

Diabetic Ketosis Decompensations at the National Hospital in Benin (West Africa), What Did We Learn about the Precipitating Factors?

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Abstract

We performed a retrospective study on diabetic ketosis decompensations in 101 diabetic patients in Endocrinology and Metabolic Diseases Service of the National Hospital and University Koutoukou Hubert Maga (CNHU-HKM) for a period of 3 years. Objective: The main objective of the study was to identify the underlying factors of ketosis decompensations for a more focused education program. Results: The mean age was 43.84 years. In half of cases (49.5%), the ketosis decompensations were inaugural for the diabetes. Type 2 diabetes was predominant with a frequency of 85.1% versus 14.9% for type 1 diabetes. The overall prevalence rate of ketosis decompensations was 21.82%. The precipitating factors were infections (51.49%) and treatment withdrawal (25.74%). The average blood glucose was 4.46 g/L with ranges of 1.86 g/L and 13 g/L. The outcome was favorable in 89.1% of cases. The mortality rate was 7.9%. The average hospital stay was 13.23 days. Conclusion: This study showed that ketosis decompensations are still frequent. The main precipitating factors are infection and therapeutic noncompliance. Preventive actions are needed through screening programs, regular monitoring and targeted education.

Keywords

Ketoacidosis, Diabetes, Complications, Ketosis-Prone

1. Introduction

Diabetes mellitus is a chronic disease affecting a large fraction of the world population

[1]. Its prevalence is increasing at an alarming rate [1]. If once morbidity and mortality related to diabetes were considered weak in developing countries, nowadays many things have changed [2]. Indeed, according to WHO estimations, 80% of the adult population with diabetes will be in developing countries in 2025 [3]. In Benin, the prevalence of diabetes increased from 1.1% in 2001 to 2.6% in 2008 [4]. Diabetes is a serious condition and its severity is primarily related to its complications. Diabetic ketoacidosis, which is one of common metabolic complications, is lethal [5]. Some studies have reported a high frequency of ketoacidosis in Africa, ranging from 12.4 to 25.5% according to the authors [6]. Diabetic ketoacidosis has inaugurated diabetes in adults in 36.6% of cases in the Ivory Coast [6] and in 40% of cases in Cameroon [6]. A high mortality rate is often associated with the high frequency of ketoacidosis: 28.57% of cases in Burkina Faso [2] and 29.8% in Kenya [5]. The most common causes of ketoacidosis are infections and poor compliance to treatment of diabetes [2] [5]. It therefore seems clear that DKA is not only common but also lethal. Moreover, the precarity and the socioeconomic poverty with diabetic patients represent obstacles to obtain a normoglycemia which is essential to prevent complications in diabetic patients. It has seemed important that we better understand the underlying factors of the ketosis decompensations in our country. The aim of our study was to better understand the factors behind the ketosis decompensation diabetes for targeted patient education.

2. Patients and Method

Our study was conducted in the Endocrinology and Metabolic Diseases Service of the National Hospital and University Koutoukou Hubert Maga (CNHU-HKM).

This is a retrospective cross-sectional study over a period of 3 years. All the diabetic patients hospitalized for decompensated ketosis from 1st January 2005 to 31st December 2007 were enrolled in this study. Demographic parameters, glycaemia, ketonuria, glycosuria, precipitating factors and therapeutic features were collected.

We included in this study, all patient with hyperglycemia and two cross ketonuria (++) on urine dipstick test regardless of their state of consciousness.

Eight patients with incomplete medical records were excluded.

Data analysis was performed with Epi-Info 3.3.2 software.

3. Results

3.1. General Characteristics

Of the 472 hospitalized diabetic patients, 101 had a ketosis decompensation with the overall frequency of 21.39%. The mean age of the study population was 43.84 years \pm 14.18 years ranging from 15 years and 75 years. The sex ratio was 1.24. The most affected age group was those of 31 to 40 years and the 41 to 50 years (**Table 1**).

Type 2 diabetes was the most common, 85.1% against 14.9% for type 1 diabetes. Ketotic decompensation was inaugural for diabetes in 49.50% of cases. The mean duration of diabetes was 4.88 years, ranging from 0 to 29 years. More than half (56.40%) of patients had duration of diabetes less than 1 year (**Figure 1**).

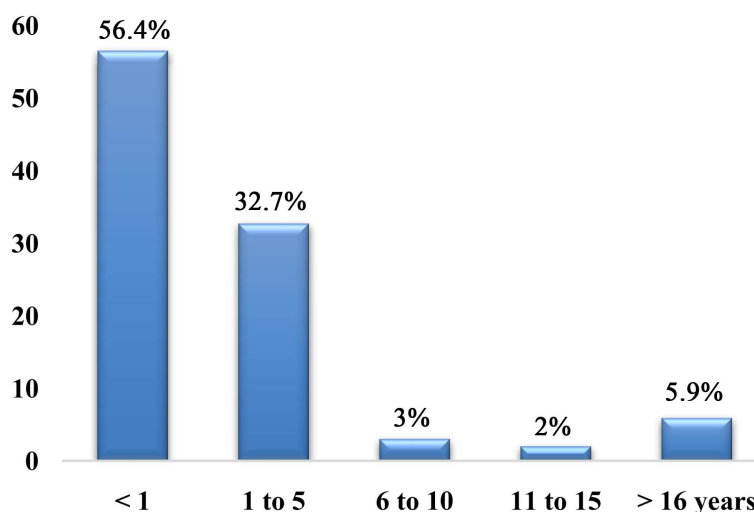


Figure 1. Distribution of patients according to the duration of diabetes.

