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Original Research Article

Epidemiological profile of severe malaria and sickle cell disease in children at the mother and child university hospital center Jeanne Ebori foundation of libreville from 2020 to 2021

Midili Tecle Larissa[1,2]*, Mekame Meye Eurudys Angela[1,2], Mintsa Mi Nkama Edmée Laetitia[1,2], Lembet Mikolo Aude Mariela[1,2], Koumba Maniaga Raissa[1,2], Ikouyou Abessolo Adriel Levi[1], Kiba Live Gael[1], Kuissi Kamguaing Eliane[1,2], Ategbo Simon[1,2]

[1]Department of Paediatric, Mother-Child University Hospital of Libreville, Gabon, Africa
[2]Department of Pediatrics, Faculty of Medicine, Libreville-Gabon, Africa

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***Correspondence:**
Dr. Midili Tecle Larissa,
E-mail: midililarissa@yahoo.fr

ABSTRACT

Background: Hemoglobinopathies represent the most common genetic diseases worldwide. In Gabon, the clinico-biological profile of patients with homozygous hemoglobin S or those with AS sickle cell traits, faced with this prevalence of serious malaria, remains unknown today. The objective was to evaluate the complications of severe malaria in SS homozygous sickle cell patients and those carrying AS sickle cell traits.
Methods: This is an observational, retrospective study, with descriptive and analytical aims which took place from January 2020 to October 2021. The parameters studied were socio-demographic, clinical and paraclinical data, the diagnosis chosen, therapeutic data and evolution.
Results: severe neurological form of malaria was the most common criterion with a frequency of 41.7%, followed by parasitic forms 35.8% and anemic forms 21.8%. Among AS heterozygotes, the most widespread severe form was the neurological form with a frequency of 63.2%, the anemic form 26.3% and parasitic at 10.5%. In homozygous SS subjects, the most widespread severe form was the anemic form with a frequency of 68.1% followed by neurological forms 27.7% and parasitic forms 4.2%. Abdominal pain, prostration, respiratory distress were the main signs in SS homozygotes. In heterozygotes, prostration, convulsion and clinical jaundice were the main signs. A total of 99.8% of our patients were cured.
Conclusions: All the electrophoretic profiles identified were subject to this infection which mainly affects heterozygous AS subjects and subjects with the AA electrophoretic profile in its severe neurological form and homozygous SS subjects in its anemic form.

Keywords: Severe malaria, Sickle cell disease, Heterozygous, Homozygous, Clinical sign, Children, CHUMEFJE, Libreville

INTRODUCTION

Hemoglobinopathies represent the most common genetic diseases worldwide. They are transmitted autosomally and are generally found in malaria endemic areas.[1] Of all hemoglobinoses, hemoglobinosis S or sickle cell disease is the most widespread and best known in the world. It affects more than 50 million individuals with a high concentration in regions with high malaria endemicity.[1] The particular distribution of hemoglobinopathies and their high frequency among racial or ethnic groups originating from malaria endemic areas or having a

history of malaria can be explained by the most debated hypothesis according to ALLISON's work, namely, effect ofprotection conferred by hemoglobinopathy against malaria and which would be responsible for a natural selection of heterozygous subjects. In Gabon, the increase in the prevalence of plasmodial infection in patients aged less than 20 years was observed between 2011 (25%) and 2014 (36.3%).[2] It increased to 29.8% in 2019.[3]

During this period, the prevalence of severe malaria also increased with a change in the clinico-biological profile, with neurological forms predominating. Furthermore, the clinico-biological profile of patients with homozygous hemoglobin S or those with AS sickle cell traits, faced with this prevalence of severe malaria, remains unknown today. Is Allison's hypothesis still relevant? The objective of this work was to contribute to the evaluation of complications of severe malaria in homozygous sickle cell patients and those carrying sickle cell trait (AS).

METHODS

Study type

It is an observational, retrospective, descriptive and analytical study

Study place

The study took place in the pediatric department of the Mother and Child University Hospital Center Jeanne Ebori Foundation in Libreville, Gabon.

Study period

The study duration was from January 1, 2020 to October 31, 2021.

Patient selection criteria

All HbSS homozygous sickle cell children, HbAS heterozygous children and children with an HbAA electrophoretic profile, admitted during this period for severe malaria, regardless of age and sex.

Procedure

On the basis of a pre-established data collection questionnaire, we determined the following variables: Sociodemographic parameters, clinical parameters, biological parameters, diagnosis retained, treatment administered, evolution. (Appendices)

The file selection criterion was the medical files providing all the information necessary for our study, having been selected from a hospitalization register. The data collection technique for the study was a survey by reviewing medical records. The data collected was then transferred to a pre-established input mask.

