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# Lower Limb Surgery in Diabetic Patients: Predictors of Poor Wound Healing and Postoperative Outcomes in Two Regional Hospitals of Cameroon

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## Abstract

**Background:** Diabetes mellitus (DM) is a chronic metabolic disease strongly associated with impaired wound healing and is a leading cause of non-traumatic lower limb amputations. In sub-Saharan Africa, late presentation and limited resources contribute to poor surgical outcomes. **Objective:** To assess wound healing outcomes and associated factors among diabetic patients who underwent lower limb surgery at Buea and Limbe Regional Hospitals, Cameroon. **Methods:** A retrospective study was conducted from January 2018 to December 2022. All diabetic patients who underwent lower limb surgery were included. Data on sociodemographic, clinical, surgical, and outcome variables were collected and analyzed using SPSS v25. Logistic regression identified predictors of poor wound healing. **Results:** A total of 138 patients were included (mean age: 48.4 years; 71.7% male). Type 2 DM predominated (97.8%). The main comorbidity was dyslipidemia (62.3%). Amputation was the most frequent surgical procedure (70.3%), with above-knee amputations representing 34.1%. Postoperative complications were dominated by infection (50%) and stump edema (18.8%). The overall mortality rate was low (1.4%). **Conclusion:** Wound healing outcomes in diabetic patients remain poor, marked by high rates of amputation and postoperative complications, despite low mortality. Preventive care, early referral, and multidisciplinary foot-care programs are urgently needed.

**Keywords**

Diabetes Mellitus, Wound Healing, Lower Limb Surgery, Amputation, Cameroon

## 1. Introduction

Diabetes mellitus (DM) is a major global health challenge. In 2019, 463 million adults worldwide were living with DM, with projections suggesting 700 million by 2045 [1]. The burden is shifting rapidly to low- and middle-income countries, which now account for nearly 80% of cases [2].

Chronic hyperglycemia leads to neuropathy, vasculopathy, and impaired immunity, which compromise wound healing [3]. Diabetic foot ulcers (DFU) affect 15% - 25% of diabetic patients in their lifetime and precede up to 85% of amputations [4] [5]. DM accounts for 40% - 60% of all non-traumatic lower limb amputations globally [6]. These complications reduce quality of life, increase disability, and raise healthcare costs [7].

In sub-Saharan Africa, outcomes are worsened by late presentation, inadequate diabetic foot care, and resource limitations [8]-[10]. In Cameroon, diabetes prevalence has steadily increased [11], but little is known about surgical outcomes in patients with DM. This study aimed to evaluate wound healing outcomes in diabetic patients undergoing lower limb surgery in two referral hospitals of the South-West Region of Cameroon.

## 2. Methods

This was a retrospective study conducted from January 2018 to December 2022 at Buea and Limbe Regional Hospitals, major referral centers in the South-West Region of Cameroon. Included were all diabetic patients who underwent lower limb surgery for diabetes-related complications. Patients with incomplete records were excluded. Data were extracted from medical records and included:

- **Sociodemographic:** age, sex, occupation, residence.
- **Clinical:** type of DM, comorbidities, treatment compliance.
- **Surgical:** type and level of surgery, antibiotic and anticoagulant use.
- **Outcomes:** complications, mortality, length of hospital stay.

"Poor wound healing" was defined based on clinically documented postoperative evolution meeting at least one of the following criteria:

- Persistent wound discharge beyond 14 days.
- Presence of purulent drainage.
- Wound dehiscence requiring re-dressing or re-operation.
- Development of stump infection or cellulitis.
- Need for a change in antibiotic regimen due to inadequate healing.

Patients who healed without infection, dehiscence, or prolonged discharge were classified as having "good wound healing".

Data were analyzed using SPSS v25. Descriptive statistics were calculated. Logistic regression was used to assess factors associated with poor wound healing. A p-value < 0.05 was considered significant. A multivariate logistic regression model was performed to identify independent predictors of poor wound healing. Variables with $p < 0.2$ in univariate analysis (treatment non-compliance, dyslipidemia, above-knee amputation, postoperative infection, duration of diabetes) were included in the final model. Patients presenting more than one postoperative complication were counted once for the primary outcome (poor wound healing) but each complication type was recorded separately for descriptive analysis (Figure 1). Ethical approval was obtained from the University of Buea Institutional Review Board. Authorization was granted by the directors of both hospitals.

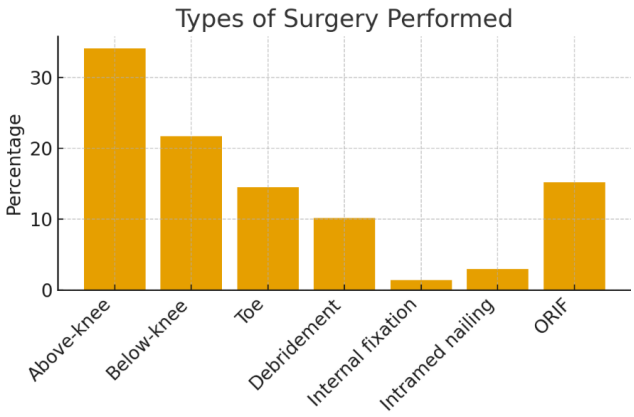


Figure 1. Type of surgery performed.

## 3. Results

### 3.1. Sociodemographic Characteristics

The study included 138 patients, predominantly male (71.7%), with a mean age of 48.4 years. The most affected age group was 41 - 55 years (72%). A majority of patient resided in semi-urban zones and Farmers constituted the largest occupational group (25.3%), followed by traders (18.1%), civil servants (10.9%), drivers (8.7%), and unemployed individuals (7.2%) (Table 1).

