Journal of Emergency Medicine and Surgery
https://www.sciltp.com/journals/jems

Article

Prevalence of Infected Diabetic Foot Ulcers in Kisumu County, Kenya: Identifying Risk Factors

Silas O. Awuor [1,2,*], Eric O. Omwenga [3], Eliud Wafula [4], Ibrahim I. Daud [5] and Richard M. Mariita [6]

[1] Department of Applied Health Sciences, School of Health Sciences, Kisii University, Kisii 40200, Kenya
[2] Microbiology Department, Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu 40100, Kenya
[3] Department of Medical Microbiology & Parasitology, School of Health Sciences, Kisii University, Kisii 40200, Kenya
[4] Department of Physical and Biological Sciences, Bomet University College, Bomet 20400, Kenya
[5] Kenya Medical Research Institute, United States Army Medical Directorate-Africa, HJF Medical Research International, Kericho 20200, Kenya
[6] CYCLYN Biosciences, Zionsville, IN 46077, USA
* Correspondence: silasawuor@jootrh.go.ke

How To Cite: Awuor, S.O.; Omwenga, E.O.; Wafula, E.; et al. Prevalence of Infected Diabetic Foot Ulcers in Kisumu County, Kenya: Identifying Risk Factors. *Journal of Emergency Medicine and Surgery* **2026**, *1*(1), 2.

Received: 8 February 2026
Revised: 17 April 2026
Accepted: 25 May 2026
Published: 16 June 2026

Abstract: Diabetic foot ulcers (DFUs) represent a major cause of hospitalization and amputation worldwide. The prevalence and specific risk factors for infected DFUs, however, remain inadequately characterized among people living with diabetes (PLWD) in Kisumu County, Kenya. The present study sought to determine these prevalence and to identify associated clinical determinants. A cross-sectional study employing stratified random sampling was conducted at three major referral hospitals in Kisumu. A total of 471 PLWD were recruited. Data collection comprised sociodemographic interviews, clinical record reviews, and DFU screenings, including assessments for peripheral neuropathy, ankle-brachial index, and ulceration. The relationship between variables was assessed using chi-square analysis and logistic regression modeling, with a significance threshold defined at p-values below 0.05. Among participants (51.8% male; mean age 57.5 ± 13 years), the majority had Type 2 diabetes. Clinical assessments indicated a substantial burden of foot pathology, with fungal infection markers detected in 63.1% of males and 43.2% of females. A history of foot ulceration was significantly associated with diabetes duration exceeding 11 years ($p < 0.001$). Distal neuropathy was identified as an independent predictor of diabetic foot ulcers, showing a statistically significant association (OR = 1.8; 95% CI: 1.1–2.6; $p = 0.029$). In contrast, insulin treatment demonstrated a lower prevalence association against DFU development. The findings indicate a substantial burden of DFU risk in Kisumu County, primarily attributable to neuropathy and prolonged disease duration. The observed protective association of insulin highlights potential therapeutic benefits. These results emphasize the urgent need for policies mandating routine foot screening and optimizing insulin use in primary care to prevent limb loss.

Keywords: biological therapies; diabetic foot ulcer (DFU); epidemiology and prevalence; lower extremity amputation (LEA); peripheral neuropathy; risk factors

1. Introduction

Diabetes is a chronic metabolic disorder characterized by dysregulation of blood glucose and insulin activity. It is broadly classified into two main types: Type 1 diabetes mellitus, which occurs when the immune system destroys pancreatic beta cells responsible for insulin production, and Type 2 diabetes mellitus, which develops due to insulin resistance in body tissues combined with progressive decline in insulin secretion by the pancreas,

Copyright: © 2026 by the authors. This is an open access article under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).
Publisher's Note: Scilight stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

ultimately leading to inadequate glycemic control. Type I diabetes is significantly less common (only 5–10% of all diabetes cases in the US) but is not preventable; while type II diabetes accounts for 90–95% of all US cases and can be prevented by leading a healthy lifestyle. Diabetes mellitus prevalence rates are the highest in the Middle East and Northern Africa (MENA) region at 12.2% of the population [1,2].

The prevalence of diabetes differs across the globe, with a rising burden observed in all regions of Africa. It is estimated that approximately 537 million adults aged 20–79 years are currently living with diabetes worldwide, and nearly 240 million of these cases are thought to remain undiagnosed [3,4]. Based on estimated population growth, by 2045, 46% of the global population could be living with diabetes [5]. The African region, as per the Center for Disease Control and Prevention (CDC) report, has a high burden of undiagnosed diabetes, with over half of cases going undetected. Kenya is among the 10 countries with the highest prevalence of diabetes, ranking 8th rank globally. Kenya estimates range of 2.4% to 5% among the total prevalence in Africa, with higher rates in urban areas and among older populations [6].

Diabetes is among the leading causes of hospital admissions and mortality globally, with substantial economic consequences, particularly in low- and middle-income countries where high levels of comorbidity coincide with limited healthcare workforce and widespread poverty [1,2]. In Kenya, the prevalence of diabetic foot ulcers (DFUs) continues to increase; for example, a study conducted at Kenyatta National Hospital in Nairobi in 2003 reported that out of approximately 1788 patients diagnosed with diabetes, 82 (4.6%) had DFUs [7]. The estimated annual cost of managing a person living with diabetes in Kenya is about USD 1500 per patient, while the management of diabetes-related complications such as DFUs can rise to approximately USD 3000 per year [8,9].

A major challenge to adherence to recommended care in Kenya, particularly among rural populations, is the high cost of treatment, which is largely paid out-of-pocket due to high unemployment rates among people living with diabetes [10]. In addition, low National Health Insurance contributions limit the extent of government support for chronic conditions such as diabetes, contributing to delayed care, poor outcomes, and an increased risk of mortality, thereby posing a significant public health burden [8]. Increased risk for developing other related health conditions is higher on PLWD, including vision decline or blindness (i.e., diabetic retinopathy), kidney failure, heart disease, stroke, and loss of feeling in the legs, feet, and toes (i.e., diabetic foot neuropathy) [11,12]. Up to 25% of diabetes patients, the loss of sensation in the feet and toes, often coupled with poor hygiene, poor foot protection, and limited podiatric care can also lead to chronically occurring diabetic foot ulcers (DFU) leading to many complications including lower extremity amputation (LEA) or even death [13,14].Those who have limited resources are at higher risk for developing a DFU as they lack the resources to prevent ulceration or identify and treat early enough to prevent systemic infections. For the diabetic foot infection (DFI), more than half (60%) cases is due to DFI with a prevalence of 6.3% globally and rates as high as 41% in Low-or-middle-income countries (LMICs), like Malaysia [7–9,15]. Cultural and regional practices that expose the feet to harsh conditions have increased the disparity in DFI occurrence, together with poverty conditions that make proper footwear difficult to obtain (e.g., walking barefoot in areas with poor water quality and infection management) [8]. DFIs are more prevalent among males, older adults, and individuals with a longer history of diabetes, multiple morbidities, and tobacco users [16]. Up to 85% of all diabetic LEAs are directly related to DFIs, however, 20% of all DFU cases will result in LEA, with the lifetime economic impact of DFI-related LEAs in LMICs disproportionately higher than in high-income countries [2].

