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Severely Acutely Malnourished Children under Five of Age in Chad Setting: Cases of the Notre Dame des Apôtres Hospital in N'Djamena

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

According to the World Health Organization (WHO), Malnutrition is a pathological condition which combines both the deficiency of macroelements and trace elements, with increased susceptibility to infections. This state is manifested clinically by biochemical, anthropometric or physiological

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analyses. Malnutrition is one of the major causes of child mortality worldwide. It remains a major public health problem. Hence the objective of this work is to determine the epidemiological-clinical profiles of Severely Acute Malnourished at Notre Dame des Apôtres Hospital (HNDA). This was a prospective, descriptive study spread over 7 months from January 1 to July 31, 2023, including all severely acutely malnourished children with medical complications admitted to the Therapeutic Nutritional Unit (UNT). The variables studied were epidemiological and clinical. Data were entered and analyzed using Word 2016, Excel 2016 and SSPS 18.0 software. 1454 children were admitted to the UNT, 1080 cases of wasting, i.e. a frequency of 74.27%, and 90 SAM with oedema children, i.e. 6.18% of cases treated at the HNDA. Boys were the most represented with a percentage of 45.04% and a M/F sex ratio of 1.15. The combination of vomiting and diarrhea is the most dominant reason for admission with a percentage of 26.96%. The results of this work show that the clinical situation of malnourished children is strongly linked to epidemiological profiles. The parents of these children are therefore required to be educated about the personnel and their children's hygiene and authorities level poverty solutions needed to improve to decrease the incidence of malnutrition.

Keywords: Epidemiological-clinical; children; malnutrition; hospital; N'Djamena.

1. INTRODUCTION

Malnutrition according to the World Health Organization (WHO) is a pathological state which combines both the deficiency of macroelement intake (energy nutrients, proteins) and trace elements, with increased susceptibility to infections [1]. Malnutrition is one of the causes of child mortality worldwide [2]. Despite excess food production, malnutrition rates remain very high and constitute a major public health problem [3]. According to estimates from the World Health Organization (WHO), each year severe acute malnutrition (SAM) affects approximately 16 million children under 5 years of age [4].

In its 2019 report, the FAO notes that between 2017 and 2019, "chronic undernourishment still affects an unacceptable number of people, i.e. 22.8% worldwide. According to estimates, the overwhelming majority, some 850 million people, or just under 15% of the world's population, live in developing countries" [5].

Six (6) million children die each year from causes directly or indirectly linked to malnutrition [6]. According to "Médecins Sans Frontières" (MSF), in Africa on average, one child dies of malnutrition every six seconds. It remains a major public health problem in sub-Saharan Africa [7].

In Mali in 2016 the prevalence of acute malnutrition was 11.5% [8]. It varied between 10% to 13% in Senegal, Burkina Faso, Mauritania, Niger and Sudan in 2016. In the Central African Republic, it was at 1.3% at the end of 2019 [9].

In Chad, the prevalence of Global Acute Malnutrition (GAM) in 2022 was estimated at 8.6%, between 7.9% and 9.4%. This prevalence is below the high threshold of 10% set by the WHO, placing the country in a so-called average (precarious) situation in terms of public health. It decreased significantly by 2.3% compared to that observed in 2021 when it was 10.9% [10]. Chad had the 10th highest infant mortality rate in the world in 2005 [11]. According to the SMART (Specific, Measurable, Accessible, Realistic, Timely) 2022 survey, approximately one in seven (7) Chadian children dies before the age of five (5) and more than 322,000 suffer from severe acute malnutrition each year [12].

Malnutrition can cause serious complications if not treated early and may lead to death. Respiratory complications, circulatory complications, and organ failure are automatically managed [13]. In children, malnutrition can manifest itself through stunted growth, including cognitive development (concentration problems), a weakening of the immune system and consequently less resistance to bacterial and viral infections [14]. Malnourished children are at an increased risk of infection, which can further impact nutritional status via aggravating malnutrition through loss of appetite, gastrointestinal symptoms (i.e., vomiting and/or diarrhoea), and increasing nutritional demands to combat infection and clinical symptoms [15]. The objective of this study is to describe the SAM in children under five of age in Chad settings cases of the Notre Dame des Apôtres Hospital in N'Djamena (Chad).

