



# COVID-19 in Children at the National Teaching Hospital of Cotonou: Epidemiology, Clinic, and Therapy

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## Abstract

**Objective:** The description of COVID-19 in children has evolved over time. We report here its epidemiological, clinical and evolutionary aspects in a hospital setting in sub-Saharan Africa.

**Methods:** The study was prospective cross sectional, from January 1 to June 30, 2021. It included all children from 1 month to 18 years of age, admitted to the pediatric emergency ward of the CNHU HKM of Cotonou, tested positive for SARS-CoV-2 by RT-PCR on nasopharyngeal swabs. At admission, screening of children was targeted, based on symptoms common in children with COVID-19 according to the literature.

**Results:** A total of 93 children were screened during the period, among which 18 were positive for SARS-CoV-2. The hospital frequency was 2% (18/895). The median age was 11 months. The most common symptoms were fever, cough, and shortness of breath. Half of the children had comorbidities, including heart disease, sickle cell disease, and nephrotic syndrome. The moderate form was the most frequent with pneumonia (10/18). The severe form was present in 2 children. Malaria was associated in 2 cases. The evolution was favorable in 17 children, after a mean hospitalization time of  $5.81 \pm 2.74$  days. One 4-month-old infant, with suspected multisystem inflammatory syndrome (MIS-C) died.

**Conclusion:** The evolution of COVID-19 in children is benign, but severe forms are possible. A systematic screening should be proposed to all febrile children admitted to the emergency room.

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## Introduction

As the SARS-CoV-2 pandemic has evolved, the description of the manifestations of the disease in children has increased. Published data indicate that children are less severely affected than adults, except for those under 1 month of age and those with comorbidities [1,2,3]. Asymptomatic infections represent 14.2% of cases in children. If symptoms are present, mild (36.3%) and moderate (46%) forms are the most frequent [4,5]. The main manifestations are cough, cold, fever, headache, diarrhea and/or vomiting [4,5]. Finally, severe forms are described in 2% of cases [1,4]. Biological abnormalities are variable, the most frequent being leukopenia or lymphopenia, elevated ferritin, procalcitonin, and C-Reactive Protein (CRP) [6]. Radiologically, ground glass opacities are described in 36% of cases [6]. Mortality in children is low, ranging from 0.2 to 0.3% [6,7]. Management varies according to the studies but essentially includes symptomatic treatment, antibiotic therapy and resuscitation measures [8]. In Benin, the management of children requiring hospitalization was initially centralized in a well-equipped hospital located 50 km from the capital. Gradually, referral hospitals have been equipped for case management. We report here the epidemiological, clinical, therapeutic and evolutionary aspects of Covid-19 in children screened and followed up at the CNHU of Cotonou.

## Methods

The study was a prospective cross-sectional from January 1 to June 30, 2021, in the pediatric emergency department of the National Teaching Hospital Hubert Koutoukou Maga of Cotonou (CNHU-HKM). It involved all children from 1 month to 18 years of age admitted to the unit and in whom SARS-CoV-2 infection was confirmed by the reference RT-PCR method on nasopharyngeal swabs. The samples were taken by the CNHU's team of trained technicians. Analysis of the samples was performed by the hospital's virology laboratory. On admission to the pediatric emergency room, screening of children was targeted, based on symptoms common in children with COVID-19 according to the literature [6,9]. The screening criteria were: cough, rhinorrhea, dysphagia, fever, vomiting, diarrhea, nonspecific skin rash, neurological disorders, agueusia, anosmia [6,9]. Screening was also done for any symptomatology that was poorly explained or had an unusual course, or when exist the notion of contact with a confirmed or suspected case. The search for other pathologies such as malaria was systematically performed in the presence of fever. In the absence of international consensus, and to limit the risk of transmission, chest X-ray and/or chest CT scan were performed in case of severe respiratory distress, low room air saturation ( $\text{SaO}_2 < 92\%$ ), or clinical worsening [10]. Suspect children and their mothers were isolated in a dedicated, equipped care area. Treatment of SARS-CoV-2 infection in children followed national recommendations [11]. Treatment included an antipyretic, hydroxychloroquine, azithromycin, zinc, vitamins C and D. The management of comorbidities and/or associated pathologies was adapted to each pathology. The RT-PCR was checked at the 7th and 9th day after the beginning of the treatment. These two negative controls are necessary to declare the patient cured. The variables collected were related to socio-demographic (age, sex, place of residence, child care, contact with a confirmed or suspected case), clinical (symptoms, onset time, status on admission, diagnosis, paraclinical parameters), therapeutic and evolutionary characteristics. The data were collected anonymously using a data entry form from the children's medical records. Data entry and analysis were performed with Epi-

