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# Prognostic Factors for Diabetic Foot at CNHU-HKM

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## Abstract

Introduction: Predictions on the prevalence of diabetes mellitus, according to the International Diabetes Federation, indicated 9.3% in 2019 and nearly 10.9% of the general population in 2045. In Benin, the increase in this prevalence, according to the World Health Organization (WHO), is constantly increasing. Diabetic foot is one of its most common complications. The aim of this work was to study the prognostic factors of diabetic foot in the Department of Endocrinology, Metabolism and Nutrition of the CNHU-HKM of Cotonou. Patients and method: This is a descriptive and analytical retrospective study of the prognostic factors of diabetic foot over a period of 3 years from January 2019 to December 2021 in patients who have been hospitalized or followed on an outpatient basis for diabetic foot in the Endocrinology, Metabolism and Nutrition Department of the CNHU-HKM of Cotonou. Results: A total of 112 patients were included in this study. The average age of the patients was 59.70 ± 2.10 years. A male predominance was noted with a sex ratio (M/F) of 1.7. Mixed gangrene and phlegmons were the most common lesions. According to the classification of diabetic feet according to the University of Texas, 59.1% of patients had a 100% risk of amputation. Ten patients died from sepsis (8.9%). The average blood glucose on admission was 2.74 ± 0.23 g/l, reflecting the glycemic imbalance in these patients. There is a statistically significant association between the duration of progression of diabetes, the type of lesion and amputation. Patients whose diabetes has lasted more than 30 years and patients who are not monitored have a greater risk of death. Conclusion: Diabetic patients most often consulted at a late stage, compromising conservative treatment. The duration of diabetes and the type of lesion on admission were the main factors leading to amputation, thus compromising the functional prognosis. As for death, it was mainly linked to irregular monitoring of diabetes and the duration of diabetes. Effective prevention and management of diabetic feet requires

patient education about the diabetic foot and systematic screening of at-risk feet in consultation.

## Keywords

Diabetes, Diabetic Foot, Prognosis, Blood Sugar Imbalence, Benin

## 1. Introduction

Predictions on the prevalence of diabetes mellitus, according to the International Diabetes Federation (FID/IDF), indicated 9.3% in 2019 and almost 10.9% of the general population in 2045 [1]. In Benin, the progression of this prevalence, according to the World Health Organization (WHO), is constantly increasing: 2.6% in 2008 and 5.1% in 2016 [2]. Diabetes predisposes to many complications when poorly balanced. Diabetic foot is one of the most frequent and costly complications. The prevalence of diabetic foot varies from 3% to 13% depending on the country with a global average of 6.4% according to international diabetes federation. This is a major public health problem. Its occurrence is favored by the conjunction of neuropathic, arteritic and infectious complications. The sex, the age, the level of amputation and dyslipidemia were usually associated to death [3] [4] [5]. The aim of this work was to study the prognostic factors of diabetic foot in the Endocrinology Metabolism Nutrition department of the CNHU-HKM of Cotonou.

## 2. Patients and Method

This was a retrospective descriptive and analytical study of prognostic factors for diabetic foot over a period of 3 years from January 2019 to December 2021 in patients who were hospitalized or followed as outpatients for diabetic foot in the department of Endocrinology Metabolism Nutrition of the CNHU-HKM of Cotonou. The study included all diabetic patients hospitalized or followed in an outpatient setting for diabetic foot and who gave informed consent. The variables studied mainly concerned age, sex, level of study, marital status, health insurance coverage, profession, pathological history, clinical examination data, paraclinical data, and the occurrence of amputation or death. We used a questionnaire. The data collected were coded and entered using EpiData software and processed with EPI INFO software. Means and medians were calculated with, respectively, their standard deviation and interquartile ranges on continuous variables, then proportions on categorical variables. Proportions were compared using the Chi2 and Fisher tests, as appropriate, and means using the Student t test. The significance threshold was set at 5%.

## 3. Results

### 3.1. Socio-Demographic Characteristics

A total of 112 patients were included in this study. The average age of the pa-

tients was 59.70 ± 2.10 years. A male predominance was noted with a sex ratio (M/F) of 1.7. The area of residence of the patients was urban in 73.3% of cases. The majority of them was unschooled (**Table 1**)

### 3.2. Clinical and Paraclinical Data

The main reason for consultation was a foot wound in 91 patients (81.4%). The average time for the lesion to evolve before the consultation was 52.7 ± 10.3 days. Type 2 diabetics were in the majority at 91.7%. The duration of diabetes was estimated at 13.5 ± 1.6 years.

