

Decompensation Factors in Diabetic Ketoacidosis at the Fellah Polyclinic in Conakry, Guinea

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How to cite this paper: Kaké, A., Sylla, D., Diango, A., Kourouma, L., Adja, F.N., Diallo, O.K., Camara, R. and Fokou, T.K. (2025) Decompensation Factors in Diabetic Ketoacidosis at the Fellah Polyclinic in Conakry, Guinea. *Open Journal of Internal Medicine*, 15, 195-203.

<https://doi.org/10.4236/ojim.2025.153017>

Received: May 31, 2025

Accepted: July 26, 2025

Published: July 29, 2025

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Abstract

Diabetic ketoacidosis (DKA) is the most common and serious diabetic emergency, with a high mortality rate estimated between 5% and 21%. This study aimed to identify the factors contributing to DKA decompensation at the Fellah Polyclinic in Conakry, Guinea. A descriptive cross-sectional study with prospective data collection was conducted over a three-month period, from December 1, 2023, to February 29, 2024, at the Fellah Polyclinic, a national reference center for endocrine diseases. DKA was defined by the presence of fasting blood glucose ≥ 250 mg/dL, Kussmaul respiration, ketonemia ≥ 0.7 mmol/L, and glycosuria and acetonuria of at least two crosses. During the study period, 52 cases of DKA were identified among 120 hospitalized diabetic patients, representing a prevalence of 43%. The sex ratio was 0.73, favoring females. The mean age was 50.2 ± 16.2 years (range: 22 - 77 years). Type 2 diabetes was predominant (88.4%), and in 32.6% of cases, DKA was the initial presentation of the disease. All patients had blood glucose levels >400 mg/dL and ketonuria of at least two crosses. Notably, 50% of patients had not received any therapeutic education. The main decompensation factors identified were infection (71.1%), dietary errors (63.4%), treatment interruption (30.7%), inappropriate treatment (13.4%), and difficulties with insulin therapy (22%). Multiple factors were present in 30.7% of patients. DKA remains a frequent complication at the Fellah Polyclinic, where it often represents the first sign of type 2 diabetes. The primary decompensation factors—mainly infections, dietary mistakes, and challenges in treatment adherence—are largely preventable through targeted patient education and improved access to health-care.

Keywords

Ketoacidosis, Diabetes, Infection, Guinea

1. Introduction

Diabetic ketoacidosis (DKA) is the most common and serious acute complication of diabetes mellitus [1]. In Africa, it frequently represents the initial manifestation of previously undiagnosed diabetes, but it can also occur because of decompensation in patients with known diabetes. The incidence of diabetes in sub-Saharan Africa remains high, with reported rates ranging from 12.4% to 35.9%, depending on the study population and methodology [2]-[4].

The prognosis of DKA remains concerning, with mortality rates estimated between 5% and 21% [5]. Early identification and management of the underlying decompensation factors—particularly infectious causes—are critical in improving outcomes [6]. In resource-limited settings, therapeutic education for diabetic patients is a key strategy for reducing both the frequency and severity of DKA.

In Guinea, a study by Baldé N.M. *et al.* in 2006 reported a DKA frequency of 35% among hospitalized diabetic patients [7]. The present study aims to update this data by describing the decompensation factors observed during episodes of diabetic ketoacidosis at the Fellah Polyclinic in Conakry.

2. Patients and Methods

This was a descriptive cross-sectional study with prospective data collection, conducted over a three-month period from December 1, 2023, to February 29, 2024, at the Fellah Polyclinic in Conakry. This facility serves as a national reference center for the management of endocrine disorders in Guinea.

The study included a consecutive series of diabetic patients aged 18 years and older who were hospitalized during the study period with a confirmed diagnosis of diabetic ketoacidosis (DKA). The only exclusion criterion was refusal to participate in the study.

Data sources included the consultation register, hospitalization records, patient follow-up notebooks, and a standardized survey form specifically developed for the study. All patients underwent a comprehensive clinical examination, followed by testing for glycosuria and acetonuria using fresh urine samples.

