

Research Article

EPIDEMIOLOGICAL, CLINICAL, PARACLINICAL AND THERAPEUTICAL PROFILE OF CHILDREN WHO DIED OF SEVERE MALARIA IN THE NATIONAL HOSPITAL OF NIAMEY

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Abstract

Introduction : In Niger, as in the majority of countries south of the Sahara, malaria remains the major endemic disease and the first cause of morbidity and mortality in the most vulnerable groups, particularly children under 5 years of age. The objective of the study was to determine the epidemiological, clinical, therapeutic and evolutionary profile of children aged 0-59 months who died of severe malaria in the paediatric wards of the national hospital of Niamey. **Method:** This was a retrospective descriptive study conducted over a five-year period (1 January 2016 to 31 December 2020). Data were collected by non-probability sampling for convenience with exhaustive selection of all children's records meeting the selection criteria. The collected data were entered and analysed using SPSS version 23.0 software. **Results:** A total of 131 children died of severe malaria during the study period. The mean age of the deceased children was 28.18 (± 16.86) months with extremes ranging from 1 to 59 months. Children who were less than or equal to 30 months of age were most affected in 57.30% of cases. The sex ratio was in favour of males in 59.50% of cases. The majority of the children (52.70%) came from an urban environment and 71.80% of the parents of the deceased children had a low socio-economic level. Clinically, 89.30% were referred to the national hospital by another health facility. The predominant signs of seriousness were lethargy (71.0%), altered consciousness (71%), severe pallor (57.30%) and convulsion (48.10%). The most frequent clinical forms observed in the deceased children were neurological malaria (41.20%), anaemia (28.20%), and mixed malaria (11.40%). On the therapeutic plan. **Conclusion:** Severe malaria is a public health priority in Niger and remains the leading cause of hospitalisation in the national hospital of Niamey with a lethality of 4%. A reinforcement of the technical platform, as well as preventive measures are necessary to reduce the death rate related to severe malaria in paediatric services.

Keywords: Severe malaria, children, evolutionary trend, Niamey National Hospital.

INTRODUCTION

Malaria remains a worrying disease in the world. It is a major public health problem with mortality remaining high in severe forms, especially in children [1]. In 2019, the World Health Organization (WHO) estimated the number of malaria cases worldwide at 229 million with 409,000 deaths, 67% of which (i.e. 274,000 cases) were in children under the age of 5. The WHO African Region alone accounted for 93% of these deaths [2]. According to the same report, almost 90% of cases and deaths worldwide were concentrated in the African region. In 2016, according to the Niger Health Statistical Yearbook, malaria was diagnosed in 1.5 million children under the age of 0-59 months, of which 90 thousand cases were severe malaria (5.81%) [3]. Of the 1561 deaths recorded in the same year, 77.19% were children in this age group. The lethality of malaria is mainly related to severe forms exclusively secondary to Plasmodium falciparum infestation [1, 2, 4]. Many factors predictive of death in severe malaria in children have been identified. These include: coma, convulsion, respiratory distress and hypoglycaemia [5-6]. Despite Niger's efforts to reduce malaria morbidity by 75% and make it a public health problem by 2030, malaria still represents more than 35% of the causes of paediatric consultations [7]. The aim of our study was to study the epidemiological, clinical and therapeutic profile of children who died of severe malaria in the paediatric wards of the national hospital of Niamey.

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MATERIALS AND METHODS

Study setting

The study took place at the National Hospital of Niamey, precisely in the A and B wards. This is one of the largest hospitals in the country. These wards receive respectively small children (0-24 months) and older children (>24 months). All children under five years of age are cared for free of charge in accordance with the state's health policy.

Type of Study

This was a retrospective, descriptive study of 131 patients aged 0-59 months who died of severe malaria during the period from 1 January 2016 to 31 December 2020. Children who died of uncomplicated malaria or any other disease were excluded from our sample. Data were collected by non-probability sampling for convenience, with exhaustive selection of all records of children meeting the selection criteria. The variables studied were the socio-demographic (mothers and children), clinical and biological and therapeutic characteristics of the children. Data were collected using a questionnaire.

Data collection tools and techniques

The data was collected manually for four months (April to July 2021) using a data collection form. A quality control of the data collection forms was carried out as the data were collected. Data entry was done with the KoBo Collect software version V1.2.3 installed on the smartphones.

Data processing and analysis

The data entered with the Kobo Collect software was extracted in Excel format, then cleaned, corrected and analysed using SPSS version 23 software. Descriptive analyses were used to describe the study population.

Ethical and deontological considerations

In order to conduct this study, research permission was obtained from the National Hospital of Niamey. The information collected from the patients' files was treated with confidentiality.