data V.3.51 and SPSS V.21 software. All families was informed about the study, and had given their oral consent.

## Results

### Socio-demographic characteristics of children with COVID-19

During the period, 18 children were confirmed positive for SARS-CoV-2, out of 93 screened. This represents a screening rate of 19.3%. As a proportion of total admissions during the period, the hospital frequency was 2% (18/895). The median age was 11 months, interquartile range [4-66] months. The minimum age was 1 month and the maximum was 288 months. The sex ratio was 1. The majority of children were cared for at home ( $n=10$ ), seven were in school/university, and one was in a nursery. In six cases, a family contact was found: mother ( $n=2$ ); father and mother ( $n=2$ ); father, mother and all siblings ( $n=2$ ).

### Clinical characteristics of children with COVID-19

The most common symptoms at admission of children were fever, cough, shortness of breath, and vomiting. Table 1 summarizes these symptoms. Half of the children ( $n=10$ ) had a specific history. These were heart disease ( $n=2$ ), homozygous sickle cell disease SS ( $n=3$ ), heterozygous sickle cell disease SC ( $n=1$ ), nephrotic syndrome ( $n=1$ ), history of prematurity ( $n=2$ ), Down syndrome with duodenal stenosis operated in the neonatal period ( $n=1$ ). The cardiopathies presented by the two children were a transposition of the great vessels (TGV) with large atrial septal defect and ventricular septal defect, and a tetralogy of Fallot. The signs found on physical examination in the children are grouped in Table 2. Lower respiratory diseases were the most frequent with pneumonia ( $n=8$ ), bronchiolitis ( $n=5$ ). Associated pathologies were: severe malaria with poorly tolerated anemia ( $n=2$ ), vaso-occlusive crisis ( $n=3$ ). Moderate forms were the most frequent ( $n=10$ ). Severe forms were found in two patients: the one with TGV, and one with severe sepsis.

### Paraclinical characteristics of children with COVID-19

The main abnormality of the red blood cell line was a hypochromic microcytic anemia ( $N=9$ ). In the white blood cell line, hyperleukocytosis ( $n=7$ ), leukopenia ( $n=1$ ), neutrophilic polynucleosis ( $n=6$ ), neutropenia ( $n=2$ ), lymphocytosis ( $n=1$ ), lymphopenia ( $n=8$ ) were found. CRP was positive in three cases. Chest radiography was performed in 10 children. Unilateral diffuse alveolar opacities were present on chest radiography in 2 children. Chest CT scan was done in one child and revealed non specific images of pneumonia.

### Treatment and evolution of children with COVID-19

Associated pathologies were treated appropriately. The management of SARS-CoV-2 infection was in accordance with national recommendations [11]. Children with heart disease did not receive chloroquine. Table 3 summarizes the treatments administered. Thermal defervescence was achieved on average after  $2.62 \pm 1.41$  days. Digestive disorders had regressed on average after  $2.60 \pm 1.14$  days. Respiratory distress improved on average after  $9.22 \pm 8.9$  days. The shortest time was 2 days and the longest time was 29 days. The mean time to hospitalization was  $5.8 \pm 2.74$  days. The shortest duration was 24 h and the longest duration was 12 days. The outcome was favorable in 17 children. A 4-month-old infant, born at 35 weeks of amenorrhea, died on the 6th day of hospitalization in a clinical context suggestive of multisystem inflammatory syndrome (MIS-C). He presented a fever  $> 39^\circ\text{C}$ , a dry cough, severe respiratory dis-

