

## Intensive Care Management of Severe Malaria in Low Income Country

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### ABSTRACT

**Objectives:** The aim of this study was to evaluate the management of severe malaria at the Niamey National Hospital (NNH).

**Patients and Methods:** Prospective study was conducted in intensive care unit (ICU) of the Niamey National Hospital, from September, 2020 to October, 2021. Data collected included: age, sex, medical history, temperature (°C), oxygen saturation (%), neurological, respiratory and circulatory distress, biological exams, treatment, prognostic and the mortality. The data was processed and analyzed by Word 2019 and Epi infos 7.2.

**Results:** The sample included thirty-six patients admitted in intensive care unit (ICU) for severe malaria. Hospital prevalence was 9.54%. The mean age of patients was 20.69 years with extremes of 3 years and 47 years; sex ratio was 1.25 (M/F). In this study 78% of our patients had no medical history. Patients had fever in 25% of cases. Neurological signs were dominated by convulsions with 52.77%. Clinically patients had respiratory distress 25% and circulatory distress represent 42% of cases. Hepatomegaly was present in 22% of cases and icterus for 10.1%. The average parasite density was 320 elements/μL with extremes ranging from 120 to 14800 parasites/μL. Severe anemia was encountered in 47% of cases and 89 % of patients have ionic disorders. Hyperparasitemia was found for 19% of cases and acute renal failure in 11%. Neurological form dominated with 64% of cases. All of our patients had received intravenous artesunate. Evolution was favorable in 89% of cases and the mortality rate was 8%. The average length of hospital stay in intensive care was 6.69 days.

**Conclusion:** Severe malaria is frequent in intensive care, nevertheless it's clinical and paraclinical manifestations are serious, constituting life-threatening distress. The trend was favourable in the majority of cases.

### Keywords

Severe malaria, ICU, NNH, Niger.

### Introduction

Malaria is now a major disease in Africa, particularly in Niger, a recognized endemic area. According to the World Malaria Report 2020, there are an estimated 229 million malaria cases worldwide, 4% of them in Niger. Plasmodium (P) Falciparum and P. vivax are responsible for the majority of global malaria cases. P. Falciparum is responsible for the majority of severe forms. Malaria remains

the deadliest and most widespread parasitosis in the world [1-4]. The objective of our study was to evaluate the management of severe malaria in the intensive care unit at Niamey National Hospital (NNH).

### Patients and Methods

Prospective study was conducted in intensive care unit (ICU) of the Niamey National Hospital, from September, 2020 to October, 2021. Data collected included: age, sex, medical history, temperature (°C), oxygen saturation in ambient air (%), neurological,

respiratory and circulatory distress, biological exams, treatment, prognostic and the mortality. The data was processed and analyzed by Word 2019 and Epi infos 7.2. P- Significant value <0,05.

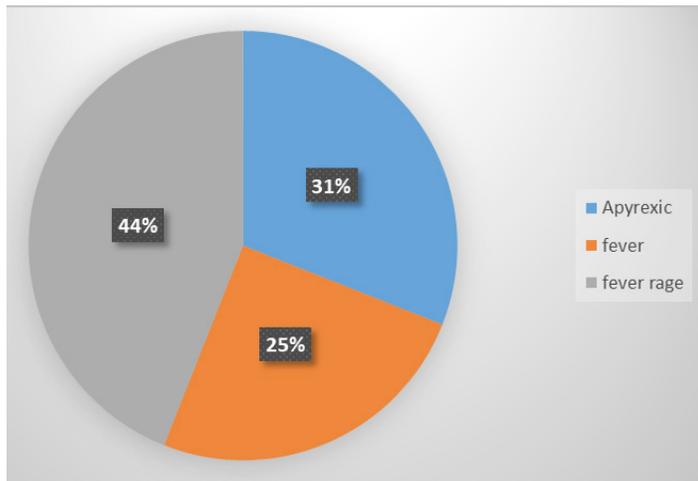
## Results

During our study, 317 patients were hospitalized in the intensive care unit, including 36 cases of severe malaria, representing a hospital prevalence of 9.54%. There is a predominance of male sex with a sex ratio of 1.25. The 15-30 years group was the most affected with 53% of cases; The mean age of patients was 20.69 years with extremes of 3 years and 47 years (Table 1).

