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Ocular Manifestations in Severe Acute Malnutrition in Children under 60 Months in a Secondary Health Center

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Abstract

Introduction: Severe acute malnutrition (SAM) is one of the main public health problems in the world. It is responsible in addition to the general symptoms, vitamin A deficiency which can cause serious eye damage including keratomalacia. This work aims to study possible ophthalmological lesions in severely acutely malnourished children from 0 to 60 months. **Patients and Method:** This study was carried out in a secondary ophthalmology center. It concerned all severely acute malnourished patients admitted for consultation in the pediatric department. **Results:** A total of 174 eyes of 87 children aged 0 to 60 months were examined. Two-thirds of the patients were aged between 6 and 18 months. Palpebral lesions are rare, however, we observed 12.64% blepharitis and palpebral dermatitis. Ocular involvement due to vitamin A deficiency was 6.9%, including one case of BITOT SPOT, 4 cases of conjunctival xerosis and one case of keratomalacia. **Conclusion:** Xerophthalmia is an ocular lesion due to a dietary intake deficient in vitamin A that occurs during severe acute malnutrition. Its occurrence is increasingly rare even in developing countries. However, some cases are observed in practice and may be responsible for profound visual impairments.

Keywords

Severe Malnutrition, Vitamin A Deficiency, Xerophthalmia, Keratomalacia

1. Introduction

Severe acute malnutrition (SAM) is one of the main public health problems in

the world. It is responsible in addition to the general symptoms, vitamin A deficiency which can cause serious eye damage including keratomalacia [1].

SAM is defined as a significant protein-energy deficit, in variable proportions, which preferentially affects young children and is generally associated with infections. Its main form results from poverty, poor hygiene and food conditions and the social marginalization in which certain populations live in peripheral urban and/or rural areas, mainly affecting children under five [2].

A WHO study estimated in 2017 that around 50 million children aged 0 to 60 months suffered from acute malnutrition worldwide [3]. Adequate nutritional intake is essential for visual health, so ocular involvement is quite common and severe in early childhood. An estimated 250,000 to 500,000 are blind each year due to severe acute malnutrition due to vitamin A deficiency [4].

In Mali, according to EDS IV, the level of acute malnutrition can be described as high: in fact, one in six children (15%) suffer from acute malnutrition, including 9% in moderate form and 6% in severe form. The risk of xerophthalmia occurring is not negligible and death between birth and the fifth birthday is estimated at 191 per thousand births, *i.e.* nearly one in five children [5].

Vitamin A deficiency is the most common cause of preventable childhood blindness in developing countries [6].

This work aims to study possible ophthalmological lesions in children suffering from severe acute malnutrition.

2. Patients and Method

Patients: This study was carried out in a secondary ophthalmology center. It concerned all severely acute malnourished patients admitted for consultation in the pediatric department. It involved 174 eyes of 87 children aged 0 to 60 months suffering from severe malnutrition at the time of admission for treatment in a severe malnutrition unit.

All patients under 60 months of age suffering from severe acute malnutrition with or without ocular involvement were included. Patients who did not undergo an ophthalmological consultation within the first 48 hours of admission were not included in the study. This was a prospective and analytical descriptive study.

Sample size:

The sample size was determined according to the formula $n = z2\ (p.q)/i2$.

- n = sample size.
- z = 1.96 (95% confidence limit).
- p = prevalence.
- $q = 1 - p$.
- i = correction factor.

Using this formula, with a prevalence of severe acute malnutrition in Mali of 6%, the sample size was 86.66 patients for which 87 patients were examined in this study).

Method:

A questionnaire was designed and sent to the patient's mother or caregiver. The questionnaire consisted of:

- Sociodemographic data;
- Clinical data;
- Ophthalmological data.

Clinical examination:

All patients are examined in the severe acute malnutrition unit before being admitted to the ophthalmology unit.

The visual acuities of preverbal children were examined by assessing behavior to visual stimuli using the following techniques:

1) Occlusion of one eye;

2) And the pursuit of movements.

Ocular adnexa and anterior segment including conjunctiva, sclera, cornea, anterior chamber, pupil and lens were examined by slit lamp.

Complete mydriasis is obtained for each patient using 1% Tropicamide eye drops and the posterior segment is examined using a direct ophthalmoscope and, in some cases, an indirect ophthalmoscope for posterior segment lesions.

The socio-demographic part of the questionnaire was extracted from the malnourished registration register, and the ocular examination part was extracted from the ophthalmological consultation register. The questionnaire was validated by the ethics committee.

The data was collected on a survey form and analyzed using Epi info7.2 software.

3. Results

This study enabled us to examine 174 eyes of 87 children aged 0 to 60 months, admitted to the unit for the management of severe acute malnutrition on the day of their admission during which all the patients received doses of vitamin A. Most of our patients, almost two-thirds, were between 6 and 18 months old with a rate of 63.22%, the mean was 16, 73 months ± 20, 47 and the median was 14 months. Similarly, about two-thirds of the patients were male, *i.e.* 62.09%. (See Table 1)

All the children were not weaned at the time of admission. Only 24 were weaned. Of these, the average is 13, 87 months ± 7, 6, and 13 months for the median. The introduction of complementary foods was only 63.22% (55) from six months of life.

We noted incomplete vaccination with reference to the vaccination schedule according to age at screening during which vitamin A supplementation is administered. More than half of the patients had incorrect vaccination and had not received the preventive doses of vitamin A capsules correctly. Eyelid damage is rare. However, we observed blepharitis and eyelid dermatitis in 12.64%.