tress with progressively worsening respiratory failure, and obtundation. Biologically, he had a CRP = 276 mg/l, neutrophilia, lymphopenia, normal blood ionogram and renal balance. Three blood cultures were negative, malaria thick drop was negative, the cardiac echodoppler was normal, the chest X-ray was normal. Tests for tuberculosis and Human Immunodeficiency Virus (HIV) infection were negative. A chest CT scan could not be performed. He benefit on invasive mechanical ventilation.

**Figure 1:** Symptoms present at admission in the 18 children with COVID 19 in the pediatric emergency room of CNHU from January 1 to June 2021.

Symptoms	Number
Fever	14
Cough	9
Shortness of breath	6
Vomiting	6
Diarrhea	2
Seizures	2
Asthenia	1
Headache	1
Arthralgia	1
Rhinorrhea	1

**Figure 2:** Classification and physical signs of 18 children with COVID 19 in pediatric emergency room of CNHU from January 1 to June 30, 2021.

Physicals signs	Number
Fever	17
Tachycardia	8
Heart murmur	2
Schock*	1
Polypnea	4
Respiratory struggle signs	9
Pulmonary rales	
Ronchis	1
Crépitants	7
wheezing	2
Palor	
Moderate	8
Severe	2
Maculo-papular rash	1
Joint pain	3
Classification	
Asymptomatique	0
Mild	6
Moderate	10
Severe	2

\*Patient with *Plamodium falciparum*.

**Figure 3:** Treatments administered to the 18 children with COVID 19 in the pediatric emergency room of the CNHU from January 1 to June 30, 2021.

Therapeutics	Number
Symptomatic treatments	
Antipyretic	17
Antiemetic	3
Anticonvulsivant	2
Oxygen therapy	5
SARS-CoV-2 specific treatment	
Azithromycin	18
Chloroquine	16
Zinc	18
Vitamin C et D	18
Other treatment	
Injectable Artesunate	2
Antibiotics *	10
Red blood cells transfusion	2

\* Third generation cephalosporin, amoxicillin.

### Discussion

This descriptive study confirms the generally favorable evolution of Covid 19 disease in children [9]. The median age of 11 months found in this study is close to the median age of 13.5 months reported in Cape Town, South Africa, by van der Zalm et al in their series of hospitalized children [12]. In Morocco, on the other hand, the patients were adolescents with a median age of 13 years [13]. It is difficult to state with certainty the mode of contamination of the children in this study. However, given their median age, intrafamilial transmission seems likely, even if it could only be verified in one third of the cases. Moderate forms were the most frequent (10/18), with mainly lower respiratory involvement. In Conakry, Camara et al. reported 50% asymptomatic cases in their series [14]. In Morocco, Cheiklabi et al. Reported 34% of asymptomatic children [13]. The fact that this was a hospital-based study with targeted screening explains the absence of asymptomatic infection. In half of the cases, the children in our study had a comorbidity, which may have contributed to the preponderance of moderate forms. Indeed, their presence and the mean age under 10 years would increase the risk of severe form and mortality in COVID-19 [15,16]. Microcytic anemia was found in half of the children in this study. It is probably related to a frequent martial deficiency in sub-Saharan Africa rather than to SARS-CoV-2 infection [17]. The white blood cell abnormalities are similar to those reported [6]. No specific images, including "ground glass" images, were found in this study in children who received imaging. Some lesions may have gone unnoticed because not all children had imaging. The overall outcome was favorable. MIS-C was suspected in the deceased 4-month-old infant. He had many of the criteria used by various scientific societies [18]. But the screening for another virus were not performed.

### Conclusion

The SARS-CoV-2 pandemics affects all age groups. The existence of asymptomatic forms could lead to the discussion of systematic screening of all children admitted to the emergency department as long as the pandemic persists.

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