Mixed gangrene and phlegmons were the most common lesions (**Figure 1**). The mode of appearance was spontaneous in the majority of cases (**Table 2**). According to the University of Texas foot classification, 59.1% of patients had a 100% risk of amputation.

The average blood glucose on admission was 2.74 ± 0.23 g/l, reflecting the glycemic imbalance in these patients. Osteitis was found in 87 patients (84.4%).

All patients benefited from systematic discharge, probabilistic antibotic therapy and insulin therapy. Antibiotic therapy was secondarily adapted to the results of antibiogram.

Ten patients died from sepsis (8.9%).

### 3.3. Analytical Study

There is a statistically significant association between the duration of progression of diabetes, the type of lesion and amputation (**Table 3**). Patients whose diabetes has lasted more than 30 years and patients not monitored have a greater risk of death. No influence of sex on death (**Table 4**).

## 4. Discussion

**Socio-demographic characteristics**

The average age in our series was 59.70 ± 2.10 years. This result is similar to that of Awolou who found an average age of 60.70 years [6]. Studies devoted to diabetic feet in Africa have reported an average age of less than 60 years [7] [8].

The study population is made up of 63.0% men and 37.0% women with a sex ratio of 1.7. The male predominance among the population studied is a phenomenon confirmed by several authors. Kerekou found a sex ratio of 1.5 [9]; it was 2.5 for Amoussou-Guenou [10] and 2.46 for Sani [11]

The majority of our patients were out of school (45%). This result is close to those of Traoré. D. Y [12] and Drago. A [13] with respectively 55.5% and 43.5% of uneducated patients.

**Clinical and paraclinical data**

Type 2 diabetes predominates among the patients in our study (91.7%). This percentage can also be superimposed on those of Sidibé. A. T [14]; from Awalou, from Amoussou-Guenou who found respectively 88.5%, 88.70% and 71.4%. Clinically, foot lesions were dominated by gangrene (56.4%). This result is

**Table 1.** Socio-demographic characteristics.

| | Total | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| 30 - 40 | 05 | 02.9 |
| 40 - 50 | 18 | 15.8 |
| 50 - 60 | 38 | 34.6 |
| 60 - 70 | 35 | 32.7 |
| 70 - 80 | 11 | 08.9 |
| >80 | 05 | 05.9 |
| **Sex** | | |
| Male | 71 | 63.0 |
| Female | 41 | 37.0 |
| **Residence area** | | |
| Rural | 32 | 26.7 |
| Urban | 80 | 73.3 |
| **Study level** | | |
| Unschooled | 50 | 45 |
| Primary | 28 | 25 |
| Secondary | 30 | 27 |
| University | 4 | 3 |

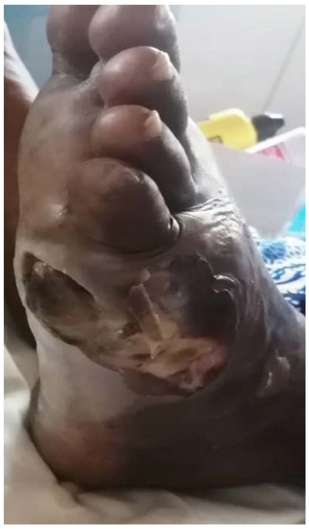

**Figure 1.** Left foot phlegmon.

comparable to those of Awalou and N'Djim who found a predominance of gangrene in 61.29% and 44.6% of patients respectively. On the other hand, in the Quassimi series, the lesions were dominated by phlegmon in 32.65% of cases [15]. The average consultation time is 52.7 ± 10.3 days. In the Amoussou- Guenou series, 34.28% of patients consulted after more than a month of progression of the lesions.