Table 1. Frequency of ketosis according to age and sex.

Age groups	Sex		Percentage for age groups
	Men	Women	
15 to 20 years	4 (7.1%)	4 (8.9%)	7.9%
21 to 30 years	3 (5.4%)	6 (13.3%)	8.9%
31 to 40 years	17 (30.4%)	9 (20.0%)	25.7%
41 to 50 years	19 (33.9%)	9 (20.0%)	27.7%
51 to 60 years	9 (16.1%)	7 (15.6%)	15.8%
61 to 70 years	4 (7.1%)	7 (15.6%)	10.9%
More than 70 years	0 (0%)	3 (6.7%)	3.0%

3.2. Descriptive Characteristics of Ketosis Decompensations

3.2.1. Biological Features

Mean plasma glucose was 4.46 ± 1.69 g/L with extremes between 1.86 and 13.5 g/l. Among the patients studied, 64 (63.4%) had ketonuria superior or equal to three crosses.

3.2.2. Precipitating Factors of Ketosis Decompensation

The main precipitating factors of decompensation were infections (51.49%), the treatment withdrawal (25.74%) and in 24.8% of cases, no factor has been identified (**Table 2**).

3.2.3. Treatment and Outcome

The treatment included intensive insulin therapy (84% of cases), hydration and treatment of precipitating factors. The outcome was favorable in 89.1% of cases. The mortality rate was 7.9% and the average hospital stay was 13.23 days.

Table 2. Frequency of precipitating factors of ketosis decompensations.

Precipitating factors	Number	Percentage (%)
Infections	52	51.49
Treatment withdrawal	26	25.74
Other intercurrent diseases	6	5.9
Use of corticosteroids	1	0.99
No factor identified	25	24.8

4. Discussion

4.1. General Characteristics

The patients were relatively young with an average age of 43.84 ± 14.18 years (range 15 to 75 years). A similar result had observed by POUYE A. *et al.* in Senegal [7]. Indeed in the series of POUYE the average age was 43.9 years, ranging from 15 to 74 years. Half (49.5%) of patients had an inaugural ketosis decompensation of diabetes. The same frequency (50%) was reported in 2008 in Sweden by Z. Wang *et al.* [8] and POUYE A. [7] reported a frequency of 41.17% of inaugural ketoacidosis of diabetes in Senegal in 2001. Moreover Monabeka H. [6] had found in Congo-Brazzaville the same prevalence (42%). This high prevalence of diabetes revealed by ketotic decompensation in this context of high frequency of type 2 diabetes (85.1%) could be explained by the many cases of undiagnosed diabetes which therefore revealed during intercurrent disease. Furthermore, it may also be some cases of ketosis-prone atypical diabetes which seems to be confirmed by the presence of cases of spontaneous ketosis decompensation (no decompensation factor was identified in 24.8% of cases) [9] [10].

4.2. Precipitating Factors

Concerning precipitating factors, in more than half of the cases (51.49%) infections were found and therapeutic noncompliance was the cause in 25.74% of cases. Umpierrez G.E. *et al.* [11] reported a similar frequency (50% of cases) in USA and MBADINGA-MUPANGU N. [12] reported a similar frequency for therapeutic non-compliance in Congo. However, some authors have reported higher frequencies. Indeed, POUYE A. [7] reported in Senegal a frequency of 82.3% of infections as precipitating factors, and BALDE M.N. [13] has found in 2007 in Guinea that errors in treatment were the main factors of decompensation (66% of cases). As shown by these studies, infections and therapeutic non-compliance are the prime factors of decompensation of diabetes mellitus.

4.3. Treatment and Evolution

The outcome was favorable in 89.1% of cases in our study population. POUYE A. [6] has found in Senegal a favorable outcome in 94.1% of cases. Ketosis decompensation was lethal in 7.9% of cases in this study. This mortality was similar to those found by some authors as SAJTI I. *et al.* [14]; KO S.H. *et al.* [15] who related a frequency of 10%

and 11.8% respectively. However, studies by others have shown lower mortality rates, 2.0% in the USA [16]; and 3.4% in Germany [17]. The low mortality rates in those developed countries could be explained by the high quality of patient care which often lacks in developing countries where there is a poor quality of patient care and lack of social insurance.

Otherwise, the average hospital stay was 13.23 days in our study. Some authors have reported similar results. Indeed, MONABEKA H. [6] reported a mean duration of hospital stay of 11 days in Congo; and in Germany, Vavricka S.R. *et al.* [17] has found an average of 11.5 days for the hospital stay for patients admitted for diabetic ketoacidosis.

Our type of study (retrospective and cross sectional), some missing data in patients' medical records were the main limitation of our study.

5. Conclusion

Ketosis decompensations of diabetes mellitus are frequent and are often inaugural in Africans. The main precipitating factors found are infections and therapeutic noncompliance. Routine screening and more targeted patient education could reduce the frequency of acute complications of diabetes.

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