**Table 1:** Distribution of patients by age range.

Age range (year)	Number	Percentage (%)
0-2	0	0
2-5	8	22
5-15	7	19
15-30	19	53
31-47	2	6
>47	0	0
<b>Total</b>	<b>36</b>	<b>100</b>

In this study 3% had sickle cell disease. Patients had fever (superior of 38.5°C) in 25% of cases, 31% were afebrile (temperature < 37.5°C) and 44% had a fever range (37.5 to 38.5°C) (Figure 1).



**Figure 1:** Distribution of patients according to temperature.

Clinically, 25% of patients had respiratory distress, 42% had circulatory distress and 72% had shown signs of altered neurological status. For neurological distress, 52.77% had convulsions, 27.77% had obtuse, and 19.44% were comatose (Glasgow Coma Scale, GCS ≤8) (Table 2).

Hepatomegaly was present in 22% of cases and icterus in 10.1%. In our study, the biological signs of severe malaria were dominated by severe anemia with 47% followed by hyperparasitemia with 19%; 11% had acute renal failure (Table 3).

**Table 2:** Distribution of patients by distress.

Type of distress	Number	Percentage (%)
<b>Respiratory</b>		
Tachypnea	8	22,22
SpO2 <94%	7	19,44
Wing beats of the nose	2	5,55
Draw	1	2,27
Bradypnea	1	2,27
<b>Circulatoire</b>		
Pallor	23	64
Tachycardia	15	41,66
Hypotension	11	30,55
Bradycardia	2	5,55
<b>Neurological</b>		
Convulsions	19	52,77
Obsessiveness	10	27,77
Coma(GCS<8)	7	19,44
Drowsiness	6	16,66
Convulsive	3	8,33
Prostration	3	8,33

**Table 3:** Distribution according to paraclinical criteria for severe malaria.

Paraclinical criteria	Number	Percentage (%)
Hemoglobin < 7 g/dL	17	47
Hyperparasitaemia ≥ 4%	7	19
Hematocrit < 20%	6	17
Creatinine > 265 µmol/L	4	11
Lactatemia > 2 mmol/L	1	3
Hypoglycemia < 2,2 mmol/L	1	3

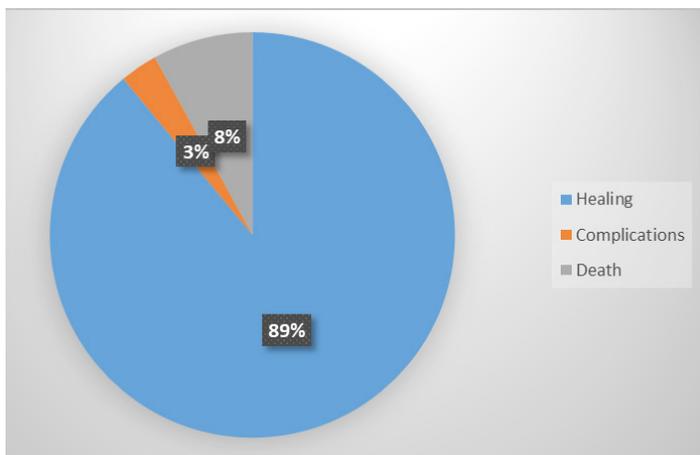
The mean parasite density (PD) was 320 parasites/µL. Malaria neurological form was the most represented clinical form of severe malaria with 64%. All our patients were treated with injectable artesunate. They had all also received symptomatic and complementary care; 8.33% had undergone dialysis and 2.77% had orotracheal intubation and ventilation (Table 4).

**Table 4:** Distribution of patients according to complementary therapies.

Therapeutic	Number	Percentage (%)
Analgesic- antipyretic	36	100
Rehydration	36	100
Gastric protection	33	91,7
Vitamin therapy	32	88,9
Anticonvulsant	19	52,7
Antibiotic	34	94,4
Blood transfusion	18	50
Antiemetic	17	47,2
Dialysis	3	8,33
Orotacheal intubation	1	2,77

The evolution was favorable after the management of our patients in the intensive care unit in 89% of cases, 3% of complications including one case of a ponto-mesencephalic hemorrhage and 8% of patients had died (Figure 2).