2. PATIENT AND METHODS

2.1 Study Framework

The Therapeutic Nutritional Unit (UNT) of the Notre Dame des Apôtres Hospital (HNDA) served as our study setting. HNDA, classified as a category 2 hospital, is a Catholic religious' hospital.

2.2 Type and Period of Study

This was a prospective descriptive study spread over 07 months from January 1 to July 31, 2023.

2.3 Study Population

The study included all cases of SAM children aged 0 to 59 months admitted to the HNDA UNT.

2.4 Data Gathering

The collection of our data consisted of systematic recruitment of all patients with malnutrition seen during the period of our study. Anthropometric measurements were collected according to WHO 2006 procedures [16]. We used a SECA-type scale (precision of 100 g), the height expressed in centimetres (cm) was measured using a measuring rod in a standing position for children aged 2 years or over and lying down for children under 2 years old (accuracy of 1mm). Age was determined from the children's birth certificates and health records. Anthropometric indices such as The Weight/Height ratio (P/T = Weight in Kg/T in cm) had been calculated and the interpretation was based on the WHO reference values: P/T less than -3Z acute malnutrition score severe, P/T ≥ - 3 and < -2 moderate malnutrition and P/T ≥ -2 normal.

2.5 Data Analysis

Word processing and tables were carried out using Microsoft Word software version 2016. Graphs were created using Excel 2016. Data entry and analysis were done using the software SPSS 18.0 for the calculation of averages.

3. RESULTS

3.1 Nutritional Status of Children

Of the 1454 children aged 0 to 59 months hospitalized for malnutrition; 954 had severe acute malnutrition, i.e. a frequency of 65.61%.

Table 1. Percentage of severely acutely malnourished children

Nutritional status	Effective	Percentage (%)
Severe acute malnutrition	954	65.61
Good nutritional status	500	34.39
Total	**1454**	**100**

3.2 Age and Sex of Severely Acutely Malnourished Children

Malnutrition was commoner among age group 13-24 followed by 0-12.

Table 2. Distribution of children by age group

Age (months)	Frequency (in %)
0 – 12	**15.95**
13 – 24	**63.96**
25 – 36	**11.96**
37 – 59	**8.11**

Fig. 1. shows a male/female ratio of 1.18 with male predominance (54%).

3.3 Characteristics of Parents of Severely Acutely Malnourished Children

Analysis of the survey results shows that more than half of severely acutely malnourished children have farmers and housewives. 57% of parents have married status polygamous.

The majority of the malnourished had farmers' fathers (63%) and housewife's mothers (52.3%) with a dominance of polygamous households (57%). This is due to poor hygiene conditions and the illiteracy of parents.

3.4 Types of Breastfeeding

Mixed breastfeeding is the type of breastfeeding most common to children with 55% of cases. Is one of the most effective ways to ensure child health and survival. Breastmilk is the ideal food for infants. It is safe, and clean and contains antibodies which help protect against many common childhood illnesses.

3.5 Type of Withdrawal

Up to 76% of our patients were currently breastfeeding.

3.6 Vaccination Status

Most of our patients do not have up-to-date vaccination status with 78% of cases. The children most at risk are those who do not have up-to-date vaccination status.

3.7 Reasons for Consultation

Diarrhea and vomiting were more represented with 26.96% of cases followed by Weight loss at 13%, Cough at 9%, Edema at 7.97% and Anorexia at 6,94%. These reasons for consultation are the most common because the majority of children do not respect hygiene.

3.8 Associated Pathologies

Gastroenteritis was the most common associated pathology in all children, i.e. 100% of cases, followed by malaria in 70% of cases (malaria period). Malnourished children with HIV represent 22%, severe anaemia 3% and 2% for pulmonary infections.

3.9 Traditional Treatments

Removal of the uvula is the most used traditional treatment with 71% of cases, force-feeding 13% and 14% for many other practices which constitute a gateway to infections.