Diabetic ketoacidosis (DKA) was defined by the presence of the following criteria:

- Dyspnea due to acidosis or Kussmaul's respiration.
- Fasting blood glucose ≥ 250 mg/dL.
- Ketonemia ≥ 0.7 mmol/L.
- Glycosuria and acetonuria graded \geq two crosses on semi-quantitative estimation.

Due to technical limitations, arterial blood gas analysis (pH), blood electrolyte

panels, and serum bicarbonate measurements could not be performed.

The following variables were assessed:

- **Socio-demographic characteristics:** age, sex, marital status, occupation, and place of residence.
- **Diabetes-related variables:** admission blood glucose, type of diabetes, known duration of the disease, and glycaemic control status. Diabetes classification was based on clinical and evolutionary features, including patient age, body habitus, symptom onset, family history, and response to treatment. Anti-GAD and anti-IA2 antibody testing were not available.
- **Decompensation factors:** this included treatment interruption (voluntary or involuntary discontinuation of therapy) and infections (cutaneous, ENT, dental, pulmonary, or urinary origin).

Decompensation Factors and Data Analysis

The following decompensation factors were investigated:

- **Treatment interruption:** voluntary or involuntary discontinuation of prescribed therapy.
- **Infections:** including skin, ear, nose and throat (ENT), dental, pulmonary, and urinary tract infections.
- **Dietary errors:** such as skipping meals or frequent snacking.
- **Insulin administration errors:** including poor injection technique, lack of rotation of injection sites, and inadequate dosing.
- **Poor medication quality:** use of expired or improperly stored insulin or other diabetes medications.

Data were collected, entered, and analyzed using **SPSS version 30.0**. Qualitative variables were expressed as **proportions**, while quantitative variables were presented as **means ± standard deviation**. For ethical considerations, all data were collected **anonymously**, and the **free and informed consent** of all participants was systematically obtained. The information gathered was used **exclusively for scientific purposes**.

3. Results

3.1. Epidemiological Variables

During the study period, a total of 120 diabetic patients were hospitalized, among whom 52 cases of diabetic ketoacidosis (DKA) were identified, representing a prevalence of 43%.

The study population consisted of 22 men and 30 women, yielding a sex ratio of 0.73 in favor of women. The mean age of patients was 50.2 ± 16.2 years, with a range from 22 to 77 years. Geographically, most patients (86.5%) resided in Conakry.

Regarding marital status, 84.6% of patients were married, followed by widowed individuals (9.6%) and single patients (5.7%). Concerning professional activity, most patients worked in the informal sector (57.7%), while 34.6% were employed

in the formal sector, and 7.7% were unemployed.

3.2. Characteristics of Diabetes

Type 2 diabetes was the predominant form, accounting for 88.4% of cases, followed by type 1 diabetes (7.6%) and gestational diabetes (3.8%). In 32.6% of patients, diabetic ketoacidosis was the initial manifestation of diabetes. All patients presented with blood glucose levels exceeding 400 mg/dL on admission. Ketonemia was greater than 3.0 mmol/L in 42% of cases, and ketonuria of at least two crosses was observed in 98.1% of patients.

Regarding therapeutic education, half of the patients (50%) had never received training in diabetes management, and 70% lacked means for home blood glucose monitoring. Diabetes was diagnosed in the context of cardinal symptoms in 48% of cases, during routine health checks in 21.1%, and because of diabetic complications in 5.7%. Glycemic control was poor, with an average glycated hemoglobin (HbA1c) level of 13%.

Microangiopathic complications were dominated by diabetic peripheral neuropathy (56.7%), followed by diabetic retinopathy (15.3%) and diabetic nephropathy (10.6%). Macroangiopathic complications included obliterative arterial disease of the lower limbs (AOMI) in 12%, ischemic heart disease in 6.3%, diabetic foot in 9.6%, and stroke in 1.9%.

As for comorbidities, dyslipidemia was present in 71% of cases, arterial hypertension in 32%, and obesity in 6%.

3.3. Decompensation Factors

Clinically, all patients presented with dehydration and Kussmaul dyspnea, a hallmark of metabolic acidosis. Cardinal symptoms of diabetes—polyuria, polydipsia, and weight loss—were observed in 57.6% of patients. Altered consciousness was noted in 8% of cases, including 5% with obtundation and 3% in a comatose state.

