

Acute Metabolic Complications of Diabetes in the Oueme-Plateau Provincial Teaching Hospital: Epidemiological, Clinical, Paraclinical and Evolutionary Aspects

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Abstract

Introduction: Diabetes mellitus, a metabolic disease, is now an important public health problem across the world. Our aim was to study the epidemiological, clinical, paraclinical, and evolutionary aspects of acute metabolic complications (AMC) of diabetes in the endocrinology department of the Oueme-Plateau Provincial Teaching Hospital. **Methods:** This was a descriptive cross-sectional study with data collection based on the medical records of patients presenting with acute metabolic complications of diabetes in the endocrinology department of the Oueme-Plateau Provincial Teaching Hospital during the 3 years study period (from January 2020 to December 2022). **Results:** Over 788 patients hospitalized during the study period, 157 had an acute metabolic complication of diabetes, which is a hospital prevalence of 19.9%. Among these 157 cases, 140 were suitable for analysis and therefore constituted our study sample. The mean age of the patients was 49.9 ± 14.7 years, with 19 as minimum and 90 years as maximum. Most of them were women (52.4%). Hypertensive diabetics accounted for 54.9% of cases. Ketoacidosis was the most common complication (62.1%), followed by hyperosmolar hyperglycemic syndrome (23.6%) and hypoglycemia (14.3%). Infection (69.3%) and therapeutic noncompliance (22.9%) were the most common triggers. The average length period of their hospital stay was 7.1 ± 5.1 days, and the outcome was satisfactory in 87.9% of the cases. Unfortunately, there were 3.6% deaths during hospitalization. **Conclusion:** Acute metabolic com-

plications of diabetes were dominated by ketoacidosis. Infection was the dominant factor in decompensation. Therapeutic education of diabetic patients as well as clinical and biological monitoring must be more stringent and rigorous.

Keywords

Acute Metabolic Complications, Diabetes, Ketoacidosis, Porto-Novo

1. Introduction

Diabetes relates to a set of heterogeneous metabolic diseases dominated by a state of chronic hyperglycemia [1]. The latter is associated, to varying degrees and by known mechanisms, with various complications (increasing cardiovascular risk) [2]. Our expanding knowledge of this complex disease has made it possible to better appreciate its public health significance, to make progress in analyzing the risk factors that lead to it, and to work solid prospects for prevention. The International Diabetes Federation (IDF) estimates that 536.6 million adults aged 20 to 79 will be living with diabetes in 2021, which means 10.5% of the world population in this age group. It means an increase in the total number of diabetics to 642.7 million (11.3%) by 2030 and up to 783.2 million (12.2%) by 2045, and more than 1.2 million children and adolescents with type 1 diabetes, more than half of whom (54%) are under the age of 15 [3]. In Africa, on the other hand, it was computed at 24 million in 2021, rising to 33 million in 2030 and 55 million in 2045 [3]. Whatever the type, diabetes mellitus evolves in a chronic mode, leading to two types of complications: chronic or degenerative complications, and acute complications (metabolic and/or infectious), which are serious accidents that can be life-threatening in the short term [4]. They are common reasons for admission to the emergency department and intensive care unit. Their prognosis is poor in general, and more marked in developing countries, especially in sub-Saharan Africa [4], with very high mortality rates of 29.8% according to studies carried out in intensive care units in Kenya [5]. In Benin, a study on the management of diabetic metabolic emergencies at the National Teaching Hospital Hubert Koutoukou Maga in Cotonou, in the southern region of Benin, found a case-fatality rate of 25% [6], as did another study in Parakou, in the northern region of the country, on the evaluation of the management of acute metabolic complications of diabetes mellitus in the intensive care unit of the Borgou-Alibori Provincial Teaching Hospital, found a case-fatality rate of 14% [4]. In Porto-Novo, to our knowledge, no study has been conducted to assess the magnitude of the situation, hence our motivation to undertake this study in the endocrinology department of the Oueme-Plateau Provincial Teaching Hospital, with the aim of studying the epidemiological, clinical, paraclinical, and evolutionary aspects of acute metabolic complications (AMC) of diabetes.

