya. Atherosclerosis. 2010;3:5–4.
7. Marzoq A, Shiaa N, Zaboon R, et al. Outcome of diabetic foot ulcers in Basrah, Iraq. Int J Diabetes Metab. 2019;25(1–2):33–8.
8. Al-Rubeaan K, et al. Diabetic foot complications and risk factors. PLoS One. 2015;10(5):e0124446.
9. Feldman EL, Callaghan BC, Pop-Busui R, et al. Diabetic neuropathy. Nat Rev Dis Primers. 2019;5(1):41.
10. 10. Aumiller WD, Dollahite HA. Pathogenesis and management of diabetic foot ulcers. JAAPA. 2015;28(5):28–34.
11. Badri MM, Ghandourah NA, et al. Lower limb amputations among diabetics in Saudi Arabia. J King Abdulaziz Univ Med Sci. 2011;18(2):13–25.
12. Ramanathan B, et al. Glycaemic status and diabetic foot outcomes in South India. J Basic Clin Physiol Pharmacol. 2022;33(2):155–62.
13. Ekenze, Sebastian O., Obinna V. Ajuzieogu, and Benedict C. Nwomeh. "Challenges of management and outcome of neonatal surgery in Africa: a systematic review." Pediatric surgery international 32.3 (2016): 291-299.
14. Goodman, Laura F., St-Louis, Etienne, Yousef, Yasmine, et al. The global initiative for children's surgery: optimal resources for improving care. European Journal of Pediatric Surgery, 2018, vol. 28, no 01, p. 051-059.
15. Udoh, David O. et Adeyemo, Adebolajo A. Traumatic brain injuries in children: a hospital-based study in Nigeria. African Journal of Paediatric Surgery, 2013, vol. 10, no 2, p. 154-159..
16. WHO. Global report on the prevention of surgical site infections. Geneva: WHO; 2018.
17. Saxton, Anthony T., Poenaru, Dan, OZGEDIZ, Doruk, et al. Economic analysis of children's surgical care in low-and middle-income countries: a systematic review and analysis. PloS one, 2016, vol. 11, no 10, p. e0165480.

Citation as **J Sci Dis 2025, Vol 3 (4): 49 - 52**