**Table 2.** Distribution of patients according to the type of lesion and the mode of appearance of the wounds.

| | total | Percentage (%) |
|---|---|---|
| **Type of lesion** | | |
| Mixed gangrene | 41 | 36.6 |
| Phlegmon | 37 | 33.7 |
| Dry gangrene | 13 | 10.9 |
| Ulceration | 11 | 09.9 |
| Wet gangrene | 10 | 08.9 |
| **Mode of appearance** | | |
| Spontaneous | 57 | 51.0 |
| Trauma | 30 | 26.5 |
| Sting | 03 | 02.0 |

**Table 3.** Factors associated with amputation.

| | Amputation | | p-value | OR | IC95% [OR] |
|---|---|---|---|---|---|
| | Yes | No | | | |
| **Duration of diabetes (years)** | | | | | |
| <10 | 9 | 25 | | 1 | |
| 10 - 20 | 30 | 25 | 0.04 | 3.33 | 1.31 - 8.4 |
| 20 - 30 | 1 | 4 | | 0.69 | 0.06 - 7 |
| >30 | 1 | 1 | | 2.77 | 0.15 - 49 |
| **Type of lesion** | | | | | |
| Ulceration | 0 | 10 | | 1 | |
| Phlegmon | 5 | 29 | <0.00001 | 2.1 | 0.23 - 5.2 |
| Dry gangrene | 7 | 4 | | 3 | 1.5 - 5.97 |
| Wet gangrene | 5 | 4 | | 3.65 | 1.86 - 7.1 |
| Mixed gangrene | 28 | 9 | | 5.63 | 2.95 - 10 |

**Table 4.** Factors associated with death.

| | death | | p-value | OR | IC95% [OR] |
|---|---|---|---|---|---|
| | Yes | No | | | |
| **Sex** | | | | | |
| Male | 4 | 60 | 0.05 | 1 | |
| Female | 6 | 31 | | 0.25 | 0.06 - 1.1 |
| **Duration of diabetes (years)** | | | | | |
| <10 | 2 | 32 | | 1 | |
| 10 - 20 | 4 | 51 | 0.001 | 1.25 | 0.21 - 7.25 |

**Continued**

| | | | | | |
|---|---|---|---|---|---|
| 20 - 30 | 2 | 3 | | 10.66 | 0.08 - 105 |
| >30 | 2 | 0 | | 3.02 | 1.08 - 8.60 |
| **Follow up** | | | | | |
| No follow up | 3 | 4 | | 1 | |
| Regular follow up | 1 | 25 | 0.008 | 0.05 | 0.004 - 0.64 |
| Irregular follow up | 6 | 61 | | 0.13 | 0.02 - 0.72 |

The majority of patients had a glycemic imbalance (55.7%) comparable to the result of Lokrou *et al.* who reported that 63.64% of patients had a blood sugar level greater than 2 g/l [7]. The foot x-ray performed in our patients revealed osteitis in 84.4% of cases. This result is superimposable to that of Sidibé A. T *et al.* who found osteitis in 60% [14].

**Prognostic factors**

There is a statistically significant association between the duration of progression of diabetes (p = 0.04), the type of lesion (p = 0.00001), the follow-up of diabetes (p = 0.008) and amputation. Patients whose diabetes has been ongoing for more than 10 to 20 years and patients whose lesions are of the gangrene type have a greater risk of amputation. Marrackchi W *et al.* also found that the type of lesion, especially gangrene, is a source of poor outcomes [16]. The high prevalence of amputation in our series reflects the severity of the lesion on admission. Foot care should be multidisciplinary because this approch improves the prognosis.

Ten patients died, or 8.9%. The mortality rate found in our series is comparable to that of N'Djim (10.6%) [17], and is slightly higher than those of Awalou (6.45%) [6], Lokrou (6.52%) %) [7] and Sidibé (5.75%) [14]. The factors associated with these deaths were diabetes duration greater than 30 years and patients not followed up.

The limitation of our study was that it was a reropective study with missing data.

## 5. Conclusion

Patients most often consulted at a late stage, compromising conservative treatment. The duration of diabetes and the type of lesion on admission were the main factors leading to amputation, thus compromising the functional prognosis. As for death, it was mainly linked to irregular monitoring of diabetes and the duration of diabetes. Effective prevention and management of diabetic feet requires patient education about the diabetic foot and systematic screening of at-risk feet in consultation.

## Conflicts of Interest

The authors declare that they have no conflict of interest.