Table 1 summarizes the main decompensation factors identified.

Table 1. Decompensation factors in diabetic ketoacidosis (n = 52 patients).

Factors leading to decompensation	Number of case (%)
Break in treatment	16 (30.7%)
Infection	37 (71.1%)
Dietary errors	33 (63.4%)
Inappropriate treatment	7 (13.4%)
Difficulty with insulin therapy	14 (26.9%)
Associated Factors	16 (30.7%)
Not determined	4 (5.7%)

Treatment discontinuation was noted in 16 patients (30.7%). Among them, ten patients cited financial reasons for reducing or interrupting their treatment (in-

sulin or oral antidiabetics), two patients cited unavailability of the drug in pharmacies, and four patients had abandoned their conventional treatment in favor of traditional medicine.

Infection was present in 37 cases (71.1%), mainly:

- Malaria: 25 cases (48%).
- Pulmonary infection: 9 cases (17.3%).
- Urinary tract infection: 7 cases (13.4%).
- Diabetic foot infection: 5 cases (9.6%).

A dietary error was identified in 35 cases (67%), including eating only one meal a day, irregular mealtimes, and inappropriate snacking.

Use of poor-quality medication was noted in six patients, including two cases of expired medication and four cases of denatured insulin, linked to inadequate storage (lack of refrigeration).

Insulin therapy-related difficulties were observed in 16 patients (30.2%), including errors in injection technique, lack of rotation of injection sites, and poor dose adaptation.

In 16 cases (30.7%), multiple decompensation factors were associated with the same patient.

The average length of hospitalization was 7.5 ± 3.1 days. No deaths were recorded during the study period.

4. Discussion

4.1. Epidemiological Variables

The hospital prevalence of diabetic ketoacidosis (DKA) in our study was 43%. This figure is consistent with those reported in similar African studies, such as Baldé *et al.* in Guinea (35%) [7] and Dionadji M. in N'Djamena (35.9%) [4]. However, significantly lower prevalence rates have been reported in other West African countries: 6.49% by Leye in Senegal [2], 4.4% by Lokrou in Côte d'Ivoire [3], and 8.24% by Ouédraogo in Burkina Faso [5]. These discrepancies may be attributed to differences in study inclusion criteria, case reporting methods, and variations in healthcare system organization across regions.

The mean age at the onset of DKA in our cohort aligns with findings from most African studies, where the average age is also around 50 years [1]-[3]. This likely reflects the predominance of type 2 diabetes, which is typically diagnosed in middle-aged or older adults.

Regarding sex distribution, our study showed a female predominance, resulting in a sex ratio of 0.73. This contrasts with findings from some African studies that report a male predominance. Although sex is not generally considered a major risk factor for DKA, such differences may stem from socio-cultural factors or better access to healthcare services for women in our study setting.

Most patients included in the study resided in Conakry, a trend also observed in other African studies where urban centers, particularly capital cities, account for most hospital admissions [8]. This can be explained by two key factors: the

location of the study site in the capital and the limited access to specialized diabetes care in rural areas, where healthcare infrastructure for managing acute diabetic complications is often lacking.

4.2. Characteristics of Diabetes

The predominance of type 2 diabetes in our study aligns with findings from other African studies, where acute decompensation—including diabetic ketoacidosis (DKA)—is also frequently observed in patients with type 2 diabetes. This may be related to a distinctive phenotype of type 2 diabetes in African populations, characterized by a tendency toward ketosis and, in some cases, a reversible need for insulin therapy [9] [10].

Although DKA is classically associated with type 1 diabetes, it can also occur in the context of gestational diabetes, albeit much more rarely. In our setting, this could be explained by the lack of routine screening and delayed management of pregnant women with gestational diabetes. DKA during pregnancy represents a serious medical emergency, as it compromises both maternal and fetal outcomes.

In 32.6% of patients, DKA was the initial presentation leading to the diagnosis of diabetes. This high proportion of inaugural DKA among patients with type 2 diabetes may be related to the occurrence of atypical diabetes in African populations, which often presents in adulthood with features of ketosis [9] [10].