2. Methods

This was a descriptive cross-sectional study with data collection based on the medical records of patients with acute metabolic complications of diabetes hospitalized in the endocrinology department at Oueme-Plateau Provincial Teaching Hospital. The study was conducted from January 1, 2020, to December 31, 2022, *i.e.* a 3-year period. All patients hospitalized in the unit during the study period, aged 18 or over and diagnosed with at least one of the acute metabolic complications of diabetes on admission or during hospitalization, were included in the study. Files that could not be retrieved, and files that could not be used due to lack of information, were excluded from the study. The variables studied were sociodemographic (Age, gender, marital status, occupation), clinical (duration of diabetes, type of diabetes, comorbidities, triggering factors, functional signs, general signs, physical signs), paraclinical (biological, radiological and other paraclinical signs), and evolutionary modes (favorable, unfavorable). Data collection was conducted from November 17 to December 31, 2022. Endocrinology hospitalization records were retained, selected, and analyzed. Thus, data were collected from patients' medical records via an electronic data collection application KoboCollect v2021.3.4 using a smartphone, considering the objectives of the study. Data collected electronically using the KoboCollect v2021.3.4 mobile data collection application were stored in the KoBoToolbox server. These data were processed in XLS format to create the dataset. Data analysis was performed using EPI Info 7.133 software. Our study was carried out in exacting compliance with ethical standards and hierarchical rules. During the study, we respected privacy and data protection policy by anonymizing with a code to each file examined. Under no circumstances was the data divulged to any third party, and the files were processed anonymously.

3. Results

3.1. In-Hospital Prevalence of Acute Metabolic Complications of Diabetes

A total of 788 endocrinology records were analyzed, including 157 cases of acute metabolic complications of diabetes, which is a hospital prevalence of 19.9%. Seventeen (17) cases could not be used and were therefore excluded from the analysis.

3.2. Socio-Demographic Characteristics

3.2.1. Age Distribution of Patients

The mean age of the patients included in our study was 49.95 ± 14.71 years with extremes of 19 and 90 years.

The 35 - 51 age group was strongly represented (37.9%) (**Figure 1**).

3.2.2. Patient Gender Distribution

In our study, 72 patients are female (52.4%) versus 68 which are male (52.4%), giving a sex ratio of 0.9.

3.3. Patient Distribution by Clinical Data

3.3.1. Distribution of Patients by Reason for Hospitalization

Fever, asthenia and alteration in state of consciousness accounted for 27.8%, 22.1% and 22.1% of cases, respectively (Table 1).

3.3.2. Distribution of Patients According to Comorbidity Factors

In our study, 65.9% of patients had at least one comorbidity factor. High blood pressure alone accounted for 54.9% of morbidity factors (Figure 2).

Type 1 diabetes was observed in 12.9% of patients, and type 2 in 87.1%.

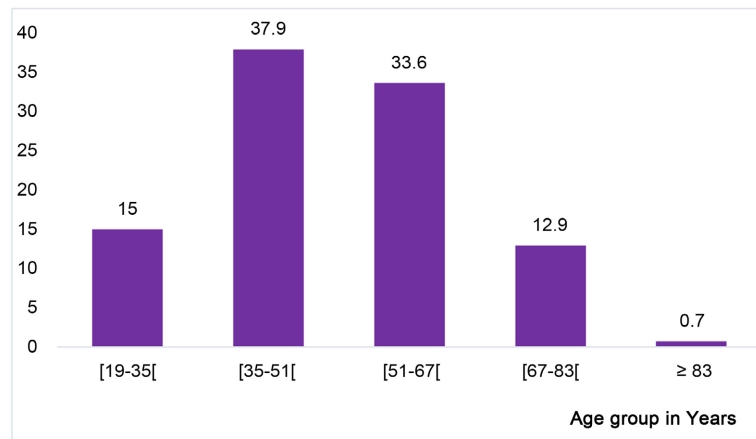


Figure 1. Patient distribution by age group.

Table 1. Distribution of patients by reason for hospitalization.

	Frequency	Percentage (%)
Fever	39	27.8
Asthenia	31	22.1
Alteration in state of consciousness	31	22.1
Alteration of the general condition	22	15.9
Abdominal pain	09	06.4
Dyspnea	07	05.7

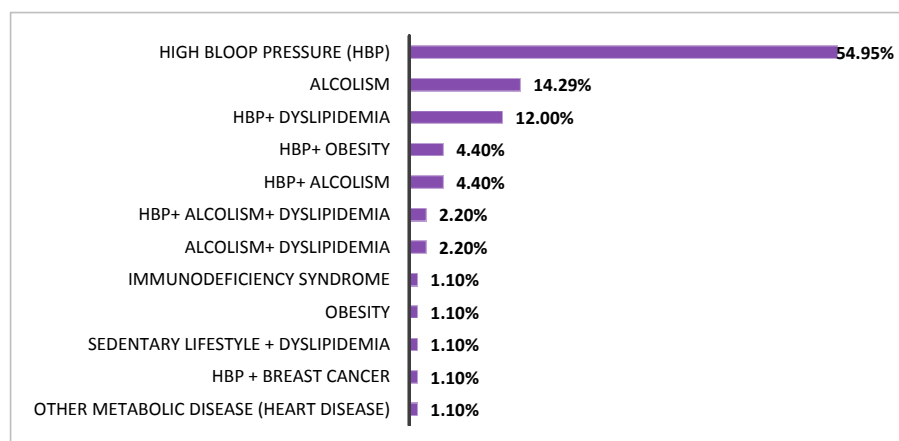


Figure 2. Distribution of patients according to comorbidity factors.