Ethical approval

we obtained agreement from the hospital's scientific committee to carry out this study and informed consent was signed by the patients' parents.

Statistical analysis

the data collected was checked and any recording errors on the collection sheets were corrected gradually. They were then coded and an input mask was developed on a computer using Epi-Info software, version 7.2.3.0.

The analysis of the data collected was done with Epi-Info software, version 7.2.3.0. The chi-2 test was used for comparison of frequencies and the student t test for comparison of means. A result was statistically significant for a value of $p<0.05$.

RESULTS

We identified 640 cases of severe malaria.

Distribution according to hemoglobin level

The average base rate of our patients was 7 in 49% of sickle cell patients.

Figure 1: Distribution of the population according to socio-demographic data (n=640).

Variables	N	%
Distribution according to age (years)		
<6	420	65.5
6-10	147	23
11-18	73	11.4
Sex		
Male	353	55.2
Female	287	44.8
School level		
Unschooled	181	28.3
preschool	248	38.7
primary	181	28.3
Collège	19	3.0
High school	11	1.7

Table 2: Distribution of severe malaria according to electrophoretic profile.

Hb electrophoresis	Effectives	Percentage
HbAS	19	03,3
HbSS	47	07,3
HbAA	574	89,7
Total	640	100

Distribution according to clinical signs

The general signs were essentially an average temperature of 38.87±0.69°C, a mean heart rate 114.66±20.07 bpm, mean respiratory rate of 28.89±4.76 cpm, good nutritional status in 97.73% of patients.

Distribution according to form of malaria

When distributing the clinical forms, we noted that severe malaria, a neurological form, was the most representative of the 640 files retained, with 41.7% of cases (Figure 1).

Among AS subjects, 63.2% presented the neurological form as a severity criterion. In SS subjects, 68.1% presented the anemic form as a severity criterion.

The paraclinical manifestations showed us: a thick drop positive at 100%, a venous blood sugar was on average 4.5±1.51 mmol/l, a parasitemia 31,779.6±25129.9 T/µl (HbSS) and 117,128, 9±203604.6 T/µl (HbAS) p<0.0042, parasite density 2.7±2.5% (HbSS) and 11.6±18.6% (HbAS) p<0.001.

Distribution according to treatment and evolution

Concerning the treatment, artesunate molecules were mainly used, i.e. 92.5% compared to 7.5% of quinine salt and in our study 83% of SS subjects were transfused. Compared to 31.6% among AS subjects. The evolution of inpatient treatment in the study population was favorable. We recorded one death, or 0.2% of cases.

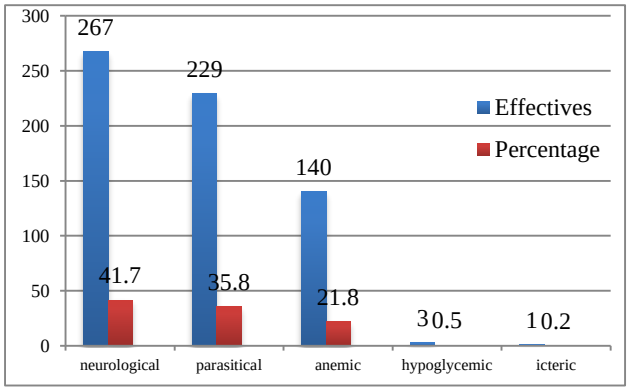

Figure 1: distribution of clinical forms in the study population.

DISCUSSION

The average age of our patients was 4.3±4.8 years for boys and 5.3±4.3 years for girls, with extremes ranging from 07 months to 18 years. These results are similar to those of Mansour MA in Niger.[4] This predominance of the 0–5-year age group is due to the fact that around 12 to 48 months, hemoglobin S almost completely replaces hemoglobin F, hence the high frequency of attacks and even complications (in particular infections and anemia) and that from 08-09 years old it begins to lower. This reduction in the rate of complications in sickle cell patients as a function of age was noted by Diallo et al and Traoré et al.[5,6] However, certain other studies such as that of Eloundou CO7 in Gabon have revealed more marked complications in children aged 6 to 15 years. Showing that all age groups can be affected, one or the other depending on the type of complication or crisis.