The mean length of hospital stay was 6.69 days with extremes of 2 and 11 days. After an analytical study there was a significant correlation between death and coma, collapse and acute renal failure (Table 4).



**Figure 2:** Distribution of patients according to evolution.

**Table 4:** Degree of significance between signs and death.

Event	Number	Percentage (%)	P
Respiratory distress	9	25	$p \leq 0,90$
Coma (GCS <8 )	7	27	$p \leq 0,02$
Collapse	5	14	$p \leq 0,05$
Acute renal failure	4	11	$p \leq 0,02$

P-value <0,05

## Discussion

Severe malaria remains an infrequent cause of admission to intensive care, we had recorded 36 cases of severe malaria in the intensive care unit during the period of our study; a prevalence of 9.54%. Eholie S et al. in Ivory Coast and Sidibé A et al. in Mali reported frequencies of 4% and 3.9%, respectively [5,6]. The average age of our patients was 20.69 years; this average age is lower than that found by Sidibé A et al. Which is 36.1 years and that of Moudden MK et al. in Morocco with 33.3 years [7]. In our study there is a predominance of male sex with a sex ration of 1.25; this predominance of sex was found in the literature among most authors as Boushab MB et al. in Mauritania, Chiabi A et al. in Cameroon, Adehossi E et al. in Niger had respectively reported a sex ration of 2.1; 1.2 and 1.17 [8-10]. At their admission to intensive care 25% of our patients were febrile and 44% had a fever, our result is close to that of Yogi M et al. in India, reported 44.44% had a fever [11]. For our patient 72% of them had shown signs of neurological disorder, 25% had respiratory distress and 42% of our patients had hemodynamic instability. In Cameroon Fargier et al. had reported that 82% had a disorder of consciousness at their admission; in the Moroccan series El Mostafa EM et al. reported 15% of patients who were in a coma [12].

All of our patients had a positive thick drop, and the average parasite density was 320 elements/ $\mu$ L. Our result is lower than that found by Sidibé et al. who reported 2191 elements /  $\mu$ L. [2,13] We had observed severe anaemia in 47% of our patients; This result is higher than that of Bruneel et al. in France which had 2.8%. Anemia is a common sign in malaria because of hemolysis of red blood cells by plasmodium [13,14].

Hypoglycemia is often associated with lactic acidosis and is a major indicator of poor prognosis. The increase in lactate levels varies with the degree of tissue hypoxia. In our study 3% of our patients had hyperlactatemia. Our result is lower than that of Adehossi E. et al. in Niger and Sanou I et al. in Burkina Faso who reported 22.7% and 10.3% respectively [10,15]. The renal failure observed during severe malaria is a major factor of poor prognosis, we found 11% of patients who had renal failure. This result is higher than that of Eholie S et al. in Ivory Coast (7%) and lower than that of Bruneel F et al. in France (31%) [3,13,14]. Malaria neurological form was the most represented clinical form of severe malaria with 64%; The anemic form is the most represented in the pediatric population. In our study the anemic form represented 19%, this result is close to that of Obonyo et al. in Kenya, who had found a rate of 21% [13].

All patients had received intravenous artesunate treatment at a dosage of 2.4mg/kg/day according to Niger's national malaria program protocol. Sidibé and al. reported quinine use in 23.3% of cases, artesunate use in 30% of cases and artesunate-quinine in 46.7% of cases [6]. In our study, all patients had undergone vascular filling, 8.33% of patients had benefited from extrarenal purification and 50% were transfused with labile blood products; 94% received antibiotic therapy and 2.77% orotracheal intubation with mechanical ventilation. The evolution was favourable in 89% of cases and the mortality rate was 8%; in the Mali series, Sidibé A et al. had reported a mortality rate of 30% [6]. The average length of hospital stay for our patients was 6.69 days; in the Moroccan series it was 13 days on average and 6.8 days in Mali study [6,12].

## Conclusion

Severe malaria is a reason for infrequent hospitalization in intensive care, nevertheless it's clinical and paraclinical manifestations are serious, constituting life-threatening distress. The anti-malaria treatment in our series consisted entirely of artesunate, as recommended by the WHO. The trend was favourable in the majority of cases.

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