Among people living with diabetes mellitus (PLWD), diabetic foot ulcers (DFUs) affect an estimated 6% and are associated with a spectrum of lower-limb complications including peripheral neuropathy, peripheral arterial disease (PAD), soft tissue infections, and ulceration [9]. Over the course of their lifetime, more than one-third of PLWD are likely to develop DFU, with foot ulceration representing the most frequent manifestation, accounting for about 25% of all DFU-related complications [10]. DFUs contribute to over 85% of diabetes-related amputations, and approximately one in five affected individuals ultimately undergo amputation, significantly reducing quality of life and increasing diabetes-related mortality by nearly 2.5 times [10,11].

Several factors contribute to the development of DFU, including advanced age, low socioeconomic status, alcohol use, smoking, elevated body mass index (BMI), type of diabetes, impaired circulation, and comorbid conditions such as cardiovascular disease, nephropathy, retinopathy, and intermittent claudication [12]. Importantly, effective foot care practices have been shown to reduce DFU occurrence by 50–80%, highlighting the critical role of adequate knowledge, positive attitudes, and appropriate practices in prevention [13–15]. Conversely, poor knowledge and negative attitudes toward foot care are strongly associated with inadequate self-care practices, thereby increasing the risk of DFU development [16]. Evidence from different socioeconomic settings further indicates that the distribution and strength of risk factors vary across populations due to contextual influences, underscoring the need for localized studies to identify setting-specific determinants of DFU.

Although several studies have examined wound infections among hospitalized patients [17], limited research has specifically focused on DFUs as a cause of wounds among diabetic patients in Kenya. Existing studies report a wide prevalence range of 1–33% [18], with identified risk factors including prolonged duration of diabetes, absence of pedal pulses, and peripheral neuropathy [19]. However, studies assessing knowledge, attitudes, and practices related to DFU in Kenya remain scarce, often limited by small sample sizes and single-center designs, with none conducted in Kisumu County. Therefore, this study aimed to determine the prevalence and risk factors for infected diabetic foot ulcers among diabetic patients in Kisumu County, Kenya.

2. Materials and Methods

2.1. Study Design

A cross-sectional study design was employed, using stratified random sampling. The study population was categorized into strata based on service departments, specifically inpatient and outpatient units. Diabetic patients attending clinics between March and June 2025 at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH), Kisumu County Hospital (KCH), and Lumumba Sub-County Hospital (LSCH), who fulfilled the inclusion criteria, were recruited into the study.

2.2. Participant Recruitment

Sample collection areas were organized by different departmental units, focusing specifically on the In-patient (IP) and Out-patient (OP). As per Israel, 2009 formula [20], 157 participants were considered for this study in each study site, giving a total of 471 participants across the three study sites.

2.3. Inclusion Criteria

i. Patients with diabetes who have infected DFU.
ii. Patients with infected DFU who have not been under antibiotic treatment for the past 1 week.
iii. Only patients who provided informed consent by voluntarily signing a consent form were included in the study.

2.4. Exclusion Criteria

i. Patients with infected DFUs but screen negative to any diabetic type.
ii. Patients who are currently on antibiotic medication.
iii. Patients who did not provide consent and withdraw their participation before study ends.

2.5. Determination of Risk Factors on Diabetic Foot Ulcer Patients

A structured questionnaire Supplementary File S1 was used to obtain sociodemographic information and clinical characterization. For sociodemographic information, including gender, history, age, marital status, religion, current location, education, housing, insurance status, job, and income. For clinical characterization, information on diabetic history, lifestyle, foot hygiene, and foot self-care behavior was captured. Participants' feet were examined for abnormalities including skin changes, foot deformities such as calluses, claw toes, hallux valgus, flat feet, and Charcot arthropathy, as well as discoloration and the presence of ulcers.

2.6. Face-to-Face Interviews

Structured face-to-face interviews were conducted to obtain participants' demographic and behavioral information. Variables collected included age, sex, educational attainment, socioeconomic and employment status, smoking behavior, and alcohol use. Information regarding family history of diabetes and cardiovascular diseases was also documented.

2.7. Review of Medical Records

Clinical records were reviewed to extract diabetes-related information, including body mass index (BMI), treatment modality, duration of diabetes, and associated comorbidities. Additional data collected included histories of hypertension, coronary artery disease, cerebrovascular events, claudication, revascularization procedures, renal transplantation, dialysis, and laser photocoagulation. Records on previous amputations, foot infections, nephropathy, retinopathy, and symptoms suggestive of diabetic neuropathy were similarly obtained.

2.8. Foot Examination

Comprehensive foot assessments were performed to evaluate abnormalities such as discolored toenails, calluses, fissures, corns, interdigital infections, nail condition, presence of toe hair, and joint mobility, following procedures adopted in earlier studies [21]. Visual inspection was also undertaken to identify active ulcers, healed ulcer scars, and evidence of toe or limb amputation as indicators of diabetic foot ulceration (DFU).

2.9. Assessment of Self-Care Deficits

Participants were evaluated for deficits in foot self-care practices. This assessment considered whether participants were unable to inspect the soles of their feet, used ill-fitting footwear, lacked prior education on foot care, failed to report existing foot ulcers to healthcare providers, or did not implement measures to prevent foot injuries. A positive response to any of the foot hygiene assessment items in Section B of the supplementary questionnaire was considered indicative of a self-care deficit.

2.10. Diabetic Foot Risk Classification

The likelihood of developing DFUs within a two-year period was estimated using a validated clinical prediction rule (CPR) for diabetic foot ulceration [21]. The scoring system incorporated three parameters: loss of sensation to a 10 g monofilament, absence of pedal pulses, and previous history of ulceration or amputation. Scoring was allocated as follows: loss of monofilament sensation (1 point), absence of one pedal pulse (1 point), and history of ulceration or amputation (2 points). Total scores were summed and interpreted according to established CPR risk categories.

2.11. Knowledge, Attitudes, and Practices (KAP) Assessment

A semi-structured questionnaire was administered at enrollment to evaluate participants' knowledge, attitudes, and practices concerning DFU prevention and management. The questionnaire included items related to routine foot examination, management of calluses, wounds, and cuts, foot hygiene, and other recommended preventive measures in line with guidelines from the American College of Foot and Ankle Surgeons and Diabetes UK [21].

The knowledge component consisted of five multiple-choice questions with response options of "Yes", "No," or "Unsure." The attitudes and practices section comprised six short-answer questions. Topics assessed included the role of diabetes medication in preventing complications, wound care, and behavioral risks such as smoking. To reduce random guessing, an "Unsure" option was provided for each question. Correct responses were awarded one point, whereas incorrect or uncertain responses received zero points. The highest attainable KAP score was 11, with higher scores reflecting better understanding and practices related to diabetes and DFU prevention.

Knowledge scores exceeding 60% (at least 3 correct responses out of 5) were categorized as good knowledge. For attitudes and practices, scores above 80% (5 or more correct responses out of 6) indicated good practice/attitude, scores between 60% and 79% (4 correct responses) reflected moderate practice/attitude, and scores below 59% (fewer than 3 correct responses) were considered poor. The questionnaire was administered in both English and Kiswahili, the two most widely spoken languages in Kenya.

