

Diabetic Foot: Epidemiological and Clinical Aspects in the Department of Medicine and Endocrinology of the Hospital of Mali, Mali

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Abstract

Introduction: Diabetes is a heterogeneous group of metabolic diseases characterized by chronic hyperglycemia resulting from a defect in the secretion and/or action of insulin, diagnosed by the observation of high levels of glucose in the blood, responsible in the long term for vascular and nervous complications. The diabetic foot is the set of pathological manifestations affecting the foot in relation to the diabetic disease. Approximately 5% of diabetics present a chronic lesion of the foot. **Objective:** To describe the epidemiological and clinical aspects of the diabetic foot in the medicine/endocrinology department of the Mali hospital. **Methodology:** This was a retrospective descriptive study from November 2011 to December 2015. It focused on diabetic patients hospitalized in the department with a foot wound and aged 14 years and over. **Results:** The study involved 94 patients out of 828 hospitalized, a prevalence of 11.35%. Our series included 36 (38.3%) men and 58 (61.7%) women, *i.e.* a sex ratio of 0.61%. The mean age was 42.66 years with extremes of 14 and 81 years. Type 2 diabetes was present in 95% of the patients with a duration of evolution of more than 5 years in 60.6% of the cases. The mechanism of occurrence of the wounds was minor trauma in 54 cases (57.4%). Self-medication was the primary treatment in 70 patients (74.5%).

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More than 50% of the patients wore unsuitable footwear. Clinical and para-clinical examinations revealed isolated neuropathy in 37 cases (39.4%), necrotic wound in 37 cases (39.19%), poor glycemic control: HbA1c > 7% (98.9%), absence of osteitis (57.4%), normal Doppler ultrasound 45 cases (45.7%), stenosing arteriopathy 11 cases (22.3%), non-stenosing 3 cases (20.2%), germs present 56 cases (59.6%) including 21 cases (22.4%) of *Staphylococcus aureus*. **Conclusion:** Diabetes and diabetic foot constitute a real public health problem. They are responsible for dreadful and sometimes disabling complications. Its management is multidisciplinary and requires significant financial resources.

Keywords

Diabetic Foot, Epidemiology, Clinic, Bamako

1. Introduction

Diabetes is a heterogeneous group of metabolic diseases characterized by chronic hyperglycemia resulting from a defect in insulin secretion and/or action. It is diagnosed by the observation of high blood glucose levels. In the long term, it is responsible for vascular and nervous complications.

According to the International Diabetes Federation [1]:

- 1) In 2015, the number of diabetics in the world was estimated at 415 million including 14.2 million in Africa;
- 2) This figure will rise to 642 million people worldwide, including 34.2 million in Africa in 2040.

The prevalence of diabetes varies according to the type of diabetes and the country. In the top 10 countries with high prevalence of type 1 diabetes in children (0 - 14 years), Nigeria ranks 9th and 1st in Africa with 14,400 cases. The prevalence of diabetes is 1.8% nationwide [1].

Diabetic foot: is the set of pathological manifestations affecting the foot as a consequence of diabetic disease. About 5% of diabetics present a chronic lesion of the foot [2]. It is estimated that 30% to 70% of non-traumatic amputations of the lower limbs concern diabetics [3]. Diabetic foot injuries have a functional and psychological impact.

We initiated this work in view of the following observations:

- 1) In Mali, in the hospital setting there are few studies on the frequency of diabetic foot (16.37% in 2013 at the Mali Hospital) [4].
- 2) The increase in the number of cases in the service.

Objectives: To describe the epidemio-clinical aspects of diabetic foot in the medicine/endocrinology department of Mali Hospital.

2. Methodology

We conducted a retrospective, descriptive study from November 1, 2011 to De-

cember 31, 2015 in the medicine/endocrinology department of Mali Hospital in Bamako, which is the reference in the management of diabetic feet in Mali, ranked 3rd reference. All diabetic patients arriving in the department with a foot infection, aged 14 years and older were included. All non-diabetic patients under 14 years of age were not included. Information was collected from the patients files through a questionnaire including socio-demographic data, history of diabetes, type of diabetes, mechanism of occurrence of the wound, associated lesions.

The data were entered and/or analyzed using software on Epi-Info version 7.0.9, Word 2007, SPSS version 20.0, Excel 2007. Strict anonymity of the patients was respected.

3. Results

During the period we identified 94 cases of diabetic foot out of a total of 828 diabetic hospitalized patients, a prevalence of 11.35%.