Ocular involvement due to vitamin A deficiency was 6.9% including one case of Bitôt spot, 4 cases of conjunctival xerosis and one case of keratomalacia (see Figure 1 and Figure 2).

Table 1. Demographic and clinical aspects of severe acute malnutrition.

Variable	n (%)
Age: month (means ± SD; median)	16, 73 months ± 20, 47; 14 months
Gender (female: male)	33 (37, 91): 54 (62, 09)
Age of wean: month (means ± SD; median)	13, 8750 months ± 7, 6; 13 months
Vitamin A supplementation before	55 (63.22%)
Blepharitis and eyelid dermatitis	11 (12, 64)
Bitôt spot	1 (1, 15)
Conjunctival xerosis	4 (4, 60)
Keratomalacia	1 (1, 15)
Total xerophtalmia	6 (6, 9)
Total of eyes examined	174 eyes of 87 children

Figure 1. Keratomalacia of the left eye causing.

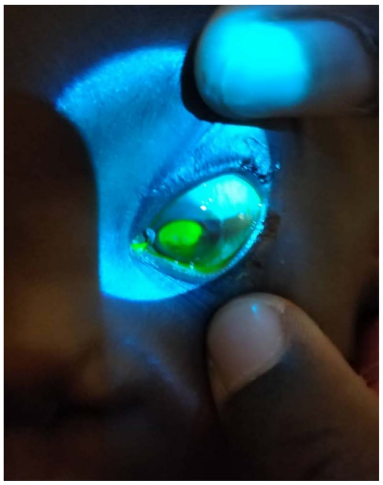

Figure 2. Keratomalacia of the left eye causing iris hernia in a malnourished child, fluorescein staining.

The patients all received a dose of vitamin A as an additional treatment. From 6 months to 11 months, a dose of 100,000 IU, and for children over 12 months, one dose of 200,000 IU. All the ocular lesions had regressed after evaluation in one week with the exception of the case of keratomalacia. This eye has unfortunately lost visual function.

4. Discussion

The rate of xerophthalmia is increasingly rare in sub-Saharan Africa, unlike the 80s and 90s when the disease was considered a real public health problem. However, some sporadic cases may be encountered in practice in certain geographical areas.

Our study made it possible to detect ocular involvement in approximately 14% of children, including 6.9% due to xerophthalmia, thanks to the creation of a multidisciplinary consultation composed of general practitioners, nurse nutritionists and a doctor ophthalmologist.

We observed 62.09% (54) of males and 37.91% (37) of female subjects with a sex ratio of 1.63. A study carried out in Sudan on 75 children [7] found 36 boys against 39 girls. In several studies there is no relationship between the occurrence of SAM and sex, however in our environment, the frequency of boys could be explained by the fact that girls are much more pampered by their mothers than boys.

We found that some infants were subject to nutritional value restrictions in their diet either by customary habit or ignorance. Added to this is inappropriate weaning. This would be responsible for the occurrence but also for the aggravation of protein-energy malnutrition. Thus in our observation, all the children suffered from an inadequate diet, there were about 30% of our children who were weaned before the age of 12 months and 2.72% were weaned before the age of 6 months.

Clinical vitamin A deficiency presents as apparent xerophthalmia and serum retinol levels below 0.35 μmol, while subclinical vitamin A deficiency presents as night blindness without evidence of clinical xerophthalmia [8]. We did not evaluate the serum level of retinol. Our study was based on the search for ocular clinical signs in malnourished children admitted for SAM.

A therapeutic dose of vitamin A was systematically administered to all patients upon admission. Some of the symptoms and signs of vitamin A deficiency, for example, night blindness disappear within 24 to 48 hours, active conjunctival xerosis and BITOT SPOTS begin to disappear within 2 to 5 days. [9]

Early weaning increases the risk of xerophthalmia. In our study, the occurrence of Bitôt spots was not significantly related to the precocity of weaning. Indeed, all children weaned early systematically received doses of vitamin A as part of the national protocol for the fight against malnutrition.

Alessandra Pereira Dantas *et al.* [10] conducted a study in Brazil, in children under 6 months of age suffering from severe acute malnutrition during which no eye damage had been obtained. This is explained by the fact that vitamin A defi-

ciency is less common in children under 6 months of age.

Eyelid lesions were observed in 11 (12.64%) cases. These infections may be due to secondary immunodeficiency caused by malnutrition leading to a predisposition to external infections and also poor hygiene. The signs of xerophthalmia were observed in 6.9% of cases. Of these, conjunctival xerosis was predominantly observed in 4 (66.67%) eyes.

Furthermore, Bitôt spot and keratomalacia were each observed in 1 patient 1 (16.67%) eyes. Our result is close to that of Divya Raichandani [11] in India who had observed 8.5% of cases of xerophthalmia including 58.9% of conjunctival xerosis, 11.8% of keratomalacia. However, he had not found any cases of Bitôt stains. Another mock study by Anandakumar [12] *et al.* documented conjunctival xerosis in 36% of SAM cases. However, Bitôt spots were observed in 24% of cases. A corneal scar was observed in one case. Night blindness was not observed in any child. These results are different from our observations, which could be due to the fact that our patients systematically received doses of Vitamin A during their postnatal follow-ups. We could not measure the visual acuities because of the altered general condition of the patients and their great difficulty in cooperating.

5. Conclusion

Xerophthalmia is an ocular attack due to a dietary intake deficient in vitamin A which occurs during severe acute malnutrition. Its occurrence is increasingly rare even in developing countries. However, some cases are described in practice and may be responsible for profound visual impairments.

Conflicts of Interest

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

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