2.12. Data Analysis

Data were entered into REDCap and analyzed using STATA version 12 (StataCorp LLC, College Station, TX, USA). Continuous variables were summarized using means and standard deviations or medians with interquartile ranges, while categorical variables were presented as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square goodness-of-fit test. Both univariate and multivariate logistic regression analyses were performed to determine associations between potential risk factors and DFU or amputation outcomes. Statistical significance was established at a p-value of less than 0.05.

2.13. Ethical Considerations

Strict measures were implemented to ensure participant privacy and confidentiality, and no identifying personal information was recorded during data collection or reporting. Written informed consent was obtained from all participants prior to enrollment. Ethical clearance for the study was granted by the Institutional Research Ethics Committee (IREC) of Jaramogi Oginga Odinga Teaching and Referral Hospital (Ref. No. ISERC/JOOTRH/096/2024), the National Commission for Science, Technology and Innovation (NACOSTI) (Ref. No. NACOSTI/P/25/16381), and

the Kisumu County Ministry of Health and Education (Ref. No. GN 133 VOL.XIX/(168)). All study procedures were conducted in accordance with the principles outlined in the Declaration of Helsinki.

3. Result

3.1. Sociodemographic of the Participants

From the total participants (n = 471) with a confirmed diagnosis of diabetes within the 3 study sites, 244/471 (51.8%) were males and 227/471 (48.2%) were females with combine mean of 57.5 ± 13 years.

No statistically significant difference in age distribution was observed between male and female participants (*p* = 0.947). Normal weight (18.6–24.9 Kg/M^2) was observed across the gender with higher male participants at 120/244 (49.2%) while female at 85/227 (34.4%). On the diabetic type, there was a higher prevalence to diabetic type II than type I at 190/244 (77.9%) and 186/227 (81.9%) among males and females respectively (Table 1).On the diabetic duration most of the participant have been living with diabetes for a period of 1–5 years among the male at 92/244 (37.7%) and 6–10 years among female 68/227 (30.0%) with most of the participant using oral hypoglycaemics at 145/244 (59.4%) among male and at 107/227 (47.1%) among the female as the most common treatment (Table 1).

Table 1. Characteristics for n = 471 PLWD recruited in Kisumu county, Kenya, between March to June 2025.

Characteristic	Male (n = 244) n (%)	Female (n = 227) n (%)	*p*-Value
Age (Years)			
10 to 19	6 (2.5)	7 (3.1)	
20 to 29	12 (4.9)	12 (5.3)	
30 to 39	25 (10.2)	29 (12.8)	0.896
40 to 49	42 (17.2)	97 (42.7)	
50 to 59	91 (37.3)	37 (16.3)	
>60	68 (27.9)	45 (19.8)	
Mean Age ± SD Years	57 ± 17	58 ±13	
Minimum Age	12	14	0.947
Maximum Age	89	95	
BMI (Kg/M^2)			
Underweight (<18.5)	30 (12.3)	25 (11)	
Normal (18.6–24.9)	120 (49.2)	85 (34.4)	0.056
Overweight (25.0–29.9)	73 (29.9)	57 (25.1)	
Obese (>30.0)	21 (8.6)	60 (26.5)	
Diabetic Type			
I	54 (22.1)	41 (18.1)	0.001
II	190 (77.9)	186 (81.9)	
Diabetics Duration (years)			
<1	22 (9.0)	39 (17.2)	
1 to 5	92 (37.7)	59 (26.0)	
6 to 10	51 (20.9)	68 (30.0)	0.92
11 to 15	42 (17.2)	41 (18.0)	
>15	37 (15.2)	20 (8.8)	
Type of treatment *			
Oral Hypoglycaemics	145 (59.4)	107 (47.1)	
Insulin	69 (28.3)	80 (35.2)	0.643
Diet	30 (12.3)	40 (17.7)	
Smoking History			
Never Smoked	164 (67.2)	197 (86.8)	
Past Smoker	55 (22.5)	24 (10.6)	<0.01
Current Smoker	25 (10.3)	6 (2.6)	
Number of Cigarattes per day			
<5	21 (84)	3 (50)	
6 to 10	4 (16)	2 (33.3)	0.625
>10	0 (0)	1 (16.7)	
Alcohol Consumption History			
Never Drunk	135 (55.4)	127 (55.9)	
Past Drunker	45 (18.4)	78 (34.4)	0.007
Current Drinker	64 (26.2)	22 (9.7)	

* Some patients were receiving two or more modalities.

Current smoking was reported among 25 of 244 (10.3%) male participants compared to 6 of 227 (2.6%) female participants. Similarly, alcohol consumption was documented in 64 of 244 (26.2%) males and 22 of 227 (9.7%) females. The proportions of participants who smoked ($p < 0.001$) and consumed alcohol ($p = 0.007$) were significantly higher among men than women (Table 1). Among the total participant, there was no glycated haemoglobin (HbA1c) valued obtained from the participant records even with the presence of the test within some study area.

3.2. DFU Complications Prevalence

Among the total participants, foot examination was conducted and 175/244 (71.7%) male and 113/227 (49.8%) female had discolored toenails, with fungi infection among 154/244 (63.1%) male and 98/227 (43.2%) female. On the distal peripheral neuropathy higher number was observed on Touch sensation Loss on feet in which male was at 180/244 (80.4%) and women at 161/227 (70.9%). The prevalence of foot ulcers did not differ significantly between male and female participants ($p = 0.451$). Lower limb amputations were documented in 29 of 244 (9.4%) males and 19 of 227 (8.3%) females (Table 2).

Among the other diabetes related complications described in this study, retinopathy 200/471 (42.5%) was the most common complication, followed by hypertension 170/471 (36.0%), coronary artery disease 65/471 (13.8), claudication 20/471 (4.2%), renal disease 8/471 (1.7%) and revascularization 4/471 (0.8%). Women had a significantly higher prevalence of hypertension ($p = 0.010$) and coronary artery disease (CAD) ($p = 0.048$) compared to men (Figure 1).

