

# Impact of the Covid-19 Pandemic on Severe Childhood Malaria at the University Hospital of Brazzaville

Moyen Engoba<sup>1,2\*</sup>, Arquevia Nature Ofamalekou Gnakingue<sup>1</sup>, Ben Borgea Nianga<sup>3</sup>, Carel Ervane Goma<sup>1</sup>, Armel Landry Batchi-Bouyou<sup>1</sup>, Annie Rachel Okoko<sup>1,2</sup>, Georges Marius Moyen<sup>1,2</sup>

<sup>1</sup>Faculty of Health Sciences, Marien Ngouabi University, Brazzaville, Congo

<sup>2</sup>Pediatric Intensive Care Service, University Hospital of Brazzaville, Brazzaville, Congo

<sup>3</sup>Program and Project Coordination Unit, Ministry of Health and Population, Brazzaville, Congo

Email: \*engoba\_m@yahoo.fr

**How to cite this paper:** Engoba, M., Gnakingue, A.N.O., Nianga, B.B., Goma, C.E., Batchi-Bouyou, A.L., Okoko, A.R. and Moyen, G.M. (2021) Impact of the Covid-19 Pandemic on Severe Childhood Malaria at the University Hospital of Brazzaville. *Open Journal of Pediatrics*, 11, 301-312.

<https://doi.org/10.4236/ojped.2021.112028>

**Received:** April 28, 2021

**Accepted:** June 21, 2021

**Published:** June 24, 2021

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## Abstract

**Introduction:** Malaria management has been a source of concern for health systems since the advent of the Covid-19 pandemic. **Objective:** To assess the impact of the Covid-19 pandemic on severe childhood malaria in Brazzaville. **Material and Method:** A quasi-experimental intervention/non-intervention study was carried out between March and October 2020 in the pediatric departments of the Brazzaville University Hospital. Children aged three months to 15 years hospitalized were the target population. Two groups were formed: the “intervention” group, that of children hospitalized between March and October 2020 and the “control” group that of those hospitalized between January and August 2015. The study variables were epidemiological, clinical, biological and therapeutic. Chi-square and T-Student tests were used. The impact of the intervention was assessed by the absolute risk difference. **Results:** Of 1392 children hospitalized, 199 (14.6%) had severe malaria with an average age of 6.94 years. These were children under 5 years old n = 95 (47.7%) of low socioeconomic level n = 145 (72.9%) seen on average after 4.6 +/- 2.4 days. Repeated convulsions (56.8%) and anemia (20.1%) were the main reasons for hospitalization. These were isolated forms (n = 146; 73.4%) of which n = 84 (42.2%) neurological and n = 62 (31.2%) anemic. The lethality was 13.1%. Delayed consultation, fever, repeated convulsions, pallor, respiratory distress, sickle cell anemia, thrombocytopenia and hypoglycemia are associated with death. The risk difference for signs of severity between the two periods was 16.6 for repeated convulsions; 14.3 for severe anemia. The relative risk between the two studies was 1.8. **Conclusion:** The increase in

morbidity and mortality in severe malaria since the beginning of the Covid-19 pandemic encourages the maintenance of the balance between the management of the Covid-19 pandemic and that of other worrying health problems.

## Keywords

Impact, Covid-19, Severe Malaria, Children, Brazzaville

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## 1. Introduction

Malaria, a major public health problem [1], is an endemic for which many resolutions have been taken: that of Abuja: “to roll back malaria” [2], the United Nations Millennium Declaration (UN): building together a more secure, prosperous and equitable world [3], the Millennium Development Goals (MDGs) [3] and the Sustainable Development Goals for the eradication of malaria in many countries by 2030. In 2019, 229 million cases of malaria were recorded worldwide, including 213 million in Africa. There were 409,000 deaths and, children under five were the most affected [4]. The severe forms are the fifth leading cause of death from infectious diseases in the world and second in Africa [5]. The high prevalence and relative mortality are variable: 18% - 67.8% in the Democratic Republic of Congo (DRC) [6], 21.7% in Senegal [7], 55.8% in Mali [8] and 53 % in Niger [9] with respectively 4%, 24%, 10%, and 3.6% of deaths.