Table 3. Parental characteristics

	Frequency (in %)
Father's status	
Farmer	**63.13**
Moto-Taximan	**14.78**
Official	**22.07**
Mother's status	
Housewife	**52.43**
Street seller	**33.79**
Official	**4.33**
Shopkeeper	**9.45**
Marital status of parents	
Monogamous married	**25**
Polygamous married	**57**
Widowed/Divorced	**18**

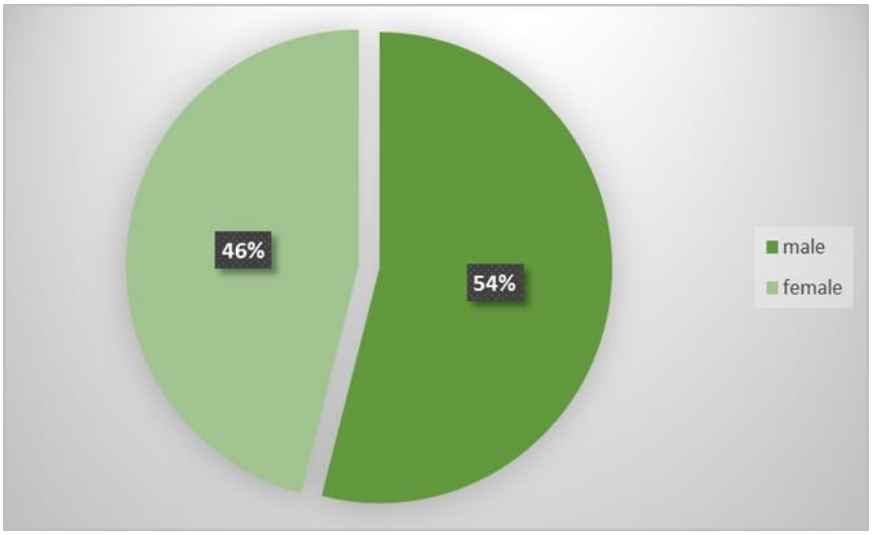

Fig. 1. Distribution of children surveyed by gender

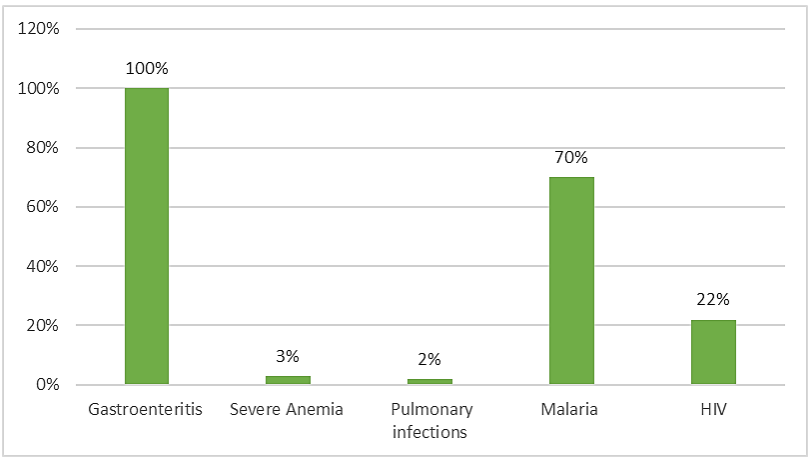

Fig. 2. Types of breastfeeding in the first six (06) months