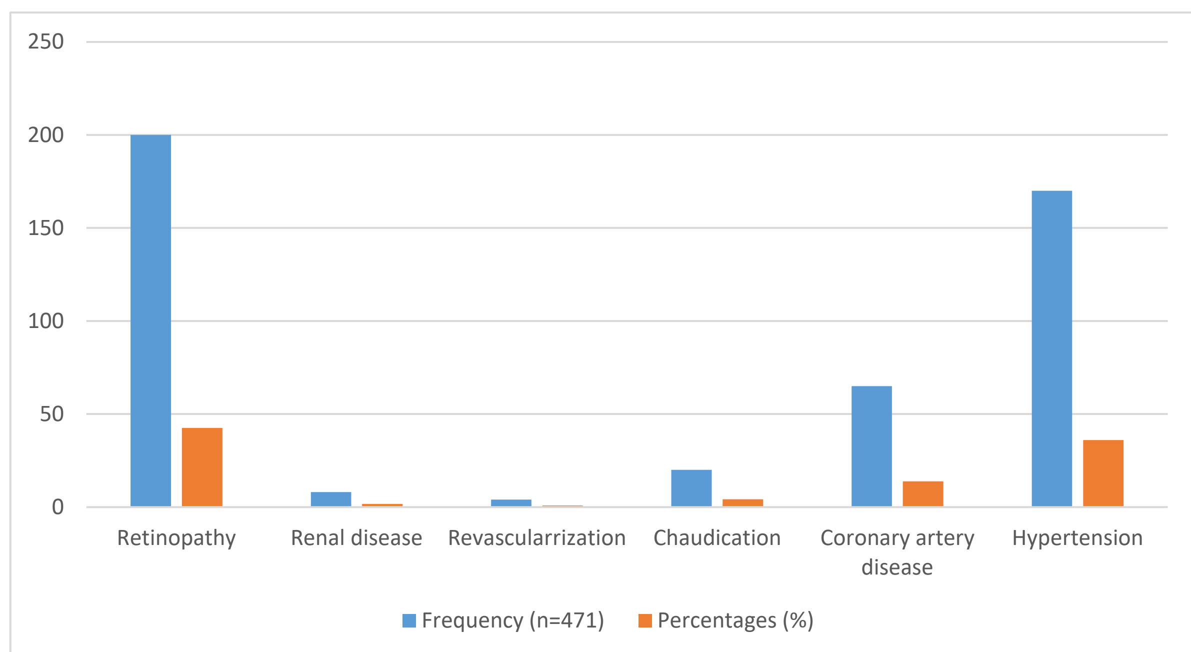

Figure 1. Frequency of diabetes-related complications among the 471 study participants.

Table 2. Prevalence of factors previously associated with diabetic foot ulcers among participants in Kisumu County (n = 471).

Characteristic	Diabetic Foot Complication	Male (n = 244) n (%)	Female (n = 227) n (%)
Physical Observation	Fungal Nail	154 (63.1)	98 (43.2)
	Discolored Toenails	175 (71.7)	113 (49.8)
	Lack of Joint Flexibility	87 (35.7)	124 (54.6)
	Foot Deformities	94 (38.5)	89 (39.2)
	Flat Foot	106 (43.4)	111 (48.9)
	Hammer Toes	132 (54.1)	108 (47.6)
Distal Neuropathy	Unsteadiness in Walking	72 (32.1)	56 (24.7)
	Burning, Aching Pain, or Tenderness	142 (63.4)	109 (48.0)
	Pricking sensation on leg & feet	167 (74.5)	114 (50.2)
	Numbness of the feet/leg	173 (77.2)	134 (59.0)
	Touch sensation Loss on feet	180 (80.4)	161 (70.9)

Table 2. *Cont.*

Characteristic	Diabetic Foot Complication	Male (n = 244)	Female (n = 227)
		n (%)	n (%)
Ankle Brachial Index	Normal	120 (53.6)	137 (60.4)
	Sub-clinical	74 (33.0)	65 (28.6)
	Severe	30 (13.4)	25 (11.0)
	Foot Ulcer	64 (28.6)	56 (24.7)
	Amputation	21 (9.4)	19 (8.3)
	Abnormal ankle reflex	32 (14.3)	41 (18.1)
	Abnormal patellar reflex	28 (12.5)	39 (17.1)

3.3. Risk Factors for Diabetic Foot Complications

An analysis of diabetic foot ulcer (DFU) complications according to duration of diabetes revealed that participants with a longer history of diabetes had a significantly higher prevalence of previous foot ulceration. Increased frequencies of foot ulcer history were particularly evident among individuals living with diabetes for 11–15 years ($p < 0.001$) and those with a duration exceeding 15 years ($p < 0.001$) (Figure 2).

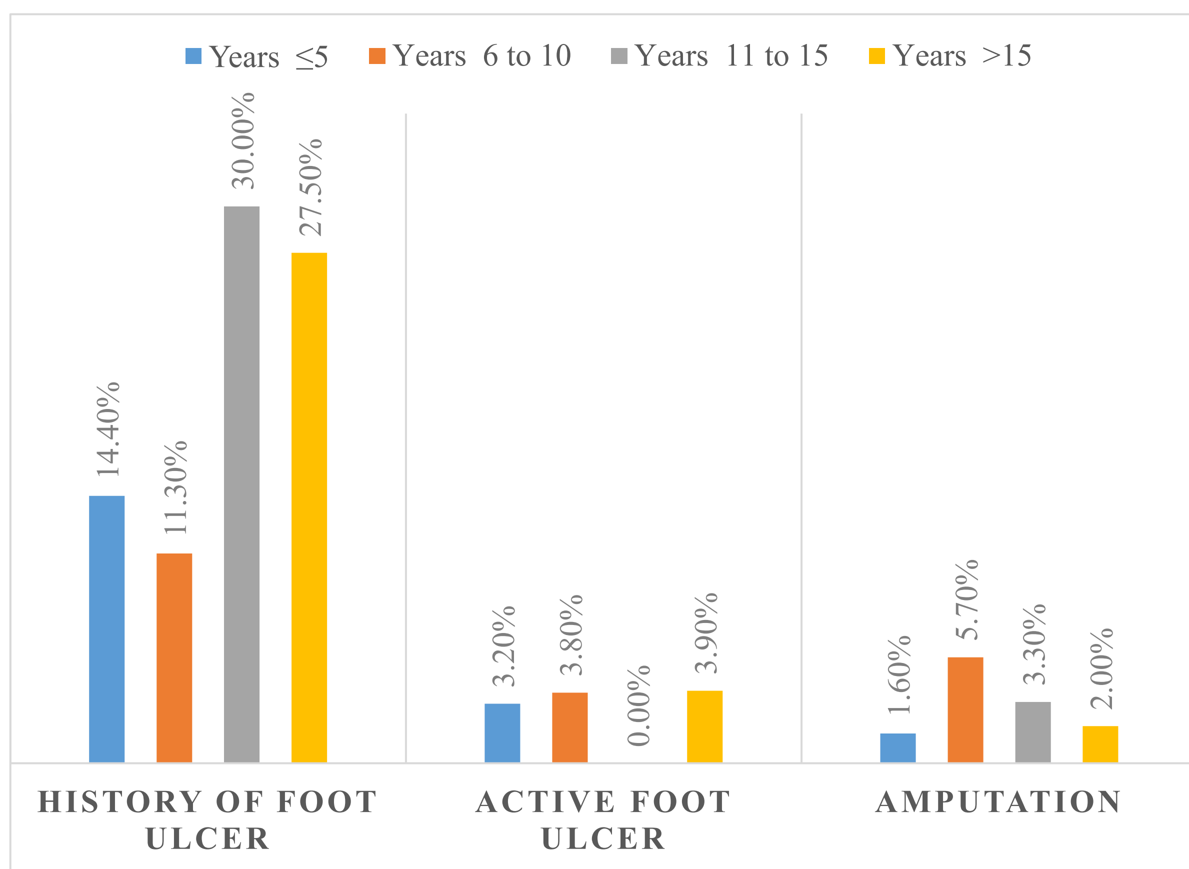

Figure 2. Prevalence of diabetic foot complications according to duration of diabetes among study participants (n = 471).