RESULTS

We collected 131 patients who died of severe malaria during the study period in paediatric wards A and B.

Socio-demographic and comedic characteristics of patients and mothers

Socio-demographic characteristics of the patients: The average age of the children who died was 28.18 months (± 16.86) months with extremes ranging from 1 to 59 months. In 57.30% of the cases, they were less than or equal to 30 months of age, 59.50% were male (with a ratio of 1.47) and 52.70% of the deceased children were from urban areas (Table I).

Table I. Distribution of deceased patients according to socio-demographic characteristics in the A and B paediatric wards of the national hospital in Niamey (2016-2020)

	Frequencies	Percentage
Age of patients		
≤30 months	75	57,30
>30 months	56	42,70
Gender		
Male	78	59,50
Female	53	40,50
Source		
Urban	62	47,30
Rural	69	52,70

Table II. Distribution of mothers according to socio-demographic and economic characteristics in the A and B paediatric wards of the national hospital in Niamey (2016-2020)

Age Mother	Frequencies	Percentages
≤25 years	63	48,10
] 25-40[years	64	48,80
≥40 ans years	4	3,10
Level of education		
No	32	24,40
Primary	85	64,90
Secondary	11	8,40
Supérieur	3	2,30
Profession		
Housewife	117	89,30
Trader	2	1,50
Civil servant	3	2,30
Pupil/Student	7	5,30
Other	2	1,50
Socio-economic level		
Bottom	94	71,80
Medium	32	24,40
High	5	3,80

Socio-demographic and economic characteristics of the mothers: The average age of the mothers of the deceased

children was 26.44 years (± 5.24) with extremes ranging from 17 to 50 years. The majority had primary education in 64.90% of cases, were housewives in 89.90% of cases and 94% of the deceased children had parents with low income levels (Table II).

Characteristics of patients who died according to the mode of admission

The majority of children who died 117 (89.30% of cases) were referred by a health facility (Figure 1)

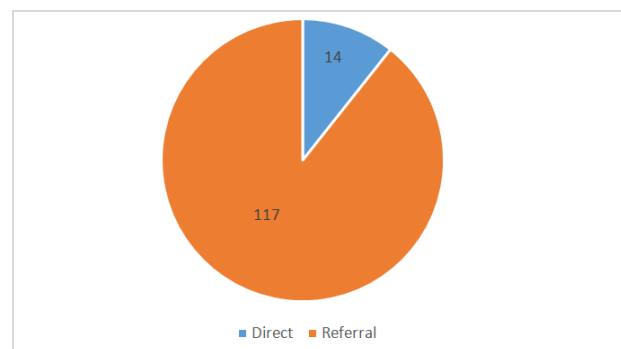


Figure 1. Distribution of deaths by mode of admission in the A and B paediatric wards of the national hospital in Niamey (2016-2020)

Clinical characteristics

Signs of severity of severe malaria: Clinically, the predominant signs of severity were alteration of the general state (71%), lethargy (71%), severe pallor (57.30%) and convulsion (48%) (Table III).

Table III. Distribution of deaths according to signs of serious malaria in the A and B paediatric wards of the national hospital in Niamey (2016-2020)

Signs of seroussness	Frequencies	Percentages
Convulsion	63	48,10
Severe pallor	75	57,30
Lethargy	93	71,00
Respiratoire detress	21	16,00
Alteration consciousness	93	71,00
severe anaemia	44	33,60
Hypoglycemia	54	41,20
Haemoglobinuria	6	4,60
coma	53	40,50

Clinical forms of severe malaria: The most frequent clinical forms among the deaths were severe malaria, neurological form in 54 cases (41%), anaemic form in 37 cases (28.20%), and hypoglycaemic form in 17 cases (13%) (Figure 2).

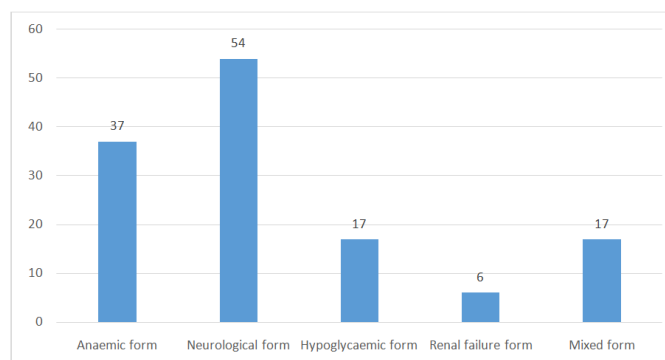


Figure 2. Distribution of patient deaths by severe forms of malaria in the A and B paediatric wards of the national hospital in Niamey (2016-2020)

Characteristics according to the treatment received by the patients: The table shows that the majority of the children who died had received artemether in 57.30% of cases and artesunate in 41.20% of cases. Ceftriaxone-based antibiotic therapy was associated in 83.20% of cases. Blood transfusion was used in 39.70% of cases. 35% of the children who died had received oxygen-based resuscitation (Table IV).

