

# Asthma in Children at the Pediatric Intensive Care Unit of University Hospital of Brazzaville (Congo)

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## Abstract

**Objectives:** To describe the epidemiological, clinical and therapeutic aspects of asthma in children at the Pediatric Intensive Care Unit of University Hospital of Brazzaville. **Patients and methods:** We reviewed the records of children hospitalized in the Pediatric Intensive Care Unit of University Hospital of Brazzaville from January 1 to December 31, 2015, and retained those from two months to 17 years hospitalized for asthma. The study variables were: age, sex, influence of seasons, history of atopy; the factors triggering the crisis, the type of follow-up, the degree of severity of asthma exacerbation, the type of treatment instituted and the course of the disease. In total, out of 2012 hospitalized children, 65 children met the inclusion criteria. **Results:** The hospital prevalence of asthma was 3.5%. Among 65 children of study, 42 (59.2%) were male and 29 (40.8%) female. The mean age was  $3.9 \pm 2.9$  years (range from 2 months to 14 years). Children aged 30 months to 5 years were the most represented (40%). They were known as asthmatics,  $n = 18$  (27.7%). Family atopy was found,  $n = 11$  (16.9%). Acute Otorhinolaryngologic infections were in all cases the factors triggering the crisis. The peak frequency of hospitalizations for asthma occurred during the short rainy season. The crisis was moderate  $n = 46$  (70%) and severe  $n = 19$  (29%). Beta 2 mimetics were administered in all cases, by subcutaneous in 18 cases (27.7%) and inhaled in 47 cases (72.3%). The outcome was favorable in all cases with a mean hospital stay of  $1.46 \pm 0.92$  days. **Conclusion:** Childhood asthma remains a public health challenge and severe asthma is the paradigm of uncontrolled and costly asthma.

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ma. This first work suggests that a large-scale study be carried out for a better knowledge of it.

## Keywords

Asthma, Children, Pediatric Intensive Care, CHU, Brazzaville

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## 1. Introduction

Asthma is the most common chronic respiratory disease in children [1]. This is a public health problem. It concerns about 235 million people worldwide [1] [2]. In France, its frequency is 10% [3], in Burkina Faso, 0.5% in pediatric hospitals [4]. In Congo, the hospital based frequency of asthma in adult patients service was 10.22% [5]. On the other hand, the pediatric frequency is not known. We have therefore undertaken this study with the aim of reporting the epidemiological, clinical and therapeutic aspects of asthma children at the Pediatric Intensive Care Unit of University Hospital of Brazzaville (Congo).

## 2. Patients and Methods

We carried out a retrospective and descriptive study in the pediatric intensive care unit of the University Hospital of Brazzaville, covering the period from January 1<sup>st</sup> to December 31<sup>st</sup>, 2015. We reviewed all medical records of children aged from 2 Months to 17 years, hospitalized during the study period and included those whose exit diagnosis included the asthma item. The diagnosis of Asthma was retained in children over three years of age presenting cough episodes with or without sputum, wheezing, expiratory dyspnea, wheezes, and a reversibility of signs spontaneously or due to the effect of bronchodilators.

In children under three years of age, this diagnosis was retained when they had at least two previous episodes of bronchiolitis. Children who had obstructive upper airway malformation and/or other chronic diseases such as kidney failure, heart disease, or malnutrition, were excluded.

The variables studied were age, gender, influence of seasons, existence of a history of atopy and asthma, factors triggering the asthma attack, type of follow-up, pre-hospital background therapy, existence of prodromes, degree of severity of asthma exacerbation, radiological imaging, established treatment, progression and duration of hospitalization. The exacerbation of asthma was defined by the persistence of the crisis beyond 24 hours. As before, this exacerbation was classified as a mild, moderate and severe crisis [6] [7].

### 2.1. Patients

During the study period, 2012 children were hospitalized in the service. Of these, 71 (3.5%) children as an exacerbated asthma attack, among which were 42/1089 (3.8%) of male and 29/923 (1.2%) of female. For this work, only 65 cases involv-

ing 42 male (59.2%) and 29 female (40.8%) were selected.

## 2.2. Statistical Analysis

The data were entered and analyzed using the Epi Info 3.5.3 software. The statistical tests used were the chi-square and the Students *t*-test. For all tests, the significance level was set at 5%.

## 3. Results

### 3.1. Sociodemographic Parameters

The 65 children selected for this study were aged of  $3.9 \pm 2.9$  years (range: two months and 14 years). In 30 (46.1%) cases, they were under 30 months of age; in 18 (27.7%) cases, between 31 and 71 months; and in 15 (23.1%), cases between 6 and 10 years. Only two children, 3.1% aged 11 and 12 years. They were 42 (59.2%) male and 29 (40.8%) female, a sex ratio of 1.45.