In the multivariable analysis, distal neuropathy, manifesting as burning sensations, aching pain, or tenderness, was the only factor that remained significantly associated with diabetic foot ulcers (OR = 1.8; 95% CI: 1.1–2.6; $p = 0.029$) (Table 3).

Regarding amputation outcomes, insulin therapy showed a protective effect in both unadjusted and adjusted models (OR = 0.8; 95% CI: 0.1–0.9; $p = 0.059$), although this association approached but did not reach conventional statistical significance.

Table 3. Multivariable logistic regression analysis of factors associated with diabetic foot ulcers and amputation among participants in Kisumu County.

Predictor	Covariates	Odd Ratio (95% CI)	*p*-Value
Diabetic Foot Ulcer	Gender	1.1 (1.0–1.1)	0.572
	Age	1.1 (1.0–1.2)	0.265
	BMI	1.0 (1.0–1.2)	0.262
	Retinopathy	3.1 (0.7–6.4)	0.198
	Diabetic Duration	1.0 (0.9–1.1)	0.95
	Foot Colour	7.9 (0.9–37.7)	0.071
	Pricking Sensation	0.9 (0.6–1.4)	0.74
	Unsteady Walking	0.7 (0.4–1.5)	0.407
	Feet Tenderness	1.8 (1.1–2.6)	0.029 *
	Feet Numbness	1.3 (0.7–1.7)	0.931
Amputation	Age	1.0 (0.9–1.1)	0.928
	Gender	1.3 (0.1–3.9)	0.649
	Diabetic Type	2.5 (0.2–11.8)	0.798
	Foot Ulcer	10.0 (0.6–40.0)	0.237
	Insulin Use	0.2 (0.1–0.9)	0.059 *
	Oral Hypoglycemic Adherence	1.9 (0.1–5.4)	0.712
	Retinopathy	0.9 (1.0–1.9)	0.051
Both foot ulceration & Amputation	Gender	1.2 (0.3–2.5)	0.864
	Diabetic Type	0.8 (0.1–3.2)	0.563
	Diabetic Duration	0.9 (1.0–1.1)	0.165
	Non-steady Walking	1.6 (0.8–2.0)	0.245
	Feet Tenderness	1.5 (1.0–1.9)	0.071
	Pricking Sensation	1.2 (0.7–1.4)	0.921
	Feet Numbness	1.0(0.7–1.2)	0.523
	Insulin Use	0.8 (0.2–1.9)	0.412
	Oral Hypoglycemic Adherence	2.1 (0.5–6.1)	0.393
	Diet	4.5 (0.1–13.8)	0.799
	Hypertension	2.5 (0.5–8.9	0.298

* Indicate statistical significance or borderline significance at $p < 0.10$. Statistical significance was considered at $p < 0.05$.

3.4. Assessment of Knowledge of DFU

Most participants demonstrated good understanding that adherence to regular medication is essential for preventing diabetes-related complications, and that proper foot care helps reduce injuries, wounds, infections, and ulceration. This was correctly identified by 204 of 244 (83.6%) male participants and 197 of 227 (86.8%) female participants.

However, gaps in knowledge were still evident. A notable proportion of male participants (90/244; 36.9%) were unaware that individuals with diabetes should regularly inspect their feet because wounds and infections may heal slowly. In addition, 23 of 244 (9.4%) males did not recognize that smoking should be avoided in diabetes due to its role in impairing circulation and increasing the risk of diabetic foot complications (Table 4).

Table 4. Responses to knowledge-related questions among study participants (n = 471).

	Male (n= 244)	**Female (227)**
Questions	n (%)	n (%)
YES	204 (83.6)	197 (86.8)
NO	19 (7.8)	10 (4.4)
UNSURE	21 (8.6)	20 (8.8)
YES	120 (49.2)	169 (74.5)
NO	90 (36.9)	38 (16.7)
UNSURE	34 (13.9)	20 (8.8)
YES	124 (50.8)	140 (61.8)
NO	75 (30.7)	60 (26.4)
UNSURE	25 (10.2)	27 (12.8)
YES	201 (82.4)	197 (86.8)
NO	23 (9.4)	18 (7.9)
UNSURE	20 (8.2)	12 (5.3)

3.5. Attitudes and Practice Assessment

Correct responses related to attitudes and practices were generally more frequent among female participants compared to male participants, as shown in Table 5. More than half of the female participants 150/227 (66.1%) often inspect their feet daily as recommended while only 84/244 (34.4%) male do, with 187/227 (82.4%) female and 130/244 (53.3%) male seek medical attentions for trimming a corn/hard skin lesion incase detected. A total of 200/227 (88.1%) female and 97/244 (39.7%) male usually understand that warm water should be used to clean the feet with only 197/227 (86.8%) female and 94/244 (38.5) male participants do wash their feet at least once on a daily basis (Table 5).

Table 5. Responses to the attitude and practice components of the questionnaire among study participants (n = 471).

Characteristic	Male (244) n (%)	Female (227) n (%)
How often do you think you should inspect your feet?		
Correct Responses (Daily)	84 (34.4)	150 (66.1)
Incorrect Response	120 (49.2)	57 (25.1)
Unsure	40 (16.4)	20 (8.1)
What would you do if you had a corn/hard skin lesion?		
Correct Responses (Seek medical attention for trimming)	130 (53.3)	187 (82.4)
Incorrect Response	74 (30.3)	30 (13.2)
Unsure	40 (16.4)	10 (4.4)
How often do you think your feet should be washed?		
Correct Responses (At least once on a daily basis)	94 (38.5)	197 (86.8)
Incorrect Response	110 (50.1)	20 (8.8)
Unsure	40 (16.4)	10 (4.4)
What temperature of water do you think you should wash your feet in?		
Correct Response (Warm)	97 (39.7)	200 (88.1)
Incorrect Response	107 (43.9)	17 (7.5)
Unsure	40 (16.4)	10 (4.4)
How often do you think you should inspect the inside of your footwear for object or torn lining		
Correct Response (Before each wear)	84 (34.4)	137 (60.4)
Incorrect Response	140 (57.4)	75 (33.0)
Unsure	20 (8.2)	15 (6.6)

4. Discussion

Diabetic Foot Ulcerations and consequently lower limb amputation complications, when detected early, can be well managed and prevented, but due to a lack of data on these complications among those PLWD under management have been experiencing. To the best of our knowledge, no prior study has assessed the prevalence and associated risk factors of diabetic foot ulcers (DFUs) in Kisumu County. However, within Kenya, one study has reported a DFU prevalence of 38% among people living with diabetes [22]. This therefore creates a paucity of facts about such prevalence, hence might end up with poor policies being crafted for use in the management of such conditions amongst our societies.

The prevalence of DFUs observed in this study was not consistent with findings from several other low- and middle-income countries (LMICs). For instance, reported rates in Cameroon, Sudan, India, and Tanzania were 12%, 18%, 16%, and 15%, respectively [23–26]. Conversely, our results were more in line with studies from Ethiopia (31%) and Jordan (70%), which documented relatively higher DFU frequencies.