Table IV. Distribution of deceased patients according to the treatment received in the A and B paediatric wards of the national hospital in Niamey (2016-2020)

Treatments received	Frequencies	Percentages
Antipyretic	84	64,10
Artemether	75	57,30
Artesunate	54	41,20
Ceftriaxone	109	83,20
Gentamycin	87	66,40
Blood transfusion	52	39,70
Anticonvulsivant	53	40,50
antiemetic	15	11,50
Oxygen thérapy	46	35,10

Trend in deaths by year of hospitalization: The number of child deaths has been decreasing since 2016 and increasing in 2020 (Figure 3).

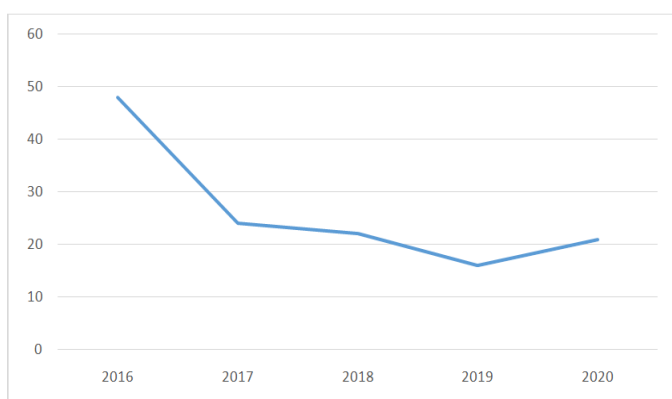


Figure 3. Distribution of deaths by year of hospitalisation in the A and B paediatric wards of the national hospital in Niamey (2016-2020)

Distribution of severe malaria cases by month of hospitalization: An increase in the number of cases of severe malaria in children aged 0-59 months can be observed from July onwards, reaching a maximum peak in October before declining in November.

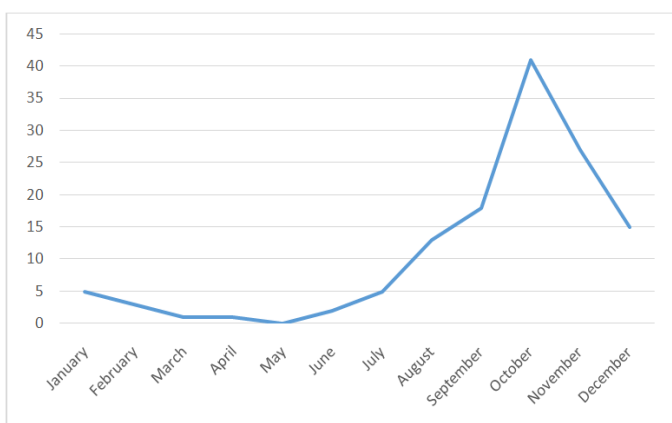


Figure 3. Distribution of cases by month of hospitalisation in the A and B paediatric wards of the national hospital in Niamey (2016-2020)

DISCUSSION

The average age of the children was 28.18 ± 16.86 months (extremes: 1 and 59 months). Our result is lower than that found by Ouermi et al in Burkina Faso, which is 33.4 months [8]. On the other hand, it is clearly superior to those found by Augustin M et al in Congo, which is 18 months (extremes: 3 and 59 months) [9]. The age group most affected was that of less than or equal to 30 months (57.30%). Our result is higher than that found by Camara in Senegal, which is 24.70% in this age group [10]. Djadou et al. found that the age range of 24 to 35 months was the most affected [11]. This age group corresponds to the period when a child has lost maternal antibodies and gradually builds up partial immunity to malaria [12, 13]. The sex ratio M/F was 1.47 in our distribution. Several authors confirm this trend in children with severe malaria, including Edelu et al in Nigeria, Nadia in Cotonou and Aminatou in Niger [14-16] who found a male predominance ratio of 1.55, 1.52 and 1.20 respectively. However, there is no relationship between severe malaria and gender in the literature. The majority of the patients who died (52.70%) were from rural areas. This result is much higher than those found by Sidi and Kamayé in Niger which are respectively 38%, 19, 20% [17, 18]. The mothers of the deceased children had a mean age of 26.44 ± 5.24 years with extremes of 16 and 50 years. 57.30% were over 30 years of age and 64.90% had primary education. In Benin, Mouniratou found a mean age of mothers of 29.5 ± 6.83 years with extremes of 18 and 42 years [19]. The same trend was found by Denou in Mali, where the majority (51.7%) were educated up to primary level [20]. In our study, the mothers of children who died of severe malaria were housewives in their great majority at 89.30%. Denou in Mali and Aminatou in Niger found a similar result respectively 94% and 76.60%. [16, 20]. This predominance of young women and housewives can be explained by the general composition of the population which is young in Africa and particularly in Niger. It can also be explained by the higher fertility rate in this age group since it corresponds to the reproductive age.