Furthermore, 44% of patients had been living with diabetes for more than five years. This contrasts with the findings of Sidibé A.T. *et al.* [11], who reported that in 78.6% of cases, diabetes had been present for less than five years. This discrepancy could reflect differences in patient profiles, prior access to care, or patient awareness of their diagnosis prior to the decompensation episode.

4.3. Decompensation Factors

Diabetic ketoacidosis (DKA) typically develops progressively over several hours or even days. Its clinical presentation is variable and may include altered levels of consciousness. In our study, 8% of patients exhibited impaired consciousness—5% with obtundation and 3% in a comatose state.

All patients presented with dehydration and Kussmaul dyspnea, which are characteristic features of DKA. Cardinal symptoms of diabetes—polyuria, polydipsia, and weight loss—were observed in 57.6% of cases. These signs reflect the natural course of poorly controlled or untreated diabetes. Our findings are consistent with those of Sidibé A.T. *et al.* [11], who also reported 100% dehydration. However, this contrasts with data from Misaoui in Tunisia, where dehydration was reported in only 26.7% of patients [12]. According to the literature, water loss due to vomiting, diarrhea, and polypnea during DKA can range from 1 to 5 liters over 24 hours [13].

Infections were the leading decompensation factor in our series, found in 71.1% of cases, followed by dietary errors in 63.4%. This predominance of infections is in line with findings from several African studies [2]-[9] [14] [15]. Infections—

whether bacterial, viral, parasitic, or fungal—increase insulin resistance, disrupt carbohydrate metabolism, and worsen dehydration, thereby precipitating DKA.

A lack of patient education and awareness remains a major contributor to acute diabetic complications. In our study, only 50% of patients had received structured therapeutic education. Among known diabetics, 30.7% had interrupted treatment, 13.4% were on an inappropriate regimen, and 26.9% of insulin-treated patients reported difficulties with administration. These findings may be attributed to several factors, including limited patient knowledge, lack of trained healthcare personnel, unavailability of insulin, and economic challenges in maintaining long-term treatment adherence.

In 30.7% of patients, multiple decompensation factors were identified. No clear precipitating factor was found in 5.7% of cases—a phenomenon also reported in other African series [7] [16]. This may be due to the lack of systematic diagnostic tests such as blood cultures or urinalysis (ECBU), and the widespread practice of self-medication, including empirical antibiotic use, which can obscure clinical signs of infection.

Importantly, no deaths were recorded during the study period, suggesting that management at our center was relatively effective despite resource limitations.

4.4. Limitations

We conducted a three-month cross-sectional study to analyze the factors involved in the decompensation of diabetic ketoacidosis at the Fella polyclinic, a specialized diabetes management center in Conakry, Guinea. A total of 52 cases of diabetic ketoacidosis were documented. However, our study has some methodological limitations. On the one hand, the concentration of cases in a specialized facility could lead to an overestimation of the prevalence of diabetic ketoacidosis, which makes it difficult to extrapolate the findings to the entire Guinean population. On the other hand, the absence of certain biological examinations (pH, ionogram, bicarbonates, bacteriology) constitutes a limitation, as the severity of acidosis and infectious etiology could not be determined in all cases.

Despite these limitations, this study provides current data on the factors contributing to the decompensation of diabetic ketoacidosis in Conakry. This information is essential for a better understanding of the determinants of this acute complication and could serve as a basis for developing prevention and management strategies tailored to the Guinean context.

5. Conclusion

Diabetic ketoacidosis (DKA) is a common complication at the Fella Polyclinic in Conakry, where it often presents as the first clinical sign of type 2 diabetes. The main contributing factors to decompensation are primarily linked to infections, dietary errors, and difficulties in treatment management. These factors are largely preventable and can be effectively addressed through targeted patient education aimed at improving treatment adherence and preventing acute complications. To

enhance the management of diabetic ketoacidosis, it is essential to improve access to healthcare and essential medications—particularly insulin and antibacterial treatments—alongside ongoing training for medical staff. Additionally, efforts must be made to ensure broader nationwide healthcare coverage, especially in rural areas where access to specialized facilities remains limited.

Conflicts of Interest

The authors declare that they have no conflict of interest in this study.

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