The age group 41 - 60 years represented more than half of the study population (61.3%) with a mean age of 42.66 years (see **Table 1**), the extremes being 14 and 81 years. The female sex was the most represented with a sex ratio of 0.61. The majority of our patients (51) did not attend school (54.3%). Housewives represented half of the study population (50%) (see **Figure 1**). The weight was abnormal in 88 patients (93.8%) (see **Figure 2**). A family history of diabetes was found in 37 patients (39.4%) (see **Table 2**). Type 2 diabetes was most represented in 89 patients (95%). Family history of diabetes 37 cases (39.4%), Family history of hypertension 6 cases (6.4%), Family history of diabetes + hypertension 8 cases (8.5%). Trauma was the most frequent mechanism of occurrence in 54 cases (57.4%) (see **Table 3**).

Self-medication was observed in the first place in 70 patients (74.5%), patients wore unsuitable shoes in 60 cases (63.8%). Diabetes had been present for more than 5 years in 57 patients (60.6%), neuropathy was found in 37 cases (39.4%), arteriopathy in 4 cases (4.3%) and mixed foot in 4 cases (4.3%) (Cf. **Table 4**), gangrene in 38 cases (40.4%) (Cf. **Table 5**), glycemic imbalance in 81 patients (86.2%), presence of osteitis in 40 patients (42.6%), abnormal doppler ultrasound in 40 patients (42.5%) (Cf. **Figure 3**). The wound was graded: stage A Grade 0 in 5 cases (4.7%), stage D Grade 3: 32 cases with 29.8% (Cf. **Table 6**) (**Picture 1**).

4. Discussion

The study included 94 cases out of a total of 828 hospitalized diabetic patients, *i.e.* a hospital frequency of 11.35%. Djim, F. *et al.* [4] and Koffi, D. [5] reported respectively 16.37% and 15.29%. The age group 40 - 60 years was the most represented in the study population, *i.e.* 61.3%, Djim, F.C. [4] *et al.* found 59.6%. The mean age was 42.66 years, other African studies: Sani, R. *et al.* [6], Nghario, L. *et al.* [7], Guèye, D.D. *et al.* [8], Sano, D. *et al.* [9], Djibril, A.M. *et al.* [10] found respectively 53 years, 54 years, 57 years, 58.9 years, 60.74 years.

Table 1. Age distribution.

AGE (year)	Workforce	Percentage
14 - 20	1	1.1
21 - 40	7	7.5
41 - 60	57	61.3
61 and more	28	30.1
Total	94	100

Table 2. Distribution by family history.

Background Family	Workforce	Percentage
Diabetes	37	39.4
HTA	6	6.4
HTA + Diabetes	8	8.5
no previous history	12	12.8
Unknown	31	33.0
Total	94	100.0

Table 3. Distribution according to the mode of occurrence of the wound.

Mechanism of wound occurrence	Workforce	Percentage
Minimal trauma	54	57.4
Burns	15	16.0
Intertrigo or mycosis	8	8.5
Friction	8	8.5
Undetermined	9	9.6
Total	94	100.0

Table 4. Distribution by foot component.

Foot components	Workforce	Percentage
Neuropathy	37	39.4
Arteriopathy	4	4.3
Neuropathy and Arteriopathy	4	4.3
Pure infection	4	4.3
Neuropathy + Arteriopathy + Infection	22	23.4
No neuropathy	23	24.5
Total	94	100.0

Table 5. Distribution by type of lesion.

Type of lesions	Workforce	Percentage
Superficial	27	28.7
Necrosis without gangrene	29	30.9
Wet Gangrene	19	20.2
Dry Gangrene	8	8.5
Mixed Gangrene	11	11.7
Total	94	100.0

Table 6. Distribution by TU classification.

Grade	Wound stage			
	Stage A	Stage B	Stage C	Stage D
Grade 0	5	2	0	0
Grade 1	8	19	0	0
Grade 2	0	16	5	4
Grade 3	0	4	3	28
Total	13	41	8	32