In Congo, the prevalence of severe forms of malaria was 11.2% in 2016 and mortality 6.5% [10]. While African populations continue to pay the heavy price for severe malaria [5], the Covid-19 pandemic risks are hampering the efforts of health systems around the world [11]. Our study aimed to assess the impact of the covid-19 pandemic on severe childhood malaria at the University Hospital of Brazzaville and the objectives: determine the frequency of severe malaria; describe the clinical, para-clinical, therapeutic and evolutionary aspects; identify the factors associated with the death of a child hospitalized for severe malaria during the Covid-19 pandemic period and report the indicators of its impact on severe childhood malaria in Brazzaville.

## 2. Materials and Methods

We carried out a quasi-experimental intervention/non-intervention study between March and October 2020, *i.e.* in eight months. Three of the four pediatric departments of the University Hospital of Brazzaville: grandchildren pediatrics, infant pediatrics and that of Pediatric Intensive Care (ICU) formed the framework of the study. The target population, made up of children aged three months to 15 years hospitalized in the aforementioned services was divided into two groups: group 1 or “intervention”, that of children hospitalized between March and October 2020 and group 2 or “control”. That of children hospitalized be-

tween January and August 2015, eight months [10].

Children aged three months to 15 years hospitalized in the aforementioned services whose discharge diagnosis included, among other things, the item “severe malaria” [12] were included. Severe malaria was defined by the World Health Organization criteria [13]. This was a simple and consecutive probability sampling taking into account medical records and service registers. The sample size of group 2 “control” was that of the study carried out in the same wards in children admitted for “severe malaria” [10]. That of group 1 “intervention” was calculated from the SCHWARTZ formula. The minimum sample size was set at 153 patients.

The sample size of group 1 “control” corresponded to that of the study carried out in the same services by Okoko [10], on “severe malaria” in children at the Brazzaville University Hospital: 382 patients. For group 2 “intervention” the sample size was calculated from the formula of Daniel Schwartz taking into account a previous study by Okoko [10].

$$N = P(1 - P) \cdot (Z\alpha)^2 / d^2$$

P: Expected proportion of subjects presenting the studied variable (severe malaria in our case);

Z $\alpha$ : Standardized significance level = 1.96;

d<sup>2</sup>: Imprecision deviation = 0.05.

Severe malaria represented 11.2% of all children hospitalized during this study period. Thus,  $N = 0.112(1 - 0.112)(1.96)^2 / (0.05)^2 = 152.83$   $N \approx 153$  is the minimum size of the sample allowing a statistical analysis.

The study variables were twofold. Those relating to the child: the mode and reason for admission, the consultation time, the antecedents, the functional and examination signs, the thick gout hematozoic smear, the rapid diagnostic test (RDT), the Complete blood count (CBC), blood sugar, creatinemia, diagnosis, treatment and pattern. Those relating to parents: age, sex, marital status, socio-economic and cultural level and occupation.

The data were collected using a pre-established survey form developed and completed for this purpose. The antimalarials used were: artesunate 2.4 mg/kg for a weight greater than 20 kg and 3 mg/kg when it was less than 20 kg intravenous (IV) or intramuscular (IM) at H0, H12, H24 then a taken per 24 hours from day 2 to day 5; quinine base 20 mg/kg as a loading dose, then 10 mg/kg every eight hours. A relay by the oral route was authorized when the clinical state was considered stable. In this case, the artemether-lumefantrine combination was used after at least three days of parenteral treatment. The maximum duration of treatment was seven days. The other therapeutic means consisted of administration of 10% hypertonic glucose serum 50 mL/kg, diazepam 0.5 mg/kg intra-rectally, phenobarbital 10 to 15 mg/kg IV, hypertonic glucose serum 50% 1 mL/kg, the erythrocyte pellet using Molison’s formula (amount = 3 × weight [desired Hb-diseased Hb]) and furosemide 1 - 2 mg/kg.