In contrast, studies conducted in high-income countries such as Australia and the United Kingdom have reported much lower prevalence rates of below 2.5% compared to the findings of the present study [27–30]. These differences in DFU prevalence across settings are concerning and may be partly explained by variations in the burden of advanced diabetes complications, including higher rates of amputation among affected patients [4].

Implementation of structured diabetic foot training programs within the Kisumu County healthcare system is essential for improving early detection of foot ulcers and strengthening case identification, thereby facilitating timely intervention and prevention of complications, as supported by findings from Kuguyo et al. (2023) [21].

Several initiatives, such as the "Step by Step" (SbS) diabetic foot program, have been developed to equip healthcare workers with knowledge and skills in the prevention and management of diabetic foot complications. This program has trained over 1500 physicians, nurses, and paramedics across Africa, leading to improved detection of DFUs and reductions in both ulcer prevalence and amputation rates [31–34]. In East Africa, countries including Kenya, Ethiopia, Uganda, and Rwanda have benefited from such training initiatives. Similarly, the

"Train the Foot Trainer" program has expanded capacity-building efforts to more than 65 countries globally [35]. However, a common challenge across these programs has been the limited integration of training into routine public health systems, affecting long-term sustainability [1]. Strengthening county-level adoption of structured foot screening programs in Kisumu could therefore enhance sustainability and improve DFU outcomes.

Evidence from demographic and health studies indicates that longer duration of diabetes is strongly associated with increased risk of DFUs, largely due to cumulative microvascular and macrovascular damage, including peripheral neuropathy and poor long-term glycaemic control, which is consistent with the findings of this study [38]. In addition, our results suggest that insulin therapy may offer a protective effect against amputations, as fewer amputation cases were observed among patients receiving insulin. Insulin use has been associated with improved glycaemic control, enhanced tissue perfusion, and improved wound healing, thereby reducing the risk of diabetes-related complications and amputations, in agreement with DHS data [36,37].

Although insulin therapy is beneficial, its effectiveness is often limited in resource-constrained settings due to interrupted supply chains, particularly in developing countries such as Zimbabwe, where treatment inconsistencies have been shown to affect adherence and worsen long-term outcomes among patients with prolonged disease duration [38].

A relatively high prevalence of retinopathy (42.5%) was observed in this study, which contrasts with findings from Zimbabwe reporting higher levels of peripheral neuropathy (53%) [39]. Both retinopathy and hypertension are important indicators of increased risk for diabetic foot complications. In this study, a higher prevalence of foot ulceration was observed among males (28.6%) compared to females (24.7%), with an overall burden of 25.5%, indicating a significant clinical concern requiring prompt attention. These findings are consistent with those of Kuguyo et al. [39], who also reported a higher prevalence of DFUs among males (33.6%) compared to females (29.7%).

When compared with data from the United States, where retinopathy and hypertension prevalence are substantially lower (6.0%), the higher rates observed in this study may reflect limited access to routine diabetic foot screening services in Kisumu County [40,41]. Evidence from Australian studies further demonstrates that regular foot screening significantly reduces DFU occurrence. Similarly, populations with better access to routine screening services show lower prevalence of DFUs compared to underserved groups with limited healthcare access and poor health-seeking behavior [42].

Based on these findings, there is a clear need to strengthen routine foot screening as an integral component of diabetes care in Kisumu County. Although global evidence highlights the importance of DFU prevention services across all populations [4], such structured services remain limited in the study area, largely due to inadequate coordination, insufficient resources, and shortages of trained personnel in podiatric care [43]. It is also important to actively engage patients in comprehensive diabetes management, not only in glycaemic control but also in self-monitoring practices such as routine foot inspection, despite existing challenges in DFU prevention and care delivery.

The study further found that a small proportion of participants (8.7%) were unaware that smoking negatively affects blood circulation and increases the risk of DFUs, with slightly higher proportions among males (9.4%) than females (7.9%). This highlights the need to strengthen education on behavioral risk factors, particularly smoking, and to promote healthier lifestyle choices among people living with diabetes. In the United Kingdom, similar patient-centered programs have been implemented at no cost, encouraging active patient participation in diabetes self-management and improving long-term outcomes [44].

5. Conclusions and Recommendations

This study highlights a substantial and previously under-documented burden of diabetic foot ulcers (DFUs) in Kisumu County, with prevalence levels that signal a growing public health concern. The findings identify distal peripheral neuropathy as the strongest independent predictor of ulcer development, while prolonged duration of diabetes and poor glycaemic control further compound the risk. Interestingly, insulin therapy showed a potential protective effect against amputation, suggesting that timely initiation and adherence to insulin treatment may play an important role in limb preservation—despite persistent hesitation in its use within some clinical and patient settings.

Overall, the results point to a critical gap in preventive diabetes care in the county. Key weaknesses include the lack of structured routine foot screening, shortages of trained podiatry personnel, and insufficient patient education on modifiable behavioral risks such as smoking and self-foot examination. These gaps collectively contribute to late presentation and preventable progression of foot complications.

For patients presenting with chronic, non-healing, neuropathic or neuro-ischemic ulcers, conventional approaches such as debridement and offloading alone may be insufficient. Future tertiary-level management could be strengthened by integrating advanced wound care strategies, including biologically based therapies such as

recombinant human platelet-derived growth factor (rhPDGF) to enhance tissue repair, bioengineered skin substitutes to support wound closure, and mesenchymal stem cell (MSC) therapy to promote angiogenesis in ischemic limbs. In addition, topical nitric oxide–based therapies may offer adjunctive benefits in managing biofilm-associated infections that are resistant to standard antimicrobial treatment.

However, while these emerging interventions show promise, their feasibility and implementation within the Kenyan healthcare system must be carefully evaluated against cost-effectiveness and health system priorities, particularly within the framework of limb preservation and precision medicine approaches in resource-limited settings.

6. Study Limitation

A key limitation of this study is that the assessment tool combined attitudes and practices into a single domain, limiting the ability to distinctly evaluate each construct. Future studies should adopt a more refined instrument that separately measures knowledge, attitudes, practices, and perceptions related to diabetic foot care. This would provide a more precise understanding of existing gaps, misconceptions, and behavioral drivers, thereby informing the development of more targeted and effective educational and prevention strategies for people living with diabetes in Kisumu County.

Abbreviations

DFUs	Diabetic foot ulcers
PLWD	People Living with Diabetes
MENA	Middle East and Northern Africa
IP	In-patient
OP	Out-patient
JOOTRH	Jaramogi Oginga Odinga Teaching and Referral Hospital
KCRH	Kisumu County Referral Hospital
LSCH	Lumumba Sub-county Hospital
PAD	Peripheral Arterial Disease
BMI	Body Mass Index
ABI	Ankle-Brachial Index
KAPs	Knowledge, Attitudes, and Practices
DFI	Diabetic Foot Infection
LMICs	Low-or-Middle-Income Countries
LEA	Lower Extremity Amputation
DF	Diabetic Foot
CPR	Clinical Prediction Rule

Supplementary Materials

The additional data and information can be downloaded at: https://media.sciltp.com/articles/others/2606161348309533/JEMS-26020060-supplementary-materials.docx.