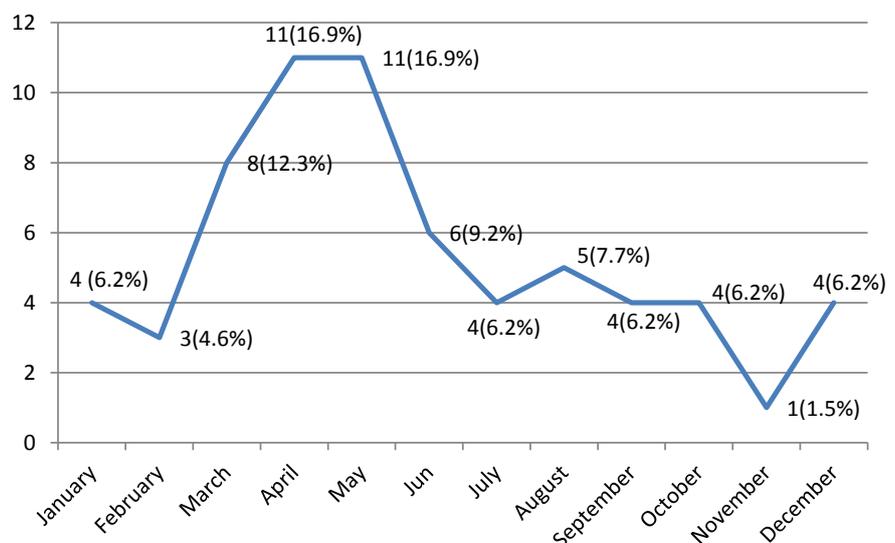
Compared to the general population of the service, the frequency was 3.9 for 1089 male and 3.1 for 923 female, a sex ratio of 1.18.

### 3.2. Influence of Seasons

Admissions for asthma occurred in 36 (55.38%) cases between March and June, while in other months, only an average of four children were admitted per month (**Figure 1**).

### 3.3. Antecedents

All 65 children were born at term. They had a history of bronchiolitis in 25 (38.5%) cases. They were known to have asthma in 18 (27.7%) cases, 8 (12.5%) of which were followed by a pediatrician. In follow up children, treatment consisted to the administration of beta 2 mimetics in spray as a background treat-



**Figure 1.** Distribution of patients by month of hospitalization.

ment. These patients were aged  $5.4 \pm 3.5$  years versus  $3.2 \pm 2.9$  years for those who did not know asthma ( $p = 0.006$ ). The history of familial atopy was found in 11 (16.9%) children, in all cases it was a history of asthma. No case of passive smoking was found.

### 3.4. Circumstances of Hospitalization

The triggers of the asthma attack were an otorhinolaryngologic infection in all cases.

Patients came directly from home ( $n = 50$ ; 79.4%) or referred by a secondary health center ( $n = 15$ ; 20.6%). The mean time between onset of symptoms and consultation was  $2.28 \pm 1.72$  days with extremes of 12 hours to 7 days. Dyspnea was the main reason for hospitalization in all cases.

### 3.5. Clinical Aspects

The functional and general signs are given in **Table 1**.

Signs of pulmonary auscultation, some associated in the same patient, were observed in the following proportions: wheezes alone 58 cases (89.2%), wheezes associated with ronchi 5 cases (7.7%), and with crackles 17 cases (26.1%). Seizures were considered moderate in 46 (70.8%) patients and severe in 19 (29.2%) patients.

### 3.6. Radiographic Aspects

The chest X-ray, performed in 45 patients (69.2%), was normal in 25 cases (55.6%), showed thoracic distension in 18 cases (40.0%), atelectasis and alveolar image in one case each (2.2%).

### 3.7. Treatment

The treatment consisted in all cases of administration of beta 2 mimetics, subcutaneously ( $n = 5$ ; 7.7%) or inhaled ( $n = 60$ ; 92.3%) by spray ( $n = 39$ ; 60%) or in nebulization ( $n = 21$ ; 32.30%). In combination with oxygen therapy in all cases, corticosteroids were administered in 52 (80.0%) cases, as slow intravenous methylprednisolone to 50 children (76.9%), and betametasone per os 2 (3.1%). Antibiotic therapy was administered in 16 (24.6%) cases. It was a beta-lactam in 5

**Table 1.** Functional and general signs.

	N	(%)
Asthenia	15	4.0
Fever	43	66.1
Cough	53	81.5
Rhinorrhoea	44	67.6
Expectoration	7	10.7
Sneeze	2	3.0
Difficulties feeding	17	26.1

(31.0%) cases, a macrolide in 1 (6.0%) case, and a combination of beta-lactam and macrolide in 10 (63.0%) cases. There was no significant difference between the type of antibiotic prescribed and the age groups ( $p = 0.64$ ).

### 3.8. Evolution

The outcome was favorable in all cases. The mean hospital stay was  $1.46 \pm 0.92$  days (range= 12 hours - 6 days). For severe seizures, and  $1.7 \pm 1.4$  days (range 1 - 6 days) for seizures: significant difference ( $p = 0.04$ ).

