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Research Article

Epidemio-Clinical Aspects of Severe Malaria with Positive RDT in the Paediatrics Department of University Hospital Gabriel Touré (UH-GT)

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Abstract

In 2004, the WHO introduced rapid diagnostic tests (RDTs) for the biological diagnosis of malaria. However, the policy of the National Malaria Control Program (PNLP) reserves RDTs for peripheral facilities and thick blood tests for hospitals with adequate technical facilities, including clinical biology laboratories.

Aim: The aim of our study was to assess the epidemiological and clinical aspects of severe RDT-positive malaria in the paediatric department of the UH-GT.

Patients and Methods: This was a prospective, cross-sectional, descriptive study conducted over a six-month period (1 July to 31 December 2019) in children aged 1 month to 15 years hospitalised in the paediatric department for severe RDT-positive malaria.

Results: The hospital frequency was 23.7%. Children aged 01 to 59 months were the most affected (53.7%). Males were the most common (58%). Fever was the most frequent reason for consultation (85.9%). Cerebral malaria was the most common clinical phenotype (66.1%). RDTs and thick blood tests were positive in 69% of cases. RDT alone was positive in 31%. Artesunate injection was the aetiological treatment used in our patients (100%), with a case fatality rate of 24.4% and an average hospital stay of 5 days.

Conclusion: The use of the malaria RDT has enabled rapid diagnosis and management of severe malaria cases at the CHU-GT.

INTRODUCTION

In Mali, malaria remains a major public health problem in terms of mortality and morbidity. In 2018, according to the health information system (the EDSM-VI), 2,614,104 confirmed cases of malaria and 1,001 deaths were recorded with a prevalence of 19% according [1-4].

In Bamako, at the GT University Hospital in the paediatrics department in 2018, malaria accounted for 19% of hospital admissions and 11.7% of deaths [5]. It is the leading cause of febrile convulsions in children and infants, accounting for 49% of cases in Mopti, a region in the centre of the country [6].

For a long time, malaria was diagnosed using the thick and thin smear, which are standard microscopic techniques. In 2004, WHO introduced rapid diagnostic tests (RDTs), for the biological diagnosis of malaria [7]. The advantage of these tests is that they are easy to use, provide results in a relatively short time (less than 20 minutes) and detect the parasite antigen in the blood, which is suitable for our context (paediatric emergencies), where it is often difficult to perform a thick smear. However, the policy of the National Malaria Control Programme (PNLP) reserves RDTs for peripheral facilities and thick blood tests for hospitals with adequate technical facilities, including the clinical biology laboratory. The result of the blood smear is obtained in an average of 45 minutes to 1 hour. In order

to shorten the diagnosis time and ensure rapid treatment, we initiated this study to evaluate the role of RDTs in the treatment of severe malaria in hospitals. Our results may enable the National Malaria Control Program (PNLP) to introduce RDTs in hospitals.

The aim of our study was to evaluate the epidemiological and clinical aspects of severe RDT-positive malaria in the paediatric department of the UH-GT.

PATIENTS AND METHODS

This was a prospective, cross-sectional, descriptive study conducted over a six-month period (1 July to 31 December 2019). It included children aged 1 month to 15 years hospitalised in the paediatric department for severe RDT-positive malaria. The RDT used to confirm cases was a cassette parachech that detects haemoglobin rich protein type 2 (HRPII) specific for Plasmodium falciparum with a sensitivity of 90.6% and specificity of 98.6% [8]. Data were collected on a survey form after verbal consent from the parent and/or guardian. The variables studied were epidemiological: age, sex, time to consultation, clinical: reason for consultation, signs of examination, paraclinical: RDT, blood smear.

CSF cytobacteriological examination, ABO grouping, RH, haemogram, treatment and outcome. The data collected were entered and analysed using SPSS version 22 software.