In all cases, the criteria for cure were the achievement of apyrexia and the

denial of thick gout. The other criteria, depending on the clinical form were the recovery of consciousness, the re-coloring of the mucous membranes, the integuments and the appearance of the urine, the resumption of food and walking, a hemoglobin level within the limits of normal and normalization of renal function.

## 2.1. Data Analysis

The software Epi info version 7.2 and Stata 13 were used for data processing. Chi-square and T-Student tests for the comparison of proportions and means. The significance level was set  $p$  less than or equal to 5% and the confidence interval at 95%. The impact of the intervention was assessed by the absolute risk difference (DR).

## 2.2. Ethical Considerations

To carry out this work, approval from the Scientific Research Ethics Committee (CERSSA) in Congo as well as a research authorization issued by the Faculty of Health Sciences of Marien Ngouabi University were obtained.

## 3. Results

### 3.1. Descriptive Study

#### 3.1.1. Frequency and Socio-Demographic Characteristics of the Study Population

Out of 1392 children hospitalized in the pediatric departments of the University Hospital of Brazzaville, 199 (14.3%) were hospitalized for severe malaria, of which 64.3% ( $n = 128$ ) in pediatric intensive care, 14.6% ( $n = 29$ ) in infant pediatrics and 21.1% ( $n = 42$ ) in older children pediatrics. These were 110 boys (55.3%) and 89 girls (44.7%): sex ratio 1.2. The average age was  $6.94 \pm 4.81$  years, extremes (3 months and 15 years): **Table 1**. They resided in Brazzaville  $n = 192$  (96.5%) and in another locality of Congo  $n = 7$  (3.5%). They came from home without prior recourse to a health center  $n = 107$  (53.8%); referred from a basic hospital  $n = 58$  (31.1%), an integrated health center  $n = 11$  (5.5%) and a doctor's office  $n = 19$  (9.6%).

**Table 1.** Distribution of children by age group and sex.

Age (years)	Sex				Total	
	Male		Female		n	%
	n	%	n	%		
0 - 5	48	43.6	47	52.8	95	47.7
6 - 11	34	30.9	26	29.2	60	30.2
12 - 15	28	25.5	16	18.0	44	22.1
	110	100	89	100	199	100

The parents were between 17 and 20 years old  $n = 17$  (8.5%) for the mothers and none for the fathers, 20 and 29 years old  $n = 50$  (25.1%) for the mothers versus 38 (19.7%) for fathers, 30 and 39 years old  $n = 81$  (40.7%) for mothers versus 82 (41.2%) for fathers and over 40 years  $n = 53$  (26.6%) for mothers versus  $n = 79$  (39.7%). They had an average age of  $31.14 \pm 7.91$  years extreme (17 and 53 years) for the mothers versus  $37.38 \pm 8.22$  years, extreme (20 and 63 years) for the fathers. The level of education was that of primary  $n = 34$  (17.15%) for mothers versus  $n = 40$  (20.1%) for fathers, secondary  $n = 145$  (72.9%) for mothers versus  $n = 98$  (49.3%) for fathers, academic  $n = 19$  (9.5%) for mothers versus  $n = 54$  (27.1%). Seven (3.5%) fathers and one mother were not in school.

The parents were without profession 75 (37.7%) mothers versus 21 (10.5%) fathers. They worked in the informal sector 65 (32.7%) mothers versus 42 (21.1%) fathers. They were manual workers 44 (22.1%) mothers versus 100 (50.3%) fathers and executives 15 (7.5%) mothers versus 36 (18.1%) fathers. The socio-economic level was low  $n = 145$  (72.86%), medium  $n = 49$  (24.6%) and high  $n = 5$  (2.5%). They lived as a couple  $n = 145$  (73.9%) and were separated  $n = 52$  (26.1%).