3.3.3. Distribution of Patients According to Precipitating Factors

In our study, more than half of the patients (69.3%) had an infection, followed by non-compliance with the treatment for 22.9% (Table 2). These two situations therefore represent the most frequent triggers in our study.

3.3.4. Patient Distribution According to Glycated Hemoglobin Assay

In our study, 61.4% of patients had glycated hemoglobin >7%, 10.7% had hemoglobin ≤7% and 27.8% had not performed this test.

3.4. Distribution of Patients According to Type of Acute Metabolic Complications

Ketoacidosis and the hyperosmolar hyperglycemic syndrome were the most frequent acute metabolic complications, with frequencies of 62.1% and 23.6% respectively. (Table 3).

3.5. Distribution of Patients According to Length of Hospital Stay

The average length of hospital stay in our study was 7.1 ± 5.1 days, with extremes ranging from 2 to 34 days.

Most patients in our study were hospitalized for more than 5 days (Table 4).

3.6. Distribution of Patients According to Outcome

The outcome was favorable in 121 patients (86.4%), with a case-fatality rate of 3.6% (Table 5).

Table 2. Distribution of patients according to triggering factors.

	Frequency	Percentage (%)
Infectious diseases	97	69.3
Therapeutic non-compliance	32	22.9
Dietary error	07	05.0
Trauma	04	02.8

Table 3. Distribution of patients according to the type of acute metabolic complication.

	Frequency	Percentage (%)
Ketoacidosis	87	62.1
Hyperosmolar hyperglycemic syndrome	33	23.6
Hypoglycemia	20	14.3
Lactic acidosis	00	00.0

Table 4. Distribution of patients according to length of hospital stay.

	Frequency	Percentage (%)
≤5 days	45	32.1
>5 days	95	67.9
Total	140	100

Table 5. Distribution of patients according to progress in the treatment.

	Frequency	Percentage (%)
Favorable outcome	121	86.4
Discharged against medical advice	8	05.7
Transferred	6	04.3
Died	5	03.6
Total	140	100

4. Discussion

Our study indicates that the prevalence of AMC represented 19.9% of hospitalizations in the endocrinology department at the Oueme-Plateau Provincial Teaching Hospital. Ouedraogo *et al.* found 22.9% in Burkina-Faso [7]. On the other hand, it is lower than that found at the CHU de Yopougon in Abidjan, Côte d'Ivoire, by Koffi *et al.* who reported 26.8% AMC among a total of 1340 diabetics hospitalized between 2002 and 2006 [8]. Ouedraogo and Koffi's studies were carried out in intensive care units. Patients included in our study had an average age of 49.9 ± 14.71 years, ranging from 19 to 90 years. This average age is identical to that reported by Kakoma *et al.* (49.8%), with extremes of 20 and 79 years in Lubumbashi, Democratic Republic of Congo [9], and the 49.15 ± 13.49 years reported by Koffi *et al.* [8] in Côte d'Ivoire. It is slightly higher than those found by Essola *et al.* in 2018 in Libreville, Gabon; Randall *et al.* and Elmehdawi *et al.* who found, respectively, 44.7 ± 16.5 [10]; 40.8 ± 13.3 years and [11] and 38.3 ± 18.5 years [12]. In the series by Ouedraogo *et al.*, the mean age was 55 ± 17 years [7]. These different studies demonstrate that the average age varies, but overall, our African diabetic patients are young. There was a dominance of women with acute metabolic complications of diabetes (51.4%) in our study population, with a sex ratio of 0.9. This preponderance is comparable to that reported by Sarr *et al.* (57%) in Senegal [13]; on the other hand, other authors report a male preponderance: Hossain *et al.* in Bangladesh [14] and Monabeka *et al.* in the Republic of Congo [15]. In view of these discrepancies, we cannot say that acute metabolic complications of diabetes are more preserved in women than men. The influence of gender may depend on the period of consultation, the population in question, and the diabetic's self-attention. The occurrence of fever in diabetic patients has long been considered a symptom of increased morbidity and mortality. It is the frequent reason for the admission of diabetic patients to the internal medicine department of the Regional and Teaching Hospital of Thies [16]. In our study, fever was the most recorded reason for admission (27.8%), followed by physical asthenia (22.1%). In the study conducted by Kerekou *et al.* in Cotonou, the frequency of fever was 54% [6]. The reason for admission was disturbed consciousness, according to Tchaou *et al.* [4] and Sarr *et al.* [13]. Over 140 patients hospitalized for acute metabolic complications of diabetes in the endocrinology unit of the Oueme-Plateau Provincial Teaching