The Chi-square test was used to compare qualitative variables. A value of $p<0.05$ was considered statistically significant. Data confidentiality was respected

RESULTS

Socio-demographic characteristics

During our study period, we recorded 242 patients with severe malaria out of 1021 hospitalisations, i.e. a frequency of 23.7%. There were 140 boys (58%) and 102 girls (42%) with a sex ratio of 1.3. The age group 01 to 59 months was the most affected (53.7%), with an average age of 67.1 months and extremes of 03 to 156 months, most of whom were referred by health facilities (80.2%) (Table 1).

Clinical and paraclinical characteristics

Fever (85.9%), convulsions (59.9%) and pallor (42.1%) were the most frequent reasons for consultation (Table 2). A large proportion of the sample (84%) had taken antimalarial drugs prior to admission, and 69% had a positive RDT and thick drop, and 31% a positive RDT alone. Haemoglobin levels were less than or equal to 5g/L in 33.8% and greater than 5g/L in 66.2%. The parasite load was very high in 59% of cases, with a parasitaemia of 21858.9 trophozoites per field, ranging from 75 to 1400000. Hypoglycaemia was present in 6.2%. The neurological form was the most frequent clinical phenotype (66.1%), followed by the mixed form (neurological + anaemic) (17.3%) and the anaemic form (16.5%) (Table 3). Associated pathologies were pneumonia (11.2%), urinary tract infection (6.2%) and bacterial meningitis (2.1%).

Therapeutic characteristics

Artesunate injection was the aetiological treatment used for our patients (100%). Symptomatic treatments included paracetamol (93.4%), diazepam (85.1%) and packed red blood cells (36.4%).

Evolution

The average length of hospitalisation was 05 days. The case fatality rate was 24.4% (Table 4).

Table 1: Epidemiological Characteristics

Characteristics		Effective (n=242)	%
Âge(month)	average	67,1	
	1-59	130	53,7
	60-120	74	30,6
	121-180	38	15,7
Sex	Male	140	58
	Female	102	42
Reference	Yes	194	80,2
	No	48	19,8

Table 2: Reasons for consultation

Reason for consultation	Effective (n=242)	%
Convulsion	145	59,9
Paleness	102	42,1
Digestive disorders	85	35,1
Fever	208	85,9
Prostration	92	31,0

Table 3: Clinical Phenotype

Phenotype	Effective	%
Neurological Form	160	66,1
Anaemicform	40	16,5
Mixed form	42	17,4
Total	242	100

Table 4: Patients distribution by outcome

Outcome	Effective	%
Healed	181	74,8
Transfer	2	0,8
Deceased	59	24,4
Total	242	100

DISCUSSION

During our study period, we recorded 242 patients out of 1021 hospitalisations, i.e. a frequency of 23.7%. Our rate is lower than the national prevalence (52%) [9], and those of certain cities in Africa, such as Bobossi-Serengbé G et al. [10], in Bouar in the Central African Republic and Tsolenyanu et al in Kpalimé [11], in Togo, who reported 42% and 46% respectively. However, it is higher than those of Camara B [12]. And Moyen G [13], who reported 6.4% and 14.7% respectively. Malaria in Bamako region has a hypo-endemic type of transmission which exposes city children to severe and complicated forms of malaria, usually at an older age than children in rural areas [14].

A predominance of males was noted (58%), giving a sex ratio of 1.3. This male predominance was reported by Doumbia A [15]. However, no author has established a formal relationship between sex and the occurrence of severe malaria. The average age of the patients was 17 months, with extremes of 3 and 156 months. The age group 25 to 59 months was the most affected with 31.4%. Karambe C [16], recorded a predominance of the 24 to 60 months age group with a frequency of 68.6%. The high frequency of severe malaria at this age could be explained by the non-acquisition of premunition or by simple malaria that was poorly treated [17].

During the study, we noted that 81.5% of patients had first consulted a health centre (community health centre, referral health centre, private facilities) before being admitted to paediatrics. They had received prior care. At the CHU GT, Doumbia A reported that 51.2% of patients consulted a health centre before hospitalisation [15]. This shows a certain respect of health pyramid in Mali. However, 18.5% of patients consulted a paediatrician directly. This can be explained by the easy accessibility of the CHU Gabriel Touré for users. In our study, the reasons for consultation were dominated by fever (85.5%), followed by convulsions (59.9%), then pallor (42.1%). These results are similar to those of Doumbia BK [18], in the Hippodrome Community Health Centre, which recorded fever as the main reason for consultation (92.2%). Similar studies carried out by Diarra FD in Commune I [19], and Traore AM in Commune II [20], confirmed fever as the primary reason for consultation, with 87% and 100% respectively.