### 3.1.2. Clinical Aspects

The mean time to consultation was  $4.6 \pm 2.4$  extreme days (one and 25 days). It was less than two days  $n = 9$  (4.5%); between two and five days  $n = 128$  (64.3%); greater than five days  $n = 62$  (31.2%). Before hospitalization, antimalarial treatment was administered  $n = 121$  (60.8%) including: quinine  $n = 33$  (27.3%), artemisinin  $n = 69$  (57.0%) and artesunate  $n = 19$  (15.7%). Medicines were obtained over the counter  $n = 66$  (33.2%), on prescription from paramedical staff  $n = 27$  (13.6%), from a general practitioner  $n = 58$  (29.1%) and from a pediatrician  $n = 6$  (3.0%).

The symptoms that formed the reason for consultation, associated or not in the same patient were: a repeated convulsion  $n = 113$  (56.8%), anemia  $n = 40$  (20.1%), a fever  $n = 36$  (18.1%) and disturbance of consciousness  $n = 52$  (26%) and coma  $n = 14$  (7.0%).

The examination signs were: fever  $n = 151$  (76%), pallor  $n = 160$  (80.4%), coma  $n = 85$  (42.7%); agitation (disturbance of consciousness)  $n = 12$  (6.0%), splenomegaly  $n = 58$  (28.1%), hepatomegaly  $n = 5$  (2.5%), respiratory distress  $n = 5$  (2.5%).

Nineteen children (9.5%) were dehydrated and 29 (14.6%) presented a nutritional disorder made up of moderate undernutrition  $n = 24$  (12.1%) and overweight  $n = 5$  (2.5%).

### 3.1.3. Biological Parameters

The parasite density was on average  $10,947.64 \pm 2057.44$  extreme parasites/ $\mu\text{L}$  (36 and 19,000 P/ $\mu\text{L}$  of blood) and less than 100,000 in all cases. The mean hemoglobin level was  $5.2 \pm 3.0$  g/dl, range (2.3 and 7.5); platelets less than

100,000/mm<sup>3</sup> in 62 (31.2%) cases with a mean of extreme 185,407.15 ± 2.96/mm<sup>3</sup> (88,000 and 826,000/mm<sup>3</sup>). The mean blood sugar level was 0.84 ± 0.3 g/l extremes (0.32 and 1.20 g/l) and less than 0.4 g/l in 17 (8.5%) cases. The mean serum creatinine level was extreme 12.27 ± 6.3 µmol/l (0.72 and 15.38 µmol/l) and elevated in 4 children (2.7%).

#### 3.1.4. Clinical Forms

It was an isolated form 146 (73.4%) of which 84 (42.2%) neurological form and 62 (31.2%) anemic. There were 53 (26.6%) cases of associated forms. The associations were: anemic and neurologic 28 (14.1%) cases; anemic, neurological and hypoglycemia 8 (4.0%) cases, anemic, neurological and jaundice 8 (4.0%) cases; neurological anemia, hypoglycemia and jaundice 5 (2.5%) cases; anemic, neurological, hypoglycemia, jaundice and renal failure 4 (2.0%) cases.

Severe malaria was associated with pneumonia n = 11 (5.5%), tuberculosis n = 5 (2.5%), HIV infection n = 4 (2.0%) and meningitis n = 2 (1.0%). This was a child living with sickle cell disease n = 13 (6.5%).

### 3.2. Treatment

Specific treatment consisted of the administration of artesunate n = 193 (97.0%) and quinine n = 6 (3.0%). The other drugs administered were: an anticonvulsant including diazepam n = 104 (52.3%) and phenobarbital n = 93 (46.7%); erythrocyte pellet n = 140 (94.6%), fresh frozen plasma and whole blood n = 4 (2.7%) cases each.