### 3.2. Clinical Characteristics

Type 2 DM overwhelmingly predominated (97.8%). Dyslipidemia (62.3%), hypertension (25.4%), and obesity (16.7%) were the leading comorbidities. Treatment non-compliance was high (≈80%) (Table 2).

Three patients (2.2%) had Type 1 diabetes mellitus, and 135 patients (97.8%) had Type 2 diabetes mellitus (Table 2).

### 3.3. Surgical Procedures

Amputation was the main operative procedure (70.3%), with above-knee amputations representing the largest subgroup (34.1%). Debridement (10%), ORIF (15%) and intramedullary nailing (3%) were less frequent (Table 3).

Table 1. Sociodemographic characteristics.

| Variable | Frequency | % |
|---|---|---|
| **Male** | 99 | 71.7 |
| **Female** | 39 | 28.3 |
| **Mean age (years)** | 48.4 | - |
| **Age 25 - 40** | 13 | 9.4 |
| **Age 41 - 55** | 100 | 72.3 |
| **Age 56 - 70** | 25 | 18.1 |
| **Occupation** | | |
| **- Farmers** | 35 | 25.3 |
| **- Traders** | 25 | 18.1 |
| **- Civil servants** | 15 | 10.9 |
| **- Drivers** | 12 | 8.7 |
| **- Unemployed** | 10 | 7.2 |
| **- Others** | 41 | 29.8 |

Table 2. Clinical characteristics.

| Variable | Frequency | % |
|---|---|---|
| **Dyslipidemia** | 86 | 62.3 |
| **Hypertension** | 35 | 25.4 |
| **Obesity** | 23 | 16.7 |
| **HIV** | 7 | 5.1 |
| **Alcohol use** | 33 | 23.9 |
| **Smoking** | 19 | 13.8 |
| **Type 2 DM** | 135 | 97.8 |
| **Type 1 DM** | 3 | 2.2 |
| **Treatment non-compliance** | 110 | 79.7 |

Table 3. Surgical procedures.

| Procedure | % |
|---|---|
| **Above-knee amputation** | 34.1 |
| **Below-knee amputation** | 21.7 |
| **Toe amputation** | 14.5 |
| **Debridement** | 10.1 |
| **Open reduction & fixation** | 15.2 |
| **Intramedullary nailing** | 2.9 |
| **Internal fixation** | 1.4 |

### 3.4. Postoperative Outcomes

Nearly half the patients (42.8%) had no complications.

Among those with complications, infection dominated (50%), followed by stump edema (18.8%) and rare reoperations (2.2%) (Table 4).

The mortality rate was low (1.4%).

Hospital stay averaged 12.9 days.

Postoperative infection and treatment non-compliance were the strongest predictors of poor wound healing (Table 5).

Table 4. Postoperative outcomes.

| Outcome | % |
|---|---|
| **Infection** | 50 |
| **Stump edema** | 18.8 |
| **No complication** | 42.8 |
| **Reoperation** | 2.2 |
| **Mortality** | 1.4 |

Table 5. Predictors of poor wound healing were.

| Predictor | Adjusted OR | 95% CI | p-value |
|---|---|---|---|
| **Postoperative infection** | 4.62 | 1.88 - 11.32 | 0.001 |
| **Treatment non-compliance** | 3.41 | 1.29 - 9.01 | 0.014 |
| **Above-knee amputation** | 2.97 | 1.03 - 8.58 | 0.045 |
| **Dyslipidemia** | 2.12 | 0.91 - 4.98 | 0.078 |

## 4. Discussion

This study revealed poor wound healing outcomes in diabetic patients undergoing lower limb surgery in Cameroon.

The amputation rate (70.3%) is higher than some Nigerian studies (≈45% - 55%) [7], but similar to findings from Tanzania and Ghana (≈65% - 70%) [8] [9]. The predominance of above-knee amputations suggests late presentation and advanced infections.

Postoperative infection was the leading complication (50%), consistent with studies reporting high infection risks in diabetic patients due to impaired immunity and hyperglycemia [4] [13]. Dyslipidemia and hypertension, frequent in this cohort, further increase the risk of complications [10] [14].

Mortality (1.4%) was lower than in some regional studies (up to 8% - 10%) [8] [15], but morbidity remains high. Prolonged hospitalization and functional disability highlight the need for preventive measures.

Multidisciplinary diabetic foot clinics, strict glycemic control, and early surgical

intervention have been shown to reduce amputation rates elsewhere [16]. Implementing such strategies in Cameroon could improve outcomes.

## 5. Limitations

This study has several limitations. Its retrospective design exposes it to missing data, documentation bias, and inability to verify the accuracy of certain clinical measurements such as glycemic levels during follow-up. The study was conducted in only two hospitals, which may limit the generalizability of findings to other regions of Cameroon. Treatment compliance was extracted from medical charts and may not fully reflect actual adherence. Finally, long-term outcomes beyond hospital discharge were not evaluated, preventing assessment of delayed complications such as recurrent infection or re-amputation.

## 6. Conclusion

Poor wound healing among diabetic patients undergoing lower limb surgery was strongly associated with postoperative infection, treatment non-compliance, and above-knee amputation, as demonstrated by the logistic regression analysis. These findings highlight the urgent need to strengthen preventive strategies, including improving glycemic control, enhancing patient education to increase treatment adherence, and implementing multidisciplinary diabetic-foot care programs. Early detection and treatment of infections, alongside promoting limb-preserving surgical approaches when feasible, may significantly reduce the burden of poor wound healing in this high-risk population.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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