In our study, the majority of the parents of the deceased children were of low socio-economic class in 71.80%. Aminatou in Niger found a similar result of 66.20% [16]. Our data is reinforced by the World Bank data which concludes that despite the great progress over the last decade, the level of extreme poverty in 2020 remains high at 42.9% [21]. Most of the children who died were referred by another health facility in 89.30% of cases. The same observation was made by several authors [18, 19]. Severe pallor was found in 57.30% of the deceased children. Augustin in Congo and F. Ly in Senegal found a similar result in 54.20% and 53.8% respectively [8, 22]. Disturbances of consciousness and convulsions are also neurological signs of severity. In our series 71% of deaths had altered consciousness. Convulsion was found in 48.10% of cases. Our result is close to that of Camara and colleagues who found 52.80% [10]. Our results are higher than those of Mansour et al in Niger who found 42.5% [23]. In our series, 16% of the children who died had respiratory distress. Our result is close to that found by Mansour in Niger which is 14.50%. Camara et al found 20.90% of cases of respiratory distress [Camara]. On the other hand, our results are much higher than those found by Aminatou in Niger which is 7.7% [16] and Augustin et al in Congo of 9.07% [8]. In our series, 33.60% of deaths had severe anaemia below 5 g/dl. Our result is superior to those of Kamaye in Niger and Camara in Senegal

who found severe anaemia below 5g/dl in 28.30% of cases [10, 18]. However, it is lower than those of Augustin Mutombo et al in Congo who found a haemoglobin level below 5 mg/dl in 46.90% [8]. This cause of anaemia is probably multifactorial. The anaemia is thought to be due to haemolysis caused by the parasite, but also the decompensation of a nutritional anaemia by severe malaria [24]. It is so common in children, especially those under five years of age, that the World Health Organisation specifically mentioned it in the latest World Malaria Report [25]. In our study, severe hypoglycaemia below 2.5 mmol/ul was found in 41.20% of cases. Our result is superior to that of Mansour et al in Niger who observed severe hypoglycaemia below 2.2 g/dl in 28.90% [26] and Camara in Senegal in 8.60% [10]. The main severe forms of malaria observed in the deaths were neurological in 41.20% and anaemic in 28.20% of cases. The same trend was found in Aminatou in Niger in 45.70% and 30.70% respectively for the neurological and anaemic forms [16]. On the other hand, Adonis in the Ivory Coast found 57.20% and 25.70% respectively. [27]. For specific antimalarial treatment, 57.30% of the patients who died were treated with IV artemether, followed by IM artemether in 41.20%. Our data are contrary to national guidelines for the management of malaria. This could be explained by the fact that in our study many deaths were recorded between 2016-2017 when artemether was in the free care of children under five years. This trend is observed by Alao et al, Wagner et al and F. llunga-llunga et al had used respectively artemether and quinine as 1st line molecule [28-30]. On the other hand, Agbeille et al. found in Benin the use of injectable artesunate in 98.70% of cases. This is perfectly in line with the WHO recommendation for the treatment of severe malaria to use artesunate as first line treatment [27]. [27]. Ceftriaxone or ampicillin-based antibiotic therapy was used in 83.20% of patients, often in combination with gentamycin. The WHO recommends that a child with suspected severe malaria associated with altered consciousness should be given broad-spectrum antibiotics at the same time as the antimalarial treatment, and that the antibiotics should be completed unless the possibility of bacterial infection can be excluded by a culture taken on admission [31]. Analysis of the trend in deaths of patients with severe malaria over the last 5 years has shown a decline in the case fatality of severe malaria in paediatric wards with an increase in 2020. This could be explained by the major floods that hit the Niamey region in 2020, thus favouring the spread of mosquitoes that cause the disease.

Conclusion

Severe malaria is a public health priority in Niger and remains the leading cause of hospitalisation at the national hospital in Niamey with a case fatality rate of 4%. Early consultation and epidemiological surveillance of the disease, reinforced by primary prevention activities, both individual and collective, are necessary, especially in rural areas, in order to reduce hospital mortality among children aged 0-59 months, as observed in our paediatric services.

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