#### 3.2.1. Evolution

The outcome was favorable: 167 (83.9%) cases, and one death noted in 26 (13.1%) cases, involving children aged 0 to 5 14 (14.7%) cases, aged 6 and 11 5 (8.3%) cases and from 12 to 15 years 7 (16.0%) cases. They were divided into 15 (57.7%) boys and 11 (42.3%) girls.

The mean length of hospital stay was 2 ± 1.5 extreme days (1 and 7 days) in the fatalities and 3 ± 3.5 extreme days (1 and 4 days) in the living.

#### 3.2.2. Analytical Study

The delay in the consultation, beyond two days; the reason for consultation is anemia; repeated convulsions, examination signs including pallor, fever, respiratory distress; association with sickle cell anemia, sickle cell anemia; thrombocytopenia, hypoglycemia and length of hospital stay predicted death (**Table 2**).

#### 3.2.3. Comparative Analysis

The comparative elements between the control study and the control study on the elements of severity of severe malaria according to WHO are given in **Table 3** and **Table 4**. Morbidity from severe malaria increased from 11.2% with a mortality of 6.2% in the control study in 2016 and in our study these figures are clearly increasing with a morbidity of 14.3% and a mortality of 13.1%.

**Table 2.** Predictors of death.

Time (days)	Total n	Death				Chi-2	OR (IC à 95%)	p-value
		Yes		No				
		n	%	n	%			
<b>Time to consultation</b>								
<2	9	2	7.6	7	4.1	0.6	1.9 [0.3 - 10.1]	0.4
2 - 5	128	10	38.46	118	68.21	5.7	3.4 [1.4 - 8.0]	0.003
>5	62	14	53.8	48	27.8	60.9	3.0 [1.3 - 7.0]	0.007
<b>Reason for consultation</b>								
Repeated convulsions	113	5	19.2	108	47.2	7.3	3.7 [1.3 - 10.2]	0.006
Anemia	40	11	42.3	29	12.6	11.5	5.0 [2.1 - 12.0]	0.0008
Fever	36	7	26.9	29	12.6	3.9	2.5 [0.9 - 6.7]	0.05
Conscience disorder	52	2	7.7	50	21.8	2.8	3.3 [0.7 - 14.6]	0.08
Coma	14	1	3.85	13	5.7	0.2	1.5 [0.1 - 11.9]	0.6
<b>Clinical symptoms</b>								
Fever	151	15	57.7	136	30.2	6.5	3.1 [1.4 - 7.0]	0.003
Pallor	160	4	15.4	12	2.7	12.2	6.6 [1.9 - 22.2]	0.004
Splenomegaly	58	1	3.9	7	1.6	0.7	2.5 [0.2 - 21.3]	0.3
Coma	85	2	7.7	83	18.4	1.9	2.7 [0.6 - 11.7]	0.16
Hepatomegaly	5	1	3.85	4	0.9	2.0	4.4 [0.4 - 41.3]	0.15
Trouble de la conscience	12	1	3.85	11	2.44	0.19	1.5 [0.1 - 12.8]	0.65
Respiratory distress	5	2	7.7	3	1.7	11.6	12.4 [1.9 - 77.8]	0.0006
<b>Associated pathologies</b>								
Pneumonia	11	1	3.9	10	5.6	0.16	1.5 [0.1 - 12.5]	0.6
Tuberculosis	5	0	0	5	2.9	-	-	-
infection à VIH	4	1	3.9	3	1.7	2.2	0.5 [0.2 - 22.6]	0.4
Meningitis	2	1	3.9	1	0.6	2.4	0.1 [0.4 - 11.0]	0.11
Sickle cell disease	13	6	24.0	7	4.1	14.1	7.4 [2.2 - 24.5]	0.0001
<b>Duration of hospitalization</b>								
1 - 3	122	24	92.3	98	56.6	12.1	1	0.0004
>3	77	2	7.7	75	43.4		9.1 [2.1 - 40.0]	
<b>Thrombopenia</b>								
<100,000	62	12	46.1	50	28.9	3.1	2.1 [0.9 - 4.8]	0.07
>100,000	137	14	53.9	123	71.1		1	
<b>Hypoglycemia</b>								
<4 mg/l	17	6	23.1	11	6.4	8.0	4.4 [1.4 - 13.2]	0.004
>4 mg/l	182	20	76.9	162	93.6		1	

