

Original Research Article

Epidemiological and Evolutionary Aspects of Diabetes Mellitus in Children and Adolescents in Pointe Noire

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Abstract: Diabetes in children and adolescents is considered rare in Africa due to a lack of data. We conducted a retrospective analytical study for 12 years, based on patient records between 2010 and 2022, and analyzed the epidemiological and evolutionary aspects of patients. A total of 236 patients were enrolled, including 121 (51.48%) men and 114 (48.51%) women. The average age at the discovery of the disease was 16.29 ± 5.39 years, ranging from 1 year to 19 years. The most represented age group was 10-20 years. The incidence rate was 2.43/10,000 inhabitants/year. The prevalence of childhood diabetes mellitus in Pointe-Noire was 0.20%. We observed 98.29% cases of T1D, 0.85% of secondary diabetes, 0.42% of T2D, and 0.42% cases of MODY. Diabetic ketoacidosis was the most common cause of hospitalization (51.89%). Follow-up was regular for 43.82% of patients but marked by patients lost to follow-up (14.46%) and a significant number of deaths (18.72%). Better biological monitoring of our patients will prevent complications and improve care.

Keywords: Diabetes in children, retrospective analytical study, biological monitoring, Diabetic ketoacidosis.

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INTRODUCTION

Adolescent diabetes mellitus is the most common endocrinopathy in children, and type 1 diabetes (T1D) is the most common form of diabetes in children and adolescents. Other forms, such as type 2 diabetes (T2DM), monogenic diabetes, and other variants, also exist in children [1]. Both type 1 diabetes (T1D) and type 2 diabetes (T2DM) are the two most common major forms of diabetes worldwide. In T1D, there is specific autoimmunity, inflammation, and predominantly lymphocytic and macrophage infiltration of the pancreatic islets, leading to the destruction of cells and an absolute deficiency of insulin secretion [2]. The prevalence of T1D has been steadily increasing in developed countries in recent years, while developing

countries lack adequate epidemiological data. The incidence of T1D varies globally, with higher rates in some regions compared to others. Recent evidence suggests that the increase in T1D incidence may stabilize or decrease in some high-income countries [3-4]. Globally, India and the US have the highest incidence rates among children aged 0-14 years, estimated at 19.19% and 15.28%, respectively [5]. In Africa, the overall incidence of T1D is 12.5% in six countries with available data [5]. In Congo, studies on the prevalence of T1D are scarce and pose a significant burden on the healthcare system. A study conducted by Monabeka *et al.* in 1999 reported a hospital frequency of T1D of 2.8% [6]. However, these statistical data are likely underestimated as the study focused exclusively

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on Brazzaville, where the country's first specialized service was located. In light of this, our study aimed to determine the prevalence of T1D in children in Pointe Noire.

MATERIALS AND METHODS

Study Population

We conducted a 12-year retrospective study from 2010 to January 2022. Data collection was prospective. Our study population consisted of children enrolled in the "Life for a Child" (LFAC) program with type 1 diabetes at Adolphe Sicé General Hospital in Pointe-Noire. We included patients up to 25 years of age at the time of diagnosis and excluded all T1D patients with a diagnosis beyond 15 years of age.

Ethical Approval

This study adhered to the guidelines of the Declaration of Helsinki and received approval from the

Health Sciences Study Committee of Congo Brazzaville. Informed consent was obtained from all patients or their parents for minors.

RESULTS

Frequency, age, and sex

A total of 235 diabetic patients were enrolled, comprising 121 (51.48%) males and 114 (48.51%) females. The average age at the time of diagnosis was 16.29 ± 5.39 years, ranging from 1 to 19 years.

Distribution of patients by age group

Patients were categorized into age groups based on the age at the time of diagnosis, with the most represented group being 10-20 years.

Table 1: Distribution of patients by age group

Class	Group number of patient (n)	Percentage (%)
0-10 years	34	14,46
10-20 years	201	85,53
Total	235	100

Prevalence

The prevalence of childhood diabetes mellitus in Pointe-Noire was 0.20%, calculated based on a total population of 1,138,000 inhabitants in 2017.

Incidence

New cases of diabetes mellitus in children were reported and updated annually since 2010 through the LFAC program. A peak incidence was observed in 2021, with an incidence rate of 0.44%, reflecting an increase of 2 new cases per year.

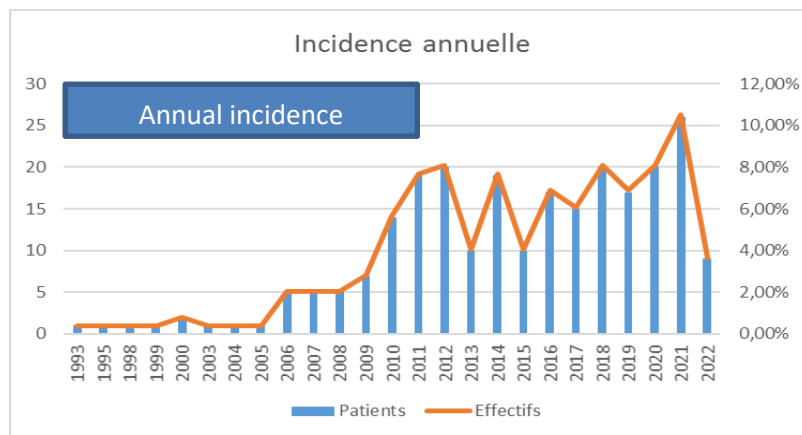


Figure 1: Incidence of Childhood Diabetes Mellitus

Typology of Diabetes

Based on clinical and epidemiological criteria obtained from patient records, we classified patients

into different types of diabetes. The majority of cases were T1D.