For biological confirmation of severe malaria, the RDT coupled with the thick blood smear was positive in 69% of cases and the RDT alone was positive in 31% of cases. Fomba S [21], and Kilonso SB [22], recorded lower results with 15.7% and 6% of positive RDTs respectively, whereas Keita M recorded 44.4% and Samaké Z [17], 94.7%.

Although the thick blood smear remains the complementary examination of reference for the diagnosis of severe malaria, it makes it possible to establish the gender diagnosis and to determine the parasite load, we note that approximately two thirds of the thick blood smears were positive. Similar results have been recorded [23-25]. Most of our patients (81.5%), had already been to a health facility and received anti-malarial drugs, which would reduce parasitaemia to a threshold that could not be detected by the thick smear, and secondly, by the hypothesis of low peripheral parasitaemia (sequestration of parasites in the micro-vessels of deep organs) by the sensitivity and specificity of the RDT, which reveals P. falciparum antigens 15 to 21 days after treatment, when trophozoites are no longer perceptible on the thick smear [26].

Children suffering from severe malaria are generally anorexic, and are therefore prone to hypoglycaemia, which further complicates the picture. Hypoglycaemia was sought in all patients, but only 6.6% had severe hypoglycaemia with a blood glucose level of 2.2 mmol/l or less. Keita M et al. [23], and Adedemy JD et al. [24], recorded better results. The neurological form was the most frequent, followed by the anaemic form and the mixed form (anaemic + neurological). Similar results have been reported by other authors [17,27]. However, Maiga B et al. [28], and Keita M et al. [23], confirm the predominance of the anaemic phenotype. In line with previous results, the neurological phenotype and severe anaemia are the most frequently associated and most fatal forms of malaria in children in areas of seasonal malaria transmission [29].

According to WHO recommendations, injectable artesunate is the first-line treatment for severe malaria. This drug was used in all our patients, with artemisinin-based combination therapy (ACT) being used as soon as the patient was able to take oral medication, but also at least after 24 hours of parenteral treatment [15].

Symptomatic treatment consisted of anticonvulsants (40.5%) and antipyretics (93.4%), with similar rates reported by Samake Z [17]. According to WHO, malarial anaemia is defined by a haemoglobin level of less than 5g/dl or a haematocrit level of less than 15%. Although a third of our sample had a haemoglobin level of less than 5g/dl, 30.4% of our patients received a transfusion of packed red blood cells. Dadou KE et al. [30], recorded rates of 64.8% and 55% respectively. The importance of anaemic forms and signs of clinical intolerance of anaemia have undoubtedly contributed to have recourse to transfusion at rates well above the threshold of WHO recommendations.

Our case fatality rate was 24.4%. While malaria used to be the leading cause of infant mortality in sub-Saharan Africa, in 2015 it ranked fourth, accounting for 10% of deaths across the continent [31]. Our rate is higher than that reported by Dembélé RK 8.2% [32]. Camara B [12], 11.1% and Savadogo M [33], 9.5%. However, G Moyen et al., in Congo (Brazzaville) [13], reported a similar rate of 26.3%. The delay in diagnosis, the unavailability of blood products, and the presence of co-morbidities could explain our high case-fatality rate.

Patients hospitalised had an average duration of 05 days, which is less than that recorded by Maiga B [28], who reported an average duration of 07 days, but close to those of Keita M et al. [23], and Moyen et al. [13], who recorded 4.8 and 4 days respectively.

CONCLUSION

The use of malaria RDT has enabled rapid diagnosis and management of severe malaria cases at the CHU-GT. Decision-makers therefore need to be made aware of the need to make the tests available in the various hospital facilities in order to improve the diagnosis and management of malaria cases.

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