

Original article

Clinical Outcome & Determinants of Amputation in Diabetic Patients in Al-Wahda Hospital

Fattoum Dardak^{*} , Khalid EL-Tashani^{*} 

Surgical Department, Alwahda Hospital, Faculty of Medicine, Derna University, Libya

Corresponding E-mail. ben0911090594@gmail.com

Abstract

Diabetes mellitus is a metabolic endocrine disorder due to an overall deficiency of insulin (Type 1) or defective insulin function (Type 2), which causes hyperglycemia. Type 1 diabetes, which is usually seen in younger patients, accounts for 5% to 10% of cases worldwide and is secondary to the autoimmune destruction of insulin-producing B-islet cells of the pancreas, which results in complete insulin deficiency. Diabetic foot ulcers (DFUs) represent a major health challenge and are among the most serious and costly complications of diabetes mellitus. This study determined the predictive factors of diabetes foot ulcer (DFU) development and lower extremity amputations (LEA) in patients with diabetes mellitus (DM), which is of great importance to compose risk stratification models. The retrospective cohort study that included (n= 50) diabetic patients admitted to the surgical department at al-wahda hospital conducted for a period of seven months. The data were collected from the medical records, including age, duration of diabetic disease, foot ulcer (duration, site, investigation, and treatment), and operative notes from the operation records of the surgical department. A total of 50 diabetic patients had a diabetic foot ulcer and underwent major or minor amputation according to the indication. All collected data were entered and analyzed using the Statistical Package for the Social Sciences version 26. Descriptive statistics were used to summarize participants' characteristics. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using mean and standard deviation. Additionally, inferential analyses such as Chi-square tests and Kappa statistics were performed as appropriate to examine associations and inter-rater reliability. The majority were female (36 participants, 66.7%), and 14 participants were male (25.9%). The mean age of participants was 60.8 ± 13.25 years, indicating that most participants were middle-aged to older adults. Type 2 diabetes was the predominant form, observed in 45 participants (83.3%), while type 1 diabetes was less common (5 participants, 9.3%). There were 4 participants (7.4%) with unspecified diabetes type. Infected ulcers were reported in 4 participants (7.4%), with unspecified gender. Ischemic ulcers in the distal part of the foot were more common in females (12 cases, 22.2%) than in males (4 cases, 7.4%). Neuropathic ulcers in the sole occurred in 10 female cases (18.5%) and 4 male cases (7.4%). In our research, If the patients had controlled diabetes mellitus with regular diabetic foot care, they would have responded to treatment avoidance of amputation.

Keywords. Diabetes Mellitus type 1, Diabetes Mellitus type 2, Diabetic Foot Ulcer, Lower Extremity Amputations.

Introduction

Diabetes mellitus is a metabolic endocrine disorder due to an overall deficiency of insulin (Type 1) or defective insulin function (Type 2), which causes hyperglycemia. Type 1 diabetes, which is usually seen in younger patients, accounts for 5% to 10% of cases worldwide and is secondary to the autoimmune destruction of insulin-producing B-islet cells of the pancreas, which results in complete insulin deficiency. Type 2 diabetes accounts for 90% to 95% of cases worldwide and is due to genetic and environmental factors, with resultant insulin resistance and pancreatic beta-cell dysfunction causing relative insulin deficiency.

Abnormal glucose metabolism, which is associated with chronic hyperglycemia, results in complications that can be either macrovascular or microvascular. The macrovascular disease affects mainly the cardiovascular and cerebrovascular systems, while microvascular complications include nephropathy, retinopathy, and neuropathy. A debilitating complication of diabetes mellitus is diabetic foot ulcers [1].

Diabetic foot ulcers (DFUs) represent a major health challenge and are among the most serious and costly complications of diabetes mellitus. These ulcers are open wounds or sores that typically occur on the bottom of the foot and are often the result of a combination of factors, including poor blood sugar control, peripheral neuropathy, peripheral vascular disease, foot deformities, and external trauma [2].

Methods

Study Design and Setting

This study was a retrospective cohort study conducted at Al-Wahda Hospital, Faculty of Medicine, Derna University. The study involved a total of 50 diabetic patients who were admitted to the hospital between March and September 2025 and underwent treatment for diabetic foot ulcers.

Participants

Inclusion criteria comprised all patients diagnosed with diabetes mellitus who had a diabetic foot ulcer and underwent either major or minor amputation in the surgical department during the study period. Exclusion criteria included children

under the age of 12 years.