## References


[1] Saeedi, P., Petersohn, I., Salpea, P., *et al.* (2019) Global and Regional Diabetes Prevalence Estimates for 2019 and Projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th Edition. *Diabetes Research and Clinical Practice*, **157**, Article ID: 107843. https://doi.org/10.1016/j.diabres.2019.107843

[2] Organisation Mondiale de la Santé (OMS) (2016) Profil des pays pour le diabète. https://www.who.int/fr/publications/m/item/diabetes-ben-country-profile-benin-2016

[3] Lcks, A., Scheer, M., Morbach, S., *et al.* (2011) Time-Dependent Impact of Diabetes on Mortality in Patients after Major Lower Extremity Amputation: Survival in a Population-Based 5-Year Cohort in Germany. *Diabetes Care*, **34**, 1350-1354. https://doi.org/10.2337/dc10-2341

[4] Faglia, E., Favales, F. and Morabito, A. (2001) New Ulceration, New Major Amputation, and Survival Rates in Diabetic Subjects Hospitalized for Foot Ulceration from 1990 to 1993: A 6.5-Year Follow-up. *Diabetes Care*, **24**, 78-83 https://doi.org/10.2337/diacare.24.1.78

[5] Kerekou Hodé, A. and Dédjan, H.A. (2022) Survie des patients diabétiques amputés pour pied diabétique dans le Service d'endocrinologie du Centre national hospitalier universitaire Hubert Koutoukou Maga (CNHU-HKM) de Cotonou, Bénin. *Médecine des Maladies Métaboliques*, **16**, 80-86 https://doi.org/10.1016/j.mmm.2021.09.003

[6] Djibol, A.M., Mossi, E.K., Djagadou, A.K., Balaka, A., Tchamdja, T. and Moukaila, R. (2018) Pied diabétique: Aspects épidémiologique, diagnostique, thérapeutique et évolutif à la clinique Médico-chirurgicale du CHU Sylvanus Olympio de Lomé. *Pan African Médical Journal*, **30**, 4.

[7] Lokou, A. and Dago, P.K. (2008) Stratégie d'amélioration de la prise en charge du pied diabétique en Côte d'Ivoire. *Médecine des Maladies Métaboliques*, **2**, 185-187. https://doi.org/10.1016/S1957-2557(08)70436-X

[8] Amoussou-Guenou, D., Wanvoegbe, F.A., BOKO, E., Segnon E.B.J., Agbodande, K.A., Kerekou, A., *et al.* (2015) Aspects bactériologiques des plaies et leurs prise en charge chez les diabétiques à Cotonou: étude prostective à propos de 42 cas. *Médécine d'Afrique noire*, **62**, 241-246.

[9] Hode, A.K., Djolo, F., *et al.* (2015) Epidémiologiques et cliniques du pied diabétique à Cotonou. *Journal of Diabetes Melitus*, **5**, 173-180.

[10] Amousso-Guenou, K.D., Zannou, D.M., Ade, G., Djrolo, F., *et al.* (2006) Morbidité du pied diabétique en médecine interne au CNHU-HKM de Cotonou. *Mali médical*, **4**, 4-7.

[11] Sani, R., Ada, A., Bako, H., Adehossi, E., Metchendje-Noundui, J., *et al.* (2010) Le pied diabétique: Aspects épidémiologiques, cliniques et thérapeutiques à l'hôpital national de Niamey: A propos de 90 cas. *Médecine d'Afrique Noire*, **57**, 172-176.

[12] Traoré, D.Y. (2013) La prévalence de la neuropathie diabétique en commune I du district de Bamako. Thèse Med., FMOS, Bamako.

[13] Drago, A. (2014) Identification du risque podologique chez les patients diabétiques dans un centre de santé de référence de Bamako. *Le Mali Médical*, **4**, 15-20.

[14] Sidibé, A.T., *et al.* (2006) Pied diabétique en médecine interne de l'hôpital du Point "G". *La Revue de Médecine Interne*, **8**, 14-17.

[15] Quassimi, F. (2015) Pied diabétique: expérience du service de dermatologie à

l'hôpital militaire Moulay Ismail de Meknes (à propos de 49 cas). Thèse de médecine, Université Cadi Ayyad, Marrakech.

[16] Marrakchi, W., Bougossa, R., Kooli, I., Ben, H., *et al.* (2021) Les facteurs pronostiques d'évolution du pied diabétique infecté. *Annales d'endocrinologie*, **82**, 347. https://doi.org/10.1016/j.ando.2021.08.257

[17] Djim, F.C. (2014) Fréquence et prise en charge des pieds diabétiques dans le service de médecine et d'endocrinologie de l'hôpital du Mali Med. FMOS, Bamako.