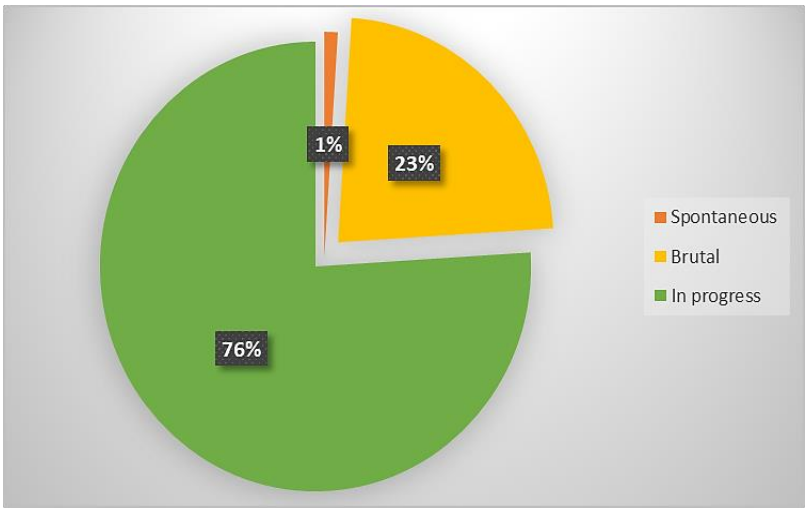

Fig. 3. Representation according to types of withdrawal

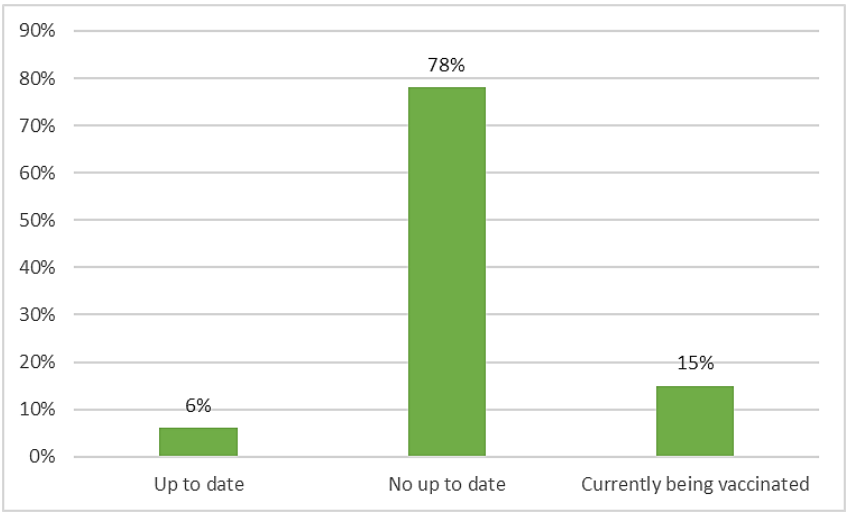

Fig. 4. Representation of the vaccination status of children

Table 4. Distribution of children according to reasons for consultations

Clinical Variables	Frequency	Percentage %
Fever	31	2.13
Vomiting	262	18.01
Diarrhea and vomiting	392	27
Diarrhea	174	11.97
Anorexia	101	6.94
Cough	131	9
Weight loss	189	13
Edema	116	7.97
Seizures	58	3.98
Total	**1454**	**100**