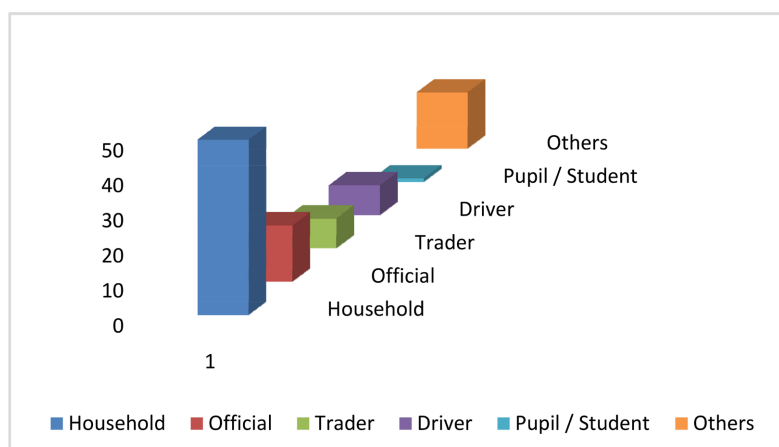


Figure 1. Distribution by socio-professional activity.

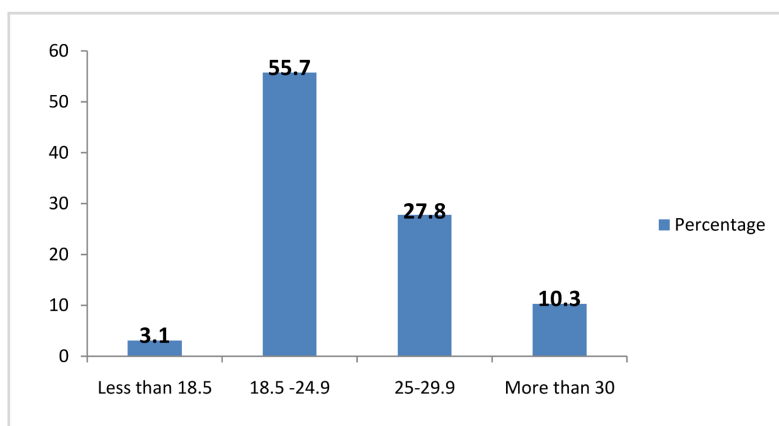


Figure 2. Distribution by BMI.

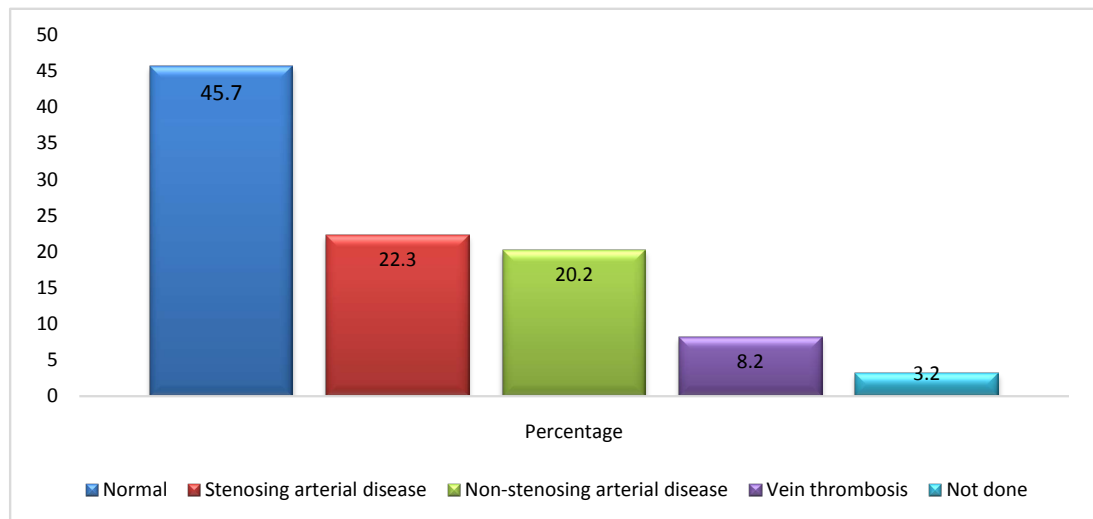


Figure 3. Distribution by Doppler ultrasound findings.



Picture 1. Plantar perforation disease.

Women were in the majority with a sex ratio of 0.61, Samaké, D. [11] and Djim, F.C. [4] *et al.* found a sex ratio of 0.59 and 0.47 respectively.

The sex ratio was 0.61. This same female predominance was observed by some authors such as Sano, D. *et al.* [9] 0.43, Guèye, D.D. *et al.* [8] 0.6, on the other hand, others had found a male predominance: Nghario, L. *et al.* [7] 1.8, Djibril, A.M. *et al.* [10] 1.38, Sani, R. *et al.* [6] 2.46.