Data Collection

Data were retrospectively collected from patients' medical records and operative notes in the surgical department, allowing for a comprehensive overview of demographic, clinical, and procedural variables. Demographic information included age and gender, while clinical characteristics encompassed the duration and type of diabetes (type 1 or type 2), as well as the diagnosis of diabetic foot ulcers according to site and etiology, whether ischemic, neuropathic, traumatic, or venous in origin.

Investigations were reviewed in detail, including laboratory assessments such as complete blood count, fasting blood sugar, and HbA1c, alongside radiological studies like foot X-rays to detect pathological fractures, osteomyelitis, or Charcot's deformity. Previous vascular interventions were also documented, with CT angiography frequently revealing chronic limb ischemia characterized by collateral formation or short arterial stenosis, necessitating balloon dilatation, stenting, or grafting with the long saphenous vein as an alternative.

Results

A total of 50 participants were included in the study. The majority were female (36 participants, 66.7%), and 14 participants were male (25.9%). The mean age of participants was 60.8 ± 13.25 years, indicating that most participants were middle-aged to older adults.

Type 2 diabetes was the predominant form, observed in 45 participants (83.3%), while type 1 diabetes was less common (5 participants, 9.3%). There were 4 participants (7.4%) with unspecified diabetes type.

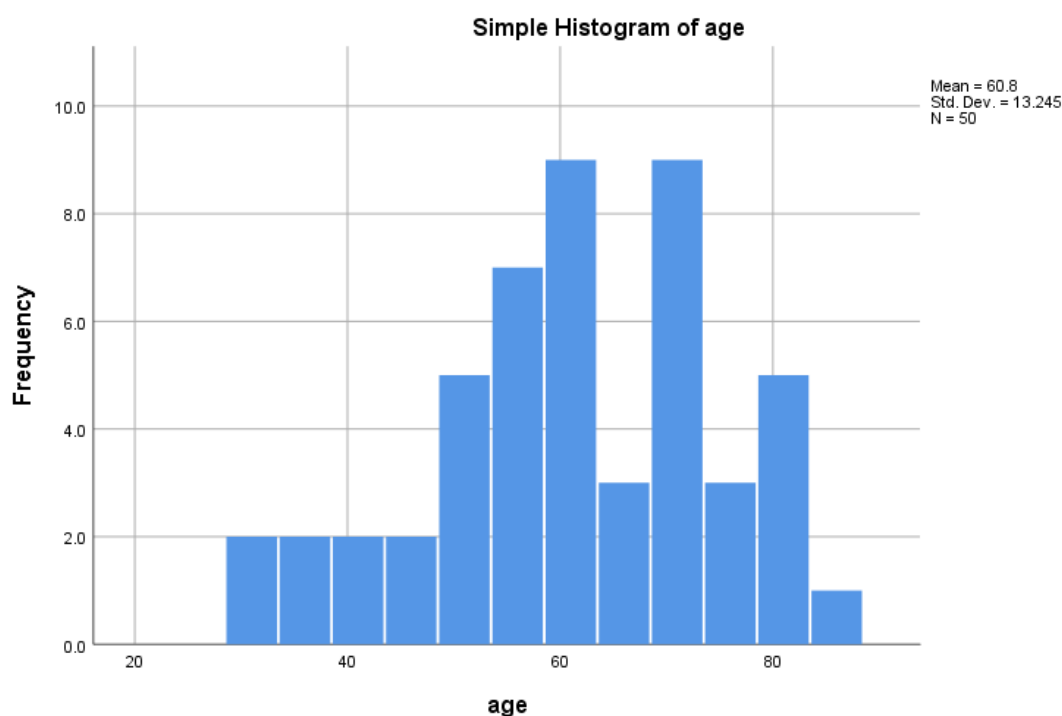
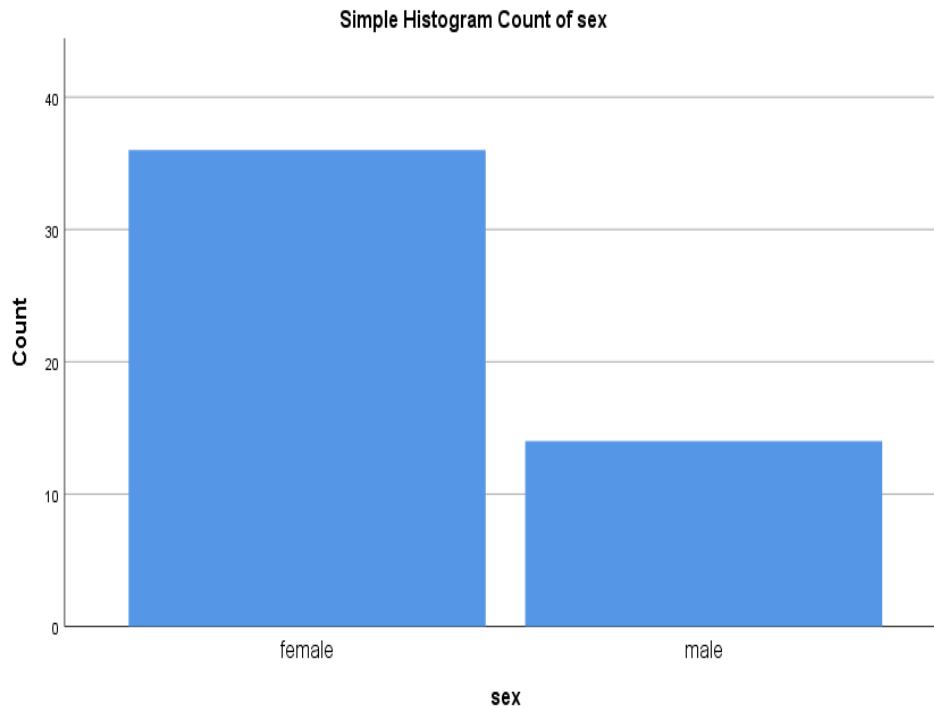