## 4. Discussion

### 4.1. Analysis of Methods

Asthma occurs in various forms: mild or intermittent asthma, moderate, and severe [8]. Some recommendations [9] classified the severity of asthma in terms of symptom intensity, level of obstruction, and variability in respiratory function in four categories: intermittent, moderate persistent, and severe. The intermittent forms, the most numerous, are followed in outpatient medicine. However, mild to moderate persistent types can be managed in general pediatric hospitalization. On the other hand, exacerbations of life-threatening asthma attacks should be treated in intensive care units. This means that the hospital frequency reported in this work (3.5% of intensive care hospitalizations) has a recruitment bias. In terms of diagnosis, only 67.7% of asthmatic children admitted to the pediatric intensive care unit had a chest radiograph. The realization of this examination, simple and inexpensive, should be systematic in the management [10]. In addition, none of our patients have received spirometry: this is a key diagnostic examination [1], whose contribution to follow-up is important [11].

### 4.2. Frequency

In a hospital and pediatric population, frequencies of 0.51% have been reported in Ouagadougou [4], 1% in Lomé [12], and 2% in Dakar [13]. In a hospital clinic for adults and children in Dakar [14], the frequency of asthma was 7.5%. In Congo, a hospital survey [5] assessed the frequency of asthma but recruited mainly adults. However, through the use of a simple and validated questionnaire, one survey [15] reported that 19.9% of Congolese aged 13 - 14 years had asthma. In France, three national surveys carried out in children [3] reported frequencies from 12.3% to 13.4%.

The mean age of onset reported in our work (3.5 years) is comparable to the French [16] and Malaysian [17] ones, with respectively  $3.9 \pm 3.3$  years and  $3 \pm 2.5$  years. Other African authors [4] [12] reported higher mean ages of 6.5 and 7 years, respectively. This difference could be explained by the size of our sample.

### 4.3. Circumstances of Occurrence

Our study covered only 12 months. It reported a higher frequency of admissions from March to June, a period corresponding to the small rainy season, whereas

this recrudescence was observed during the Great dry seasons in Togo [18]. In both cases, these are the seasons whose common denominator is the existence of dust. This is, with cold and respiratory infections [4] [5] [11] [18] [19] as a factor triggering asthma attacks. Indeed, asthma is a complex disease with multifactorial etiology, with atopy being the most frequently identified risk factor [4] [11] [16]. In children, 95% of cases originate from the hereditary allergic field, compared with 70% - 80% in adults [11]. The exact cause of asthma remains unknown, but might be the result of a complex interaction between environmental factors and various individual or genetic factors (predisposition or family history). Thus, according to Burrows *et al.* [20], the risk to the child of developing an allergic disease is all the greater as the number of individuals affected in the family is high.

#### 4.4. Clinical and Para-Clinical Aspects

The clinical expression of asthma attacks included, in our work, the usual signs reported elsewhere [3]; The majority of which were cough in 81.5%, rhinorrhea (67.6%), and wheezes (89.2%). This clinical expression and the evolution with regard to the therapeutic means implemented suggest that we have recruited many cases of severe acute asthma. However, some signs such as the fever observed in 43 patients (66.1%), the radiological images of atelectasis, and the use of antibiotic therapy in  $n = 16$  (24.6%) cases make it possible to discuss the possibility of bacterial pneumonia in children under five years of age [21].

#### 4.5. Therapeutic Aspects and Evolution

We used  $\beta$ -mimetics in 39 children (60%), as in the Burkinabe study of OUAADRAOGO *et al.* [4] (60%), and 82.8% for THIAM *et al.* [14]. It is now admitted [6] [22] [23], on the one hand that short-acting  $\beta$ -mimetics are first-line treatment irrespective of the age of the child or the level of severity of the crisis, and on the other that their preferred way of administration is the inhaled route. In line with current practice recommendations, we used this approach in 60 (92.3%). Children, the administration of corticosteroids was frequent in our experience: 52 cases, *i.e.* 80.0%. This was consistent with the degree of severity in that we used the parenteral way in 96.1%. Indeed, corticosteroids are indicated by oral inhalation [24] in the crisis and exacerbation of asthma. Having not demonstrated superiority to the oral way, the parenteral way should be reserved for children unable to ingest treatment or because of vomiting [22]. Glucocorticoid therapy should be administered in short courses because of the effects on growth. Indeed, the use of short courses of corticosteroids during seizures was recently re-evaluated [25] by three tests: measurement of markers of bone turnover, ACTH test, and bone densitometry. These tests are not significantly altered in children receiving an average of five courses a year.

The daily administration of inhaled corticosteroids, in combination with long-acting  $\beta$ -mimetics if necessary, is the background treatment of childhood asthma

to prevent exacerbations and achieve daily symptom control [26]. In monotherapy, it has been shown to be superior to other treatments such as anti-leukotrienes [27]. None of our patients used a background treatment, although eight of them were monitored. In this retrospective study, we were not able to classify the asthmatic disease according to the type of evolution.

## 5. Conclusion

The importance and frequency of asthma in the Pediatric Intensive Care Unit in Brazzaville require that preventive measures be implemented. These go through the education of patients and parents of the asthmatic child, the use of written instructions that proved beneficial, and compliance with the coding of its care.

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