Male predominance was observed with a proportion of 52.6% in HbAS heterozygotes and 63.8% in HbSS subjects for a sex ratio of 1.11 in HbAS subjects and 1.76 in HbSS subjects. Among all cases identified, 89.7% were HbAA, 3% were HbAS and 7.3% were HbSS. For Mansour MA, in Niamey, 13.24% of sickle cell patients presented with severe malaria, during a study on associated factors.[4] The reasons for consultations in our AS heterozygous patients were headaches and prostration. SS homozygotes mainly presented sub-jaundice, associated or not with abdominal or joint pain and mucocutaneous pallor.

The HbAA subjects presented a mixture of the above-mentioned signs. But whatever the electrophoretic profile, convulsions and prostration were the major reasons for consultation in patients under 5 years old. The depth of altered state of consciousness was assessed according to WHO criteria.[8] These results are relatively close to those of Masengo-Ashande C9, in the DRC, in whom the most frequent reasons for consultations were: fever, mucocutaneous pallor, prostration, abdominal pain and osteoarticular pain.

The neurological form which affects all patients regardless of the electrophoretic profile. Camara in Senegal reveal that the frequency of neurological forms is a characteristic of areas of malaria hypo-endemicity and that in Central Africa, which is an area of hyper-endemicity, the signs are less frequent.[10] In our study, the majority of AS subjects and AA subjects had neurological form as a severity criterion, in particular convulsions and prostration. After a study carried out near Lake Victoria, draws the conclusion that the protection conferred by hemoglobin S against malaria is more marked in SS subjects than in AS subjects, therefore calling into controversy Allison's hypothesis which wants whether it is the AS subjects whohave a protective natural selection against malaria compared to any other electrophoretic profile.

Our study also found protection conferred on patients with SS electrophoretic profile. Severe anemia was mainly present in SS homozygotes. Chiabi in Cameroon gives us almost similar results with 21.7% among sickle cell patients.[11] Bashawri in Nigeria consider that the pathogenesis of anemia in malaria is extremely complex. They reported that malaria-related anemia is associated with many factors that involve increased destruction and reduced production of red blood cells.[12]

The parasitic form was noted in AA subjects with 35.8%, in AS and SS subjects with 10.5% and 04.2% respectively. This can be explained by the ease with which the parasite multiplies in the normal erythrocyte; the latter being conducive to their maturation and multiplication. This is why parasitemia was higher in subjects with a normal HbAA electrophoretic profile. And this parasitemia decreases as hemoglobin A is absent. Rapp in France.[13] revealed a 28% rate of severe parasitic malaria. In our study, sickle cell patients had lower parasitemia and parasite density than patients with AA and AS electrophoretic profiles. The average hemoglobin level in our study was 4.8±1.4 g/dl in subjects with sickle cell disease and 8.6±4.6 g/dl in those without sickle cell disease. This average is comparable to those found by other authors Dahmani in Morocco and Traoré R, in Mali 6 with 7.9 g/dl and 7.8 g/dl respectively.[14]

Therapeutically, the artesunate molecule has been most used in the treatment of severe malaria. It ensures better parasite clearance, is easier to use and administer by healthcare personnel. Malaria is a curable disease, even in its serious form, provided that treatment is rapid and effective. These results are similar to those of Mansour MA et al who used quinine salts as the main molecule to treat severe malaria. But after instituting artesunate as the primary treatment, they saw their malaria death rate decrease by 34.7%. On the evolutionary level, therefore, 99.8% of patients experienced a favorable outcome and were left cured, without after-effects. One patient died, with an HIV immunosuppression rate of 0.2%.

The limitations of the study are that, this was an observational, retrospective study, with descriptive and analytical aims. This method that we adopted fit well with the study carried out. Indeed, we have, thanks to our methodological approach, contributed to the evaluation of the complications of severe malaria in homozygous sickle cell patients and those carrying sickle cell trait (AS), in the Pediatrics department of the Mother-Child Foundation University Hospital CenterJeanne Ebori.

Although the objective assigned to this work has been achieved, it has limitations linked to its retrospective nature. Thus, the weak, non-exhaustive sampling and incomplete files were the main limitations of our study.

CONCLUSION

Hemoglobinopathies represent the most common genetic diseases in the world. They affect more than 50 million individuals with a high concentration in regions with high malaria endemicity. Our study noted the clinico-biological profile of patients with homozygous hemoglobin S or those with AS sickle cell traits, faced with this prevalence of severe malaria. In its severe neurological form, it mainly affects heterozygotes and normal subjects and SS homozygotes in its severe anemic form. Progress depends on the speed and effectiveness of treatment. The frequency of malaria infection in this case would be relative to prevention and not necessarily to the electrophoretic profile.

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