The majority of our patients were not in school with 54.3%. This result is close to those of Traoré, D.Y. [12] 55.5% and Nghario, L. *et al.* [7] 47%.

The level of schooling is very important for patients in terms of therapeutic education, helping them to understand the tools. Housewives represented (50%) of the patients. Djim, F.C. [4] *et al.* found 53.3%. Weight was abnormal in 93.8%, this was found by Djim, F.C. [4] *et al.* 42.5%.

Family history of diabetes was found in 39% of patients. Djim, F.C. *et al.* [4] and Nghario, L. *et al.* [7] found 44.6%, 47% respectively. This explains by the high prevalence of T2DM in our study.

Type 2 diabetics accounted for 94.7%. Djim, F.C. *et al.* [4] had found 91.5% against 8.5% of type 1. This predominance of type 2 over type 1 is classic, 90% of diabetics have type 2 diabetes Ekoé, J. *et al.* [13]. Complications of type 2 diabetes are the most frequent because patients are very often poorly balanced. We found the notion of a family history of arterial hypertension 6.4%, and Djim, F.C. *et al.* [4] found 2.1%. Diabetes associated with familial hypertension was found in 8.5%, Djim, F.C. *et al.* [4] found 10.6%. Minimal trauma was the mode of discovery in 54 cases (57.4%). Djim, F.C. *et al.* [4] found 61.7%. Self-medication was observed in 74.5%. Djim, F.C. *et al.* [4], Nghario, L. *et al.* [7] reported 51.1% and 58% respectively. Unsuitable shoes were used by 63.8% of our patients. This risk factor for the occurrence of diabetic foot was found by Djim, F.C. *et al.* [4], Djibril, A.M. *et al.* [10] respectively 31.9%; 1.43%. Djibril, A.M. *et al.* [10].

Diabetes had been present for more than 5 years in 60.6% of patients, Djim, F.C. *et al.* [4] had found 46.8% of patients with diabetes.

Neuropathy was found in 37 cases (39.4%), arteriopathy in 4 cases (4.3%) and mixed foot in 4 cases (4.3%). Elsewhere some authors have found: Sano, D. *et al.* [9] neuropathy (75.5%), arteriopathy (31.5%), Guèye, D.D. *et al.* [8] 22.6% mixed component.

Neuropathy and arteriopathy are considered to be favourable factors for diabetic foot disease and are closely linked to glycaemic imbalance. The combination of arteriopathy and infection increases the risk of foot amputation by 50 to 100%, regardless of the type of lesion.

At admission, 40.4% of patients had gangrene. Sani, R. *et al.* [6], Djim, F. *et al.* [4], Guèye, D.D. *et al.* [8], Djibril, A.M. *et al.* [10] respectively found 40%, 44.6%, 54.60%, 61.29%.

Examination of the feet is an essential element during each consultation and allows early detection of lesions and feet at risk and to reduce the severity.

The majority of patients were unbalanced 86.2%. Djim, F.C. *et al.* [4] 80.9%. This imbalance favors the rapid onset of chronic complications.

The foot X-ray showed the presence of osteitis in 42.6% of cases. Nghario, L. *et al.* [7], Djibril, A.M. *et al.* [11], Koffi, D. [5] and Djim, F.C. *et al.* [4] found respectively 14.5%, 21.42%, 39% and 45.7%. In our series, 42.5% of the patients had arteriopathy of the lower limbs, 22.3% of which were stenosing. Djim, F.C. *et al.* [4] 48.6% of lower limb arteriopathy and 20% obliterating, Sano, D. *et al.* [9] 31.5%. Doppler ultrasonography of the lower limbs is a crucial examination which, when coupled with clinical examination, often allows a good decision to be made regarding surgical treatment.

We used the University of Texas classification to evaluate the severity of the lesions. The stage D Grade 3 with 100% risk of amputation was the most present with 29.7%.

Stage 0 Grade A was found in 4.7%, this result was estimated Djim, F.C. *et al.* [4] found 10.6%. Stage D Grade 3 with 100% risk of amputation was the most present with 29.7%, while Guèye, D.D. *et al.* [8] found that: grade 1b lesions ac-

counted for 34.0%, followed by 26.4% by grade 2D lesions and 24.5% of grade 3D lesions.

5. Limitations of the Study

1) Retrospective study whose data collection was based on information provided in medical records, consultation registers, and hospitalization registers, which were often incompletely filled out, sometimes requiring telephone calls from patients.