Hospital during the study period, 87 were admitted for diabetic ketoacidosis, which means a hospital prevalence of 62.1% during this period, 33 or 23.6% patients were admitted for hyperosmolar hyperglycemic syndrome and 20 or 14.3% presented with hypoglycemia. Data in the literature suggest that ketoacidosis is the most frequent acute metabolic complication of diabetes, accounting for 4% - 9% of the reasons for consultation of diabetic patients [17]. Mobio *et al.* reported 74.4% ketoacidosis followed by 15.4% hypoglycemia and 10.2% hyperosmolar hyperglycemia syndrome respectively [18]. We had no cases of lactic acidosis. Ouedraogo *et al.* [7] and Mobio *et al.* [18] did not find this complication. Lactic acidosis is rare because Metformin's contraindications are well-known and generally respected. The etiological search for acute metabolic complications of diabetes enabled us to identify infections (69.3%), which revealed ketoacidosis in most patients, followed by poor therapeutic compliance (22.9%) as the main triggering factor. In Africa, infections, therapeutic interruption, and lack of therapeutic education appear to be the main causes of diabetes decompensation. Indeed, in a study carried out in two cities in the southern region (Cotonou and Porto-Novo) of Benin, non-compliance was found in 90.9% of patients [19]. Abodo *et al.* in 2011, in Abidjan, reported 33.5% poor compliance [20]. These results show that there is a real problem of compliance among our diabetic patients. However, compliance is a key factor in diabetes control, and consequently in the prevention of diabetic complications. This raises the question of the place of therapeutic education in the management of our diabetic patients. In Senegal, Sarr *et al.* [13] found 78% concomitant infections, 69% patients without education or follow-up, and 53.42% discontinuation of therapy. In Algeria, Boutabia *et al.* [21] found that infectious factors predominated in 51.7% of cases. Infectious sites remain the same, but their distribution varies according to the literature. Our study, like the one of Kakoma *et al.* [9], found a predominance of malaria. On the other hand, Sarr *et al.* [13] and Umpierrez *et al.* [22] found a predominance of urogenital and bronchopulmonary infections. The length of hospitalization varied widely in the literature. Lokrou *et al.* found an average length of stay of 8.3 ± 7 days [23]. The outcome was favorable in 121 patients (86.4%), with a case-fatality rate of 3.6%, well below those reported by several authors: Mbugua [5] (29.8%), Kerekou *et al.* in Cotonou (25%) [6] and Monabeka [24] (11%). This high mortality rate on the African continent is imputable to the continent's poor health coverage, exorbitant healthcare costs, and late consultations due to the limited financial means of patients, most of whom have no health insurance.

Our study certainly has its limitations. Indeed, given the retrospective nature of our data collection, certain aspects escaped us. These include the classic shortcomings associated with non-digitized file/archiving systems: missing files; some files were difficult to use due to a lack of information. The relatively small sample size of our monocentric study was also a limitation. Nevertheless, our study has enabled us to obtain results that provide an understanding of the epi-

demiological and clinical aspects of acute metabolic complications of diabetes at the CHUD-OP in Porto-Novo. It paves the way for many other studies that could analyze more specific aspects of diabetes on larger samples.

5. Conclusion

At the end of our work based on acute metabolic complications of diabetes, we can conclude that these complications of diabetes are recurring affections in the endocrinology hospitalization unit at the Oueme-Plateau Provincial Teaching Hospital. The main trigger was infection, and the key complication was ketoacidosis. We therefore suggest subsidizing the assessment and treatment of patients suffering from diabetes to improve the management of these patients. We must also insist on therapeutic education, so that these patients rigorously observe medical prescriptions and consult a doctor at the slightest symptom, even if it seems trivial for appropriate management. In addition, we think that this type of study should also be conducted on a national scale, to assess the extent of these diabetic complications. Emphasis should be placed on measures to prevent diabetes, the prevalence of which continues to rise, especially in Africa.

Conflicts of Interest

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

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