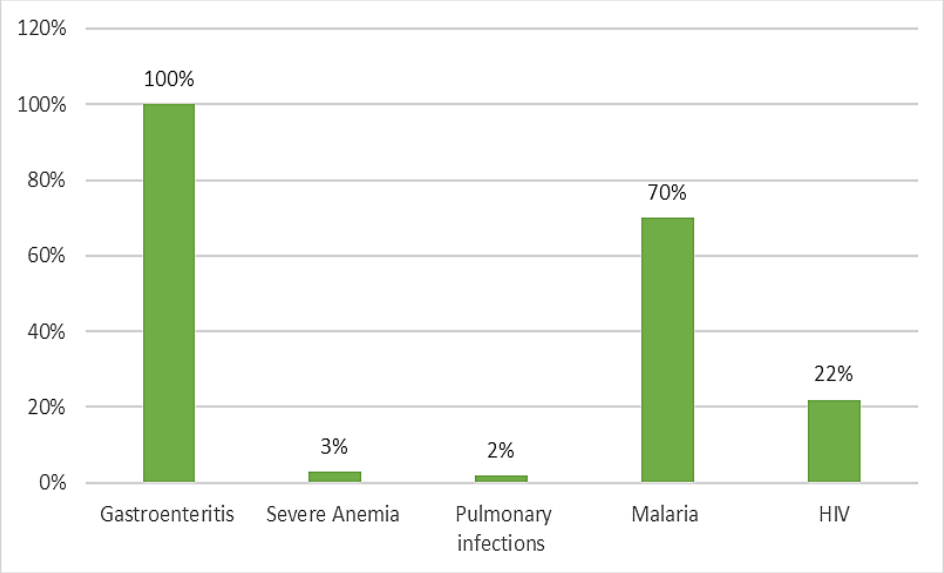

Fig. 5. Distribution of children according to associated pathologies

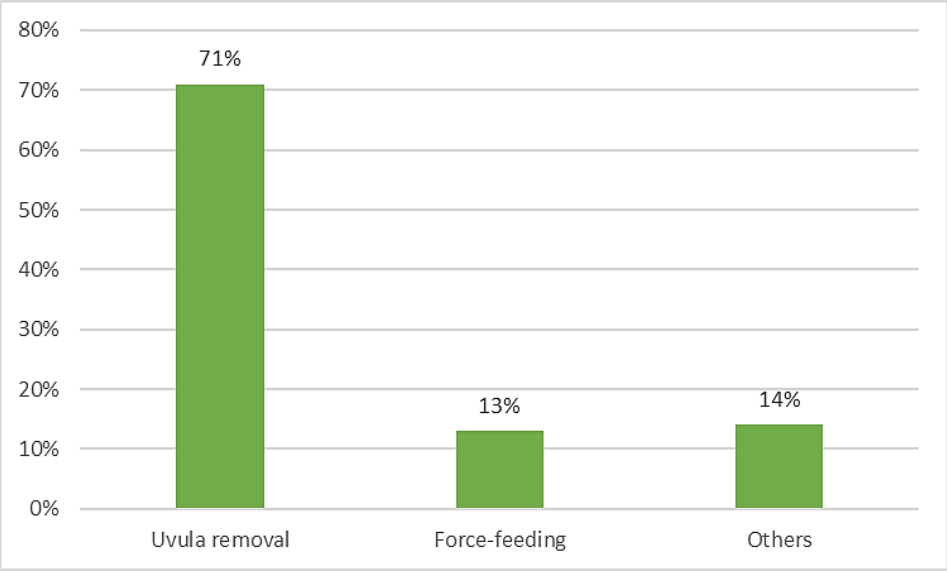

Fig. 6. Representation according to the traditional processing mode

4. DISCUSSION

4.1 Epidemiological Aspects

During the study period, 1454 children were admitted to the Therapeutic Nutrition Unit. Among these children, there were 1080 cases of wasting, i.e. a frequency of 74.27% and 90 edematous cases, i.e. 6.18%, treated at the Notre Dame des Apôtres Hospital. This result is higher than that of the service statistics in 2022 which was 1208 (16.91%). This is probably due to the demographic growth of the population, the cost of living or the increase in pockets of poverty [17].

SAM was commoner in the age group 12-24 months with 63.96%. This result is comparable to those obtained from BARRY et al. at INSE Donka Conakry whose average age is 16.87 ± 16.23 months [18] and from MAMADOU in Mali [19] in 2010 which found 31.30% for the age group of 12 to 23 months and 30.70% from 6 to 11 months. Indeed, this period of life corresponds to the period of weaning of children and transition to toddler feeds, which is an important period in the growth and development of children and is a challenge in low-middle income countries. This makes this milestone difficult for the child to overcome, thus leading to a disruption of the nutritional balance [20].

Regarding the sex of children, we noted a predominance of the male sex with 54,26 % of the cases. This was well described in the literature [21,22], 76.08% of the malnourished resided in rural areas. MALLE in 2017 [23] in Mali reported that 75.40% of the malnourished came from rural areas, which is comparable to our result. This could be explained by the lack of education on malnutrition, the non-compliance with health and diet measures on the one hand and the low socio-economic level on the other hand because the study confirmed that 83.76 % of mothers and 22.07% of fathers had a primary school level. This result shows that the majority of parents did not have adequate knowledge about child nutrition, which can lead to an increased incidence of malnutrition because education would help parents identify the factors that may lead to malnutrition in order to act to avoid it.

The mothers were unemployed 8.45% and 63.13% of the fathers were motorcycle taxi drivers, lower than that of MAMADOU T et al, in Mali [19] who found 92.1% of the mothers were unemployed. In fact, the majority of women do not have adequate means that could help the family increase its annual income. Improvement in parents' income could overcome the food shortage