2) The high cost of complementary examinations which were at the expense of the patients were often not insured, with the consequence that many patients were excluded for not carrying out examinations which were often useful for the diagnosis and follow-up of their disease.

3) The limited sampling and the short duration of the study.

4) The non-use of the chi-square statistical test to compare our results with other studies.

6. Conclusion

Diabetes in general and the diabetic foot in particular is a real public health problem. The diabetic foot is responsible for formidable and sometimes disabling complications. Its management is multidisciplinary and requires significant financial resources. In Mali, great efforts have been made in recent times to improve care in terms of organization of care and training of diabetic referral doctors.

Conflicts of Interest

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

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Survey Form

Number:

Date:

I. Patient identification

Q1. Full Name:

Q2. Age:

Q3. Gender:

Q4. Profession/socio-professional activity:

Q5. Ethnic:

Q6. Address:

Q7. Level of education:

Q8. Origin:

- | | |
|----------------|--------------------|
| a. External | c. Referred |
| b. Transferred | d. come by himself |

II. Antecedents

Q9. Medical:

Q10. Surgical:

Q11. Gyneco-obstetrics:

Q12. Family:

III. Life style

Q13. Food habit:

- | | |
|------------|--------|
| a. Tobacco | c. Tea |
| b. Alcohol | d. Fat |
| e. others | |

Q14. Personal hygiene:

- | | |
|--------|-------|
| a. Yes | b. No |
|--------|-------|

Q15. Prolonged standing:

- | | |
|--------|-------|
| a. Yes | b. No |
|--------|-------|

Q16. Prolonged bed rest:

- | | |
|--------|-------|
| a. Yes | b. No |
|--------|-------|

Q17. Frequent walking:

- | | |
|--------|-------|
| a. Yes | b. No |
|--------|-------|

Q18. Choice of shoes:

- | | |
|--------------|--------------------|
| a. Too tight | c. Object in shoes |
| b. Wounding | |

IV. Socio-economic factors:

Q19. Economic status:

- | | |
|------------|-----------|
| a. Bottom | c. Raised |
| b. Average | |

Q20. Access to health services

- | | |
|--------|-------|
| a. Yes | b. no |
|--------|-------|

V. Clinical examination:

Q21. Type of diabetes

- a. Type1
- b. Type2
- c. secondary
- Q22. Mode of wound discovery
 - a. Trauma
 - b. heat
 - vs. intertrigo
 - d. pruritus
 - e. edema
- Q23. Duration of the wound before arriving at the health center
.....
- Q24. The first gesture made in front of the wound
 - a. Self-medication
 - b. Traditional treatment
 - c. Come to the health center
- Q25. Anti-diabetic treatment followed
 - a. None
 - b. Insulin
 - c. teenager
 - d. diet alone
- Q26. Duration of treatment
.....
- 27. Blood sugar
 - a. Balanced
 - b. unbalanced
- Q28. Duration of the wound
.....
- Q29. Wound site
 - a. Toes
 - b. Posterior surface of the internal edge foot
 - c. front of the foot
 - d. Internal edge
 - e. outer edge
- VI. Physical examination
- Q30. Temperature c
- Q31. FR cycle/min
- Q32. FC beats/min
- Q33. Weight kg
- Q34. BMI
- Q35. Type of lesion
 - a. Superficial
 - b. Deep not gangrenous
 - c. Wet gangrene
 - d. Dry gangrene
- Q35. Associated lesions
 - a. Renal
 - b. Cardiac
 - c. Ocular
 - d. neurological
- VII. Additional tests

- Q36. Blood sugar Yes No
 If yes result
- Q37. NFS1-VS Yes No
 If yes result
-
- Q38. Serum creatinine Yes No
 If yes result
- Q39. Cardiac doppler ultrasound
 Yes No
 If yes result
- Q40. X-ray of the feet
 Yes No
 If yes result
- Q41. Doppler ultrasound of the lower limbs
 Yes No
 If yes result
- Q42. The culture of pus
 Yes No
 If yes result
- Q43. Blood culture yes no
 If yes result
- VIII. Supported
- Q44. Medical treatment
 a. Slow insulin d. Mono antibiotic therapy
 b. Rapid insulin e. Bi antibiotic therapy
 c. Analgesic
- Q45. Surgical treatment
 a. Distal arterial bypass c. Partial amputation
 b. Angioplasty d. Total amputation