**Table 3.** Comparative elements of the severity criteria of the control study versus our study.

	Source							
	Our study		Death		Okoko study		Death	
	Total	Frequency	n	%	Total	Frequency	n	%
Study framework	Brazzaville-Congo				Brazzaville-Congo			
Type of study	Descriptive quasi-experimental				Prospective study			
Study period	March-October 2020				January-august 2015			
Total	199	14.3			382	6.2		
Children < 5 years (%)	95	47.7			174	45.5		
Severity criteria								
<b>Neurological</b>	118	59.3			229	18.3	14	11.9
Conscience disorder	52	1.50	-	-	59	15.4	5	7.8
Repeated convulsions	113	54.2	5	19.2	104	27.2	14	11.9
Prostration	-	-	-	-	66	17,2	0	
Coma	85	3.5	3	11.6	70	18.3	-	-
<b>Anemia</b>	40	14.6	11	42.3	223	61.5	12	5.1
<b>Respiratory distress</b>	3	-	2	-	33	8.6	13	28.3
<b>Jaundice</b>	-	-	-	-	18	4.7	3	14.3
<b>Hemoglobinuria</b>	-	-	-	-	64	17.5	3	4.5
<b>Hypoglycemia</b>	17	8.5	6	23.1	19	4.9	8	29.6
<b>Renal failure</b>	3	1.5	1	3.8	7	1.8	1	12.5
<b>Dehydration</b>	19	9.5	0	-	17	4.4	-	-

**Table 4.** Comparative study of the difference in risk of signs of severity.

Signs	Group 1 Intervention	Group 2 Control	Risk difference in absolute value
	OR IC (95%)	OR IC (95%)	
Repeated convulsions	3.7 [1.3 - 10.2]	3.1 [1.4 - 7]	0.1
Dehydration	-	2.7 [0.6 - 11]	-
Fever	2.5 [0.9 - 6.7]	0.9 [0.3 - 3.1]	1.7
Coma	2.7 [0.6 - 11.7]	13 [5 - 33.7]	0.8
Splenomegaly	2.5 [0.2 - 21.3]	1 [0.4 - 2.6]	1.5
Severe anemia	5.0 [2.1 - 12.0]	0.6 [0.2 - 2.1]	7.3
Jaundice	-	2.6 [0.7 - 9.4]	-
Hypoglycemia	4.4 [1.4 - 13.2]	8.4 [3.2 - 21.8]	0.5
Renal failure	2.2 [0.2 - 22.6]	2.1 [0.2 - 17.6]	0.04



### 3.2.4. Difference in Risk of Signs of Severity between the Two Groups

The risk difference is 0.1 for seizures; 1.7 for fever; 0.8 for coma; 1.5 for splenomegaly; 7.3 for anemia; 0.5 for hypoglycemia and 0.04 for renal failure. It follows that the percentage of subjects to be treated to prevent death from severe malaria during a Covid-19 pandemic is 100% for coma, convulsions and hypoglycemia; 66.6% for splenomegaly; 58.8% for fever and 13.7% for anemia.

Children under 15 have a relative risk of death from severe malaria 1.8 times higher during Covid-19 compared to those in the control study.