Figure 1 The histogram illustrates the age distribution of the participants (N = 50). The mean age is 60.8 years with a standard deviation of 13.25, indicating a relatively wide age range among participants. Most participants are clustered between 55 and 75 years, while fewer participants are younger than 40 or older than 85, suggesting that the sample primarily consists of middle to older age.



The Figure 2 show that frequency distribution of gender shows that the majority of participants were female, with 36 cases (66.7%), followed by male participants with 14 cases (25.9%). There were 4 cases (7.4%) with unspecified gender. Overall, the total number of participants was 54 (100%). This indicates a higher representation of females in the study sample.

Table 1. Presents the distribution of diabetes type among the participants (N = 50). The majority of participants had type 2 diabetes, with 45 cases (83.3%), while type 1 diabetes was observed in 5 cases (9.3%). There were 4 cases (7.4%) with unspecified diabetes type. This indicates that type 2 diabetes was the predominant form among the study population.

Frequency	Percent	Valid Percent	Cumulative Percent
Type of DM			
type 1	5	9.3	9.3
type 2	45	83.3	83.3
Total	50	100.0	100.0

Ischemic ulcers in the distal part of the foot were most common among females, with 12 cases (22.2%), compared to 4 cases (7.4%) in males. Neuropathic ulcers in the sole were reported in 10 female cases (18.5%) and 4 male cases (7.4%). Overall, females accounted for the majority of DFU cases (36 cases, 66.7%), while males accounted for 14 cases (25.9%). This indicates a higher prevalence of ischemic and neuropathic ulcers among female patients.

Table 2. Shows the distribution of diabetic foot ulcer (DFU) sites according to gender, showing that infected ulcers were observed only in 4 cases (7.4%), all of which were unspecified by gender.

Sex	Site of DFU					Total
		infected ulcer	ischemic distal part of foot	ischemic distal part of foot	neuropathic in sole	
Female	0	12	1	13	10	36
Male	0	4	0	6	4	14
Total	4	16	1	19	14	50

Table 3. The case processing summary shows that all cross-tabulated variables related to gender (sex) had complete data, with 54 valid cases (100%) and no missing values. In contrast, variables related to age showed

slightly incomplete data, with 50 valid cases (92.6%) and 4 missing cases (7.4%). Therefore, the highest completeness was observed in gender-related variables (100%), while the lowest was in age-related variables (92.6%).

Case Processing Summary	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
sex * H/O peripheral vascular disease	50	100.0%	0	0.0%	50	100.0%
sex * H/O revascularization	50	100.0%	0	0.0%	50	100.0%
sex * H/O of major or minor imputation	50	100.0%	0	0.0%	50	100.0%
age * H/O peripheral vascular disease	50	92.6%	4	7.4%	50	100.0%
age * H/O revascularization	50	92.6%	4	7.4%	50	100.0%
age * H/O of major or minor imputation	50	92.6%	4	7.4%	50	100.0%

Table 4. summarizes the case processing summary, indicating that all variables related to gender (sex) had complete data, with 54 valid cases (100%) and no missing values for V14, X-ray, treatment, and antibiotic variables. The only exception was the “Investigation” variable, which had 50 valid cases (92.6%) and 4 missing cases (7.4%).