Author Contributions

Conceptualization, S.O.A.; methodology, S.O.A., E.O.O., E.W. and I.I.D.; resources, S.O.A.; writing—original draft preparation, S.O.A., E.O.O., E.W., I.I.D. and R.M.M.; writing—review and editing, S.O.A., E.O.O., E.W., I.I.D. and R.M.M.; Final editing, All authors; visualization, S.O.A., E.O.O., E.W., I.I.D. and R.M.M.; supervision, E.O.O., E.W. and I.I.D.; project administration, S.O.A. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Institutional Review Board Statement

The study was reviewed and approved prior to execution by the Institutional Scientific and Ethical Review Committee (ISERC) of the Jaramogi Oginga Odinga Teaching & Referral Hospital (JOOTRH) under approval number ISERC/JOOTRH/096/24.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

All data generated and analyzed during this study are included within this manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

No AI tools were utilized for this paper.

References

1. Coates, E.; Amiel, S.; Baird, W.; et al. Protocol for a cluster randomised controlled trial of the DAFNE plus (Dose Adjustment For Normal Eating) intervention compared with 5 × 1 DAFNE: A lifelong approach to promote effective self-management in adults with type 1 diabetes. *BMJ Open* **2021**, *11*, e040438. https://doi.org/10.1136/bmjopen-2020-040438.
2. Subramanian, S.; Khan, F.; Hirsch, I.B. New advances in type 1 diabetes. *BMJ* **2024**, *384*, e075681. https://doi.org/10.1136/bmj-2023-075681.
3. Heller, S.; Lawton, J.; Amiel, S.; et al. Improving management of type 1 diabetes in the UK: The Dose Adjustment For Normal Eating (DAFNE) programme as a research test-bed. A mixed-method analysis of the barriers to and facilitators of successful diabetes self-management, a health economic analy…. *Program Grants Appl. Res*. **2014**, *2*. https://doi.org/10.3310/pgfar02050.
4. Kuguyo, O.; Chirenda, J.; Chikwasha, V.; et al. Needs assessment of diabetic foot services in Zimbabwe. *Diabetes Res. Clin. Pract.* **2022**, *188*, 109925. https://doi.org/10.1016/j.diabres.2022.109925.
5. Elghazaly, H.; Howard, T.; Sanjay, S.; et al. Evaluating the prognostic performance of bedside tests used for peripheral arterial disease diagnosis in the prediction of diabetic foot ulcer healing. *BMJ Open Diabetes Res. Care*. **2023**, *11*. https://doi.org/10.1136/bmjdrc-2022-003110.
6. Baba, M.; Davis, W.A.; Norman, P.E.; et al. Temporal changes in the prevalence and associates of diabetes-related lower extremity amputations in patients with type 2 diabetes: The Fremantle Diabetes Study. *Cardiovasc. Diabetol*. **2015**, *14*, 152. https://doi.org/10.1186/s12933-015-0315-z.
7. Hicks, C.W.; Selvin, E. Epidemiology of Peripheral Neuropathy and Lower Extremity Disease in Diabetes. *Curr. Diab. Rep*. **2019**, *19*, 86. https://doi.org/10.1007/s11892-019-1212-8.
8. Machirori, Y. Yemurai Machirori: Living with diabetes, struggling to be seen. *Bull World Health Organ*. **2021**, *99*, 248. https://doi.org/10.2471/BLT.21.030421.
9. Pemayun, T.G.D.; Naibaho, R.M.; Novitasari, D.; et al. Risk factors for lower extremity amputation in patients with diabetic foot ulcers: A hospital-based case–control study. *Diabet. Foot Ankle* **2015**, *6*, 29629. https://doi.org/10.3402/dfa.v6.29629.
10. Kuguyo, O.; Mukona, D.M.; Chikwasha, V.; et al. Prevalence and risk factors for diabetic foot complications among people living with diabetes in Harare, Zimbabwe: A cross-sectional study. *BMC Public Health* **2024**, *24*, 677. https://doi.org/10.1186/s12889-023-17610-7.
11. Vatankhah, N.; Jahangiri, Y.; Landry, G.J.; et al. Effect of systemic insulin treatment on diabetic wound healing. *Wound Repair Regen*. **2017**, *25*, 288–291. https://doi.org/10.1111/wrr.12514.
12. Abbas, Z.G.; Lutale, J.K.; Bakker, K.; et al. The "Step by Step" Diabetic Foot Project in Tanzania: A model for improving patient outcomes in less-developed countries. *Int. Wound J.* **2011**, *8*, 169–75. https://doi.org/10.1111/j.1742-481X.2010.00764.x.
13. Omwenga, E.O.; Awuor, S.O. The Bacterial Biofilms: Formation, Impacts, and Possible Management Targets in the Healthcare System. *Can. J. Infect. Dis. Med. Microbiol.* **2024**, *2024*, 1542576. https://doi.org/10.1155/cjid/1542576.
14. Abbas, Z.G. Global Preventive Foot Care And A Decrease In Amputations: A Positive Step For Diabetes-related Foot Complications. *Limb Preserv. J.* **2025**, *6*, 16–24. https://doi.org/10.56885/137820gsstkn.
15. Abbas, Z.G.; Boulton, A.J.M. Diabetic foot ulcer disease in African continent: 'From clinical care to implementation'—Review of diabetic foot in last 60 years—1960 to 2020. *Diabetes Res. Clin. Pract*. **2022**, *183*, 109155. https://doi.org/10.1016/j.diabres.2021.109155.
16. Gharibzadeh, S.; Lee, J.; Highton, P.; et al. Risk factors for development of diabetic foot ulcer disease in two large contemporary UK cohorts. *Diabetes Obes. Metab*. **2025**, *27*, 4782–4792. https://doi.org/10.1111/dom.16519.
17. Zhang, Y.; van Netten, J.J.; Baba, M.; et al. Diabetes-related foot disease in Australia: A systematic review of the prevalence and incidence of risk factors, disease and amputation in Australian populations. *J. Foot Ankle Res*. **2021**, *14*, 8. https://doi.org/10.1186/s13047-021-00447-x.