## 4. Discussion

As Covid-19 continues to occupy the political health agenda in many countries around the world, so does its impact on certain diseases which is becoming apparent. Malaria is one of them. The general objective of this study was: to assess the impact of the Covid-19 pandemic on severe childhood malaria in Brazzaville and specifically: to determine its frequency, to describe the nosological varieties, to assess the evolutionary profile, to identify the factors associated with deaths during the period of the Covid-19 pandemic and report the indicators of the impact of the Covid-19 pandemic on severe malaria in children hospitalized at the Brazzaville CHU by referring to a previous study [10] of which the methodology was identical to ours. The high mortality, attributable to severe malaria despite the efforts made for its reduction by the international community guided our choice, which was reinforced by the cry of alarm from the WHO which feared that the Covid-19 pandemic would be wiped out. The benefits obtained over the last twenty years by the health systems of the various countries [11]. To achieve our objectives, a cross-sectional study carried out in the largest hospital in Brazzaville seemed to us the ideal setting. However, the conduct of the study was a source of bias, including those relating to its implementation during the period of the health emergency coupled with the confinement of the population. This study presents in its implementation some limitations, relating to its duration, namely eight months, its implementation during a period of confinement, state of health emergency, source of recruitment bias.

### 4.1. Epidemiological Aspects

This work confirms the severity of severe malaria, the role of which in child mortality in developing countries is well known [14] [15] [16]. In the Congo, the relative mortality, which has fallen sharply, from 26.3% in 2010 [17] to 6.5% in 2016 [10], has increased: 13.2%. Children of average age: 6.9 years old, more under the age of five (47.7%) are, as everywhere in Africa, the most affected [6] [18] [19]. A common denominator of deaths related to severe malaria is delayed consultation [15] [16] [18], which is correlated with risk of death [10] [17]. Lack of awareness of signs of seriousness, inadequate management of simple forms, the low socio-cultural and economic level of the populations are associated with the delay in consultation and the constraints linked to the Covid-19 pandemic.

## 4.2. Clinical and Therapeutic Aspects

Clinically, the most commonly observed severity criteria known [10] [15] [16] [20] [21] are anemia, convulsions, coma, thrombocytopenia and hypoglycemia. As already reported, the neurological and anemic forms are predominant [6] [10] [22] [23] [24]. And that the association of severe malaria with sickle cell disease increases the risk of death.

## 4.3. Evolution and Risk Factors for Death

The progression to death observed in 13.1% of the children in this study and 6.5% in the control study [10] is in both cases more attributable to anemic and neurological forms but also to hypoglycemia and at thrombocytopenia. The predictive factors of death, which vary from one study to another, are: delayed consultation, fever, repeated convulsions, pallor, respiratory distress, sickle cell anemia, thrombocytopenia and hypoglycemia.

## 4.4. Influence of the Covid-19 Period on the Management of Severe Malaria

In March 2020, WHO underlined the value of maintaining activities for the prevention, diagnosis and treatment of malaria, key to the strategy to reduce the pressure on health systems when an additional burden is expected due to the Covid-19. These forecasts related to the disruptions observed in the supply chain of essential tools for the fight against malaria due to containment measures and the priority given to imports and exports of materials intended for the fight against Covid-19. In the context of a deficit of activities related to the fight against malaria, WHO estimated that “the number of deaths due to malaria in sub-Saharan Africa in 2020 would reach 769,000, a number twice as high as in 2018. This which would represent a return to the level of mortality observed for the last time in 2000” [25]. This is the case for our study, which reports severe malaria morbidity of 14.6% and mortality of 13.1% versus 11.6% morbidity and 6.5% mortality for the control study and a risk relative death rate 1.8 times higher during the period of the Covid-19 pandemic, thus confirming the WHO forecasts [26].

## 5. Conclusion

The morbidity and mortality linked to severe childhood malaria have doubled in Brazzaville since the advent of the Covid-19 pandemic. The anemic and neurological forms are the most observed. Delayed consultation, fever, repeated convulsions, pallor, respiratory distress, sickle cell anemia, thrombocytopenia and hypoglycemia are associated with death. Mortality from severe malaria is twice as high during the Covid-19 pandemic. It seems imperative for health systems to ensure that a balance is maintained between the management of the Covid-19 pandemic and that of other worrying health problems, including malaria.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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