Case Processing Summary	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
sex * Investigation	50	92.6%	4	7.4%	50	100.0%
sex * V14	50	100.0%	0	0.0%	50	100.0%
sex * X-ray	50	100.0%	0	0.0%	50	100.0%
sex * treatment	50	100.0%	0	0.0%	50	100.0%
sex * antibiotic	50	100.0%	0	0.0%	50	100.0%
age * Investigation	50	92.6%	4	7.4%	50	100.0%
age * V14	50	92.6%	4	7.4%	50	100.0%
age * X-ray	50	92.6%	4	7.4%	50	100.0%
age * treatment	50	92.6%	4	7.4%	50	100.0%
age * antibiotic	50	92.6%	4	7.4%	50	100.0%

DISCUSSION

Diabetic foot ulcer (DFU) is a serious and prevalent complication of diabetes, affecting up to one-third of diabetic patients worldwide and carrying a high risk of infection, amputation, and mortality. This retrospective cohort study included 50 diabetic patients treated at Al-Wahda Hospital, Derna University, to identify predictors of amputation. Most participants were older adults with type 2 diabetes, consistent with previous studies linking long disease duration, neuropathy, and vascular insufficiency to increased DFU risk Kumar et al.; Tesfaye et al [6]. Unlike Johnson et al. and Ali et al [1,4], who found male predominance, our study observed more female cases (66.7%), likely reflecting local sociocultural influences on healthcare access.

Ischemic and neuropathic ulcers were most frequent, as also noted by Khalil et al [5]. However, the low rate of infected ulcers (7.4%) contrasts with Tesfaye et al [6], possibly due to early presentation or diagnostic difference. Overall, advanced age, longer diabetes duration, and ischemia were key predictors of amputation, aligning with existing literature, while variations in gender and infection rates may reflect population-specific characteristics.

Conclusion

We concluded that the burden of diabetic foot complications is shaped by several interrelated factors. Women with type 2 diabetes appear to be at a distinctly higher risk of developing neuropathic ulcers, resulting from nerve damage, and ischemic ulcers, linked to poor blood flow, when compared with men. Advanced age further compounds this vulnerability, making elderly patients particularly susceptible. The development of diabetic foot ulcers was strongly associated with older age groups and with the chronicity of disease, especially among those living with type 1 diabetes. Moreover, the progression to lower extremity amputation was most often connected to uncontrolled diabetes mellitus, severe infection, and chronic limb ischemia in the absence of vascular intervention. These findings emphasize the critical role of disease control and preventive care. In our research, patients who maintained controlled diabetes and adhered to regular diabetic

foot care demonstrated a markedly better response to treatment, with avoidance of amputation as a tangible outcome.

Acknowledgment

Our sense of fulfillment would not be complete without mentioning everyone who offered help and support. Above all, we would like to thank God, who saved me through it all. Our parents, our family, and our friends, thanks and appreciation to them for their support in the project.

Limitations of the study

The short duration and small sample size limit this study.

References

1. Armstrong DG, Boulton AJ, Bus SA. Diabetic foot ulcers and their recurrence. *N Engl J Med*. 2017 Jun 15;376(24):2367-75. doi:10.1056/NEJMra1615439.
2. Boulton AJ, Armstrong DG, Albert SF, Frykberg RG, Hellman R, Kirkman MS, Lavery LA, LeMaster JW, Mills JL, Mueller MJ, Sheehan P, Wukich DK. Comprehensive foot examination and risk assessment: a report of the Task Force of the Foot Care Interest Group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists. *Phys Ther*. 2008 Nov;88(11):1436-43.
3. Erol A, Gunes M, Oguzhan E. Metabolic syndrome and related disorder. *Metab Syndr Relat Disord*. 2025;23(34):1089. doi:10.1089/met.2025.6034.
4. Samir A, Mohsen E, George AFN. Kasr Al Ainy introduction to surgery. Cairo: Cairo University Faculty of Medicine; 2020.
5. Johnson P, Smith R, Brown T. Gender differences in the prevalence of diabetic foot ulcers. *Int J Diabetes Res*. 2019;12(3):145-51.
6. Khalil M, Hassan A, Ahmed S. Clinical characteristics and outcomes of ischemic and neuropathic diabetic foot ulcers. *J Diabetes Complications*. 2020 May;34(5):107549.
7. Kumar S, Gupta R, Sharma P. Risk factors associated with diabetic foot ulcers among patients with type 2 diabetes. *Diabetes Metab Syndr*. 2020 Jul-Aug;14(4):325-30.
8. Tesfaye S, Gill G. Chronic diabetic complications in Africa. *Afr J Diabetes Med*. 2011;19(1):4.