18. Palladino, R.; More, A.; Greenfield, G.; et al. Evaluation of the North West London Diabetes Foot Care Transformation Project: A Mixed-Methods Evaluation. *Int. J. Integr. Care* **2022**, *22*, 4. https://doi.org/10.5334/ijic.5956.
19. Aborajooh, E.; Alqaisi, T.M.; Yassin, M.; et al. Diabetic foot ulcer in Southern Jordan: A cross-sectional Study of Clinical and Microbiological Aspects. *Ann. Med. Surg*. **2022**, *76*. https://doi.org/10.1016/j.amsu.2022.103552.
20. Abdissa, D.; Adugna, T.; Gerema, U.; et al. Prevalence of Diabetic Foot Ulcer and Associated Factors among Adult Diabetic Patients on Follow-Up Clinic at Jimma Medical Center, Southwest Ethiopia, 2019: An Institutional-Based Cross-Sectional Study. *J. Diabetes Res*. **2020**, *2020*, 2879249. https://doi.org/10.1155/2020/4106383.
21. Tindong, M.; Palle, J.N.; Nebongo, D.; et al. Prevalence, Clinical Presentation, and Factors Associated With Diabetic Foot Ulcer in Two Regional Hospitals in Cameroon. *Int. J. Low. Extrem. Wounds* **2018**, *17*, 42–47. https://doi.org/10.1177/1534734618764252.
22. Shahi, S.K.; Sc, M.; Kumar, A.; et al. Prevalence of Diabetic Foot Ulcer and Associated Risk Factors in Diabetic Patients From North India. *J. Diabet. Foot Complicat.* **2012**, *4*, 83–91.
23. Almobarak, A.O.; Awadalla, H.; Osman, M.; et al. Prevalence of diabetic foot ulceration and associated risk factors: An old and still major public health problem in Khartoum, Sudan? *Ann. Transl. Med.* **2017**, *5*, 340. https://doi.org/10.21037/atm.2017.07.01.
24. Mwangi, N.; Gachago, M.; Gichangi, M.; et al. Adapting clinical practice guidelines for diabetic retinopathy in Kenya: Process and outputs. *Implement Sci*. **2018**, *13*, 81. https://doi.org/10.1186/s13012-018-0773-2.
25. Israel, G.D. Sampling the Evidence of Extension Program Impact. EDIS. 2016. Available online: https://doaj.org/article/9b6c60dafda34b00bd128e146fd6a535 (accessed on 25 March 2026).
26. Ntuli, S. Prevalence, Screening Practices and Risk Stratification for Diabetic Foot Complications in Primary Healthcare Clinics: A Cross-Sectional Study in Gauteng Province, South Africa. *Int. J. Environ. Res. Public Health* **2025**, *22*, 1794. https://doi.org/10.3390/ijerph22121794.
27. Chebet Bor, M. Management Practices of Nurses on Reproductive Health Services for Persons Living with Disabilities in Thika Hospital, Kenya. Ph.D. Thesis, Jomo Kenyatta University of Agriculture and Technology, Juja, Kenya, 2021.
28. Awuor, S.O.; Omwenga, E.O.; Mariita, R.M.; et al. Monitoring the battleground: Exploring antimicrobial resistance and virulence factors in wound bacterial isolates. *Access Microbiol*. **2023**, *5*, 000613. https://doi.org/10.1099/acmi.0.000613.v6.
29. Zhang, P.; Lu, J.; Jing, Y.; et al. Global epidemiology of diabetic foot ulceration: A systematic review and meta-analysis. *Ann. Med*. **2017**, *49*, 106–116. https://doi.org/10.1080/07853890.2016.1231932.
30. Turzańska, K.; Adesanya, O.; Rajagopal, A.; et al. Improving the Management and Treatment of Diabetic Foot Infection: Challenges and Research Opportunities. *Int. J. Mol. Sci*. **2023**, *24*, 3913. https://doi.org/10.3390/ijms24043913.
31. Waibel, F.W.A.; Uçkay, I.; Soldevila-Boixader, L.; et al. Current knowledge of morbidities and direct costs related to diabetic foot disorders: A literature review. *Front. Endocrinol.* **2024**, *14*, 1323315. https://doi.org/10.3389/fendo.2023.1323315.
32. Hurlow, J.J.; Humphreys, G.J.; Bowling, F.L.; et al. Diabetic foot infection: A critical complication. *Int. Wound J*. **2018**, *15*, 814–821. https://doi.org/10.1111/iwj.12932.
33. McDermott, K.; Fang, M.; Boulton, A.J.M.; et al. Etiology, Epidemiology, and Disparities in the Burden of Diabetic Foot Ulcers. *Diabetes Care* **2022**, *46*, 209. https://doi.org/10.2337/dci22-0043.
34. A U.S. Report Card. Diabetes. Available online: https://www.cdc.gov/diabetes/communication-resources/diabetes-statistics.html (accessed on 25 March 2026).
35. Mwangi, N.; Bascaran, C.; Ng'Ang'A, M.; et al. Feasibility of a cluster randomized controlled trial on the effectiveness of peer-led health education interventions to increase uptake of retinal examination for diabetic retinopathy in Kirinyaga, Kenya: A pilot trial. *Pilot Feasibility Stud*. **2020**, *6*, 102. https://doi.org/10.1186/s40814-020-00644-8.
36. Mwangi, N.; Macleod, D.; Gichuhi, S.; et al. Predictors of uptake of eye examination in people living with diabetes mellitus in three counties of Kenya. *Trop. Med. Health* **2017**, *45*, 41. https://doi.org/10.1186/s41182-017-0080-7.
37. Mwangi, N. Diabetic Retinopathy in Kenya: Assessment of Services and Interventions to Improve Access. Ph.D. Thesis, London School of Hygiene & Tropical Medicine, London, UK, 2020. https://doi.org/10.17037/PUBS.04658189.
38. Nyamu, P.N.; Otieno, C.F.; Amayo, E.O.; et al. Risk factors and prevalence of diabetic foot ulcers at Kenyatta National Hospital, Nairobi. *East Afr. Med. J.* **2003**, *80*, 36–43. https://doi.org/10.4314/eamj.v80i1.8664.
39. Shaikhomer, M. Pakistan Journal of Life and Social Sciences Epidemiology and Clinical Advancements in Managing and Treating Diabetes Mellitus. *Pak. J. Life Soc. Sci.* **2025**, *23*, 1417–1424. https://doi.org/10.57239/PJLSS-2025-23.1.00110.
40. Genitsaridi, I.; Salpea, P.; Salim, A.; et al. 11th edition of the IDF Diabetes Atlas: Global, regional, and national diabetes prevalence estimates for 2024 and projections for 2050. *Lancet Diabetes Endocrinol*. **2026**, *14*, 149–156. https://doi.org/10.1016/S2213-8587(25)00299-2.
41. Arsalan Wasti, S.; Wasti, A.; Ahmed, A.; et al. Prevalence of Diabetes in Incarcerated Populations of Low-and Middle-Income Countries (LMICs): A Systematic Review, Meta-Analysis, and Adapted-GRADE Appraisal. 2025. Available online: https://ssrn.com/abstract=5389166 (accessed on 12 January 2026).

42. Urhan, C. Systematic Review on Diet-Related Noncommunicable Disease Prevalence in Mediterranean Countries (2000–2025) by Age and Sex with Actionable Insights on the Potential of Acorn Consumption as a Mediterranean Food. 2025. Available online: https://ssrn.com/abstract=5342216 (accessed on 12 January 2026).
43. Hirpa, D.; Bekela, T.; Abdissa, D. Prevalence of diabetic foot ulcer and its associated factors among diabetes patients on follow up at public hospitals in West Shewa Zone, Oromia, Ethiopia. *Int. J. Afr. Nurs. Sci*. **2023**, *19*, 100578. https://doi.org/10.1016/j.ijans.2023.100578.
44. Dall, T.M.; Yang, W.; Halder, P.; et al. The economic burden of elevated blood glucose levels in 2012: Diagnosed and undiagnosed diabetes, gestational diabetes mellitus, and prediabetes. *Diabetes Care* **2014**, *37*, 3172–3179. https://doi.org/10.2337/dc14-1036.