Table 2: Distribution of Patients by Different Types of Diabetes

Type of Diabetes	Number of Patients	Percentage
T1D	235	98,29
T2D	1	0,42
MODY	1	0,42
Secondary Diabetes	2	0,85

Causes of Hospitalization

We recorded various reasons for patient hospitalization based on hospitalization records from different departments. Diabetic ketoacidosis (DKA) was

the most common cause of hospitalization, accounting for 51.89% of cases. Factors contributing to DKA are listed in Table 3.

Table 3: Distribution of Patients by Cause of Hospitalization

Cause of hospitalisation	Number of Cases	Percentage
Discontinuation of treatment	20	25,31
Pregnancy	1	1,26
Malaria	8	10,12
Tuberculosis	4	5,06
Lipodystrophy	1	1,26
Diabetic Ketoacidosis	41	51,89
Pneumonia	1	1,26
Urinary Tract Infection	3	3,79

Patient Outcomes

Patient follow-up was categorized into regular, irregular, lost to follow-up, and deceased. The results

showed that 43.82% of patients were followed regularly, 21.70% were irregular, 14.46% were lost to follow-up, and 18.72% had passed away.

Table 4: Distribution of patients by outcomes

Outcome	Number of patients	Percentage
Irregular Follow-up	51	21.70
Lost to follow-up	34	14.46
Deceased	44	18.72
Transferred	3	1.22
Followed Regularly	103	43.82

Treatment

Treatment primarily involved insulin administration, tailored to the child's social context, along with a balanced diet appropriate for age and lifestyle. The insulin requirements ranged from 0.6 to 1.2 units/kg/day.

DISCUSSION

Adolescent diabetes mellitus is considered rare in sub-Saharan Africa [8], and our study results confirm this. The objective of our study was to determine the epidemiological and evolutionary aspects of diabetes mellitus in children in Pointe Noire. The average age at diagnosis was 16.29±5.39 years, with a range of 2 to 19 years. The average duration of living with diabetes was 3.57±4.31 years, ranging from 1 to 19 years. This age is consistent with findings from studies conducted in Cameroon by Tsague *et al.* [9], in Congo by Monabeka *et al.* [6], and in Ghana by Ameyaw *et al.* [10]. However, our results differ from those of Jasem *et al.* [11] in Tanzania and Graham *et al.* in Caucasian populations [5], which reported relatively younger average ages. This discrepancy is attributed to the fact that childhood diabetes mellitus is often misdiagnosed in Africa, leading to many cases going undiagnosed until patients succumb to the disease. Males were more predominant, accounting for 51.48% of cases, while females comprised 48.51%. Our data align with findings in the literature [9-11]. The most common age group at the time of diagnosis was 10-20 years, consistent with data from other studies [5, 10] and

corroborating Monabeka *et al.* [6] and Jasem *et al.* [11]. Diabetes mellitus in Africa is relatively rare in children aged 1-10 years. We calculated the incidence of childhood diabetes mellitus in our study population from the inception of the LFAC program in 2010 to the present. The incidence rate was 2.43/100,000 inhabitants per year, with a peak observed in 2021. This rate is contrary to the findings of Pambou *et al.* in Gabon in 2019, which reported an incidence of 3.4/100,000 inhabitants per year [12].

However, it is significantly higher than the rates observed in Tanzania and Ethiopia (1.5 and 2.1 per 100,000 inhabitants per year, respectively) [13, 14]. This difference may be attributed to the likelihood of many Congolese children dying during their first episode of ketoacidosis before receiving medical care, resulting in numerous undiagnosed cases that would otherwise contribute to a higher incidence rate. The prevalence of childhood diabetes mellitus determined in our study is relatively low due to limitations in our data source, which relied solely on hospital records. More comprehensive data collection methods, such as combining information from diabetes centers, pharmacy records, and family physicians, are essential for obtaining reliable prevalence data, as demonstrated by studies in Italy [15, 16]. We reported a prevalence of 0.20%, which is consistent with studies conducted in Dakar and Libreville, reporting prevalence rates of 0.24% and 0.25%, respectively [17, 18]. However, it is substantially lower than the prevalence rates observed

in Caucasian studies, including those in Finland, the USA, and India, which report much higher prevalence rates [2]. This disparity between African and European countries can be attributed to several factors, including improved diagnostic resources and the presence of effective childhood diabetes programs. In our study, we identified one case of MODY, two cases of secondary diabetes, and one case of type 2 diabetes, with the remainder being T1D.

T1D accounted for the majority of childhood diabetes cases, consistent with several studies in the literature [6, 8, 14, 15]. Diabetic ketoacidosis (DKA) emerged as the most common cause of hospitalization, accounting for 51.89% of cases. Our findings are in line with other studies in the literature [6, 8, 14, 15]. DKA is primarily attributed to limited access to insulin, delayed hospital admissions, and inadequate patient and parental education. Other factors contributing to DKA include treatment non-adherence, neglect, and denial of the disease, which led to treatment discontinuation in 25.31% of cases, despite insulin being provided free of charge through the LFAC program. Regarding patient outcomes, we observed that a significant proportion of patients (43.82%) were regularly followed up, while a substantial number were irregular (21.70%), lost to follow-up (14.46%), or had passed away (18.72%). The high mortality rate can be partially attributed to complications and the lack of adequate diagnostic resources for optimal patient care.

CONCLUSION

Childhood diabetes is a genuine concern in the Republic of Congo, as in most African countries. While the diagnosis is relatively straightforward when presented with symptoms such as polyuria, asthenia, and weight loss, the high number of patients diagnosed at advanced stages underscores the need to enhance diagnostic capabilities, especially in terms of biological resources, to improve patient management. Regular biological monitoring of our patients can significantly reduce mortality and prevent diabetes-related complications in children and adolescents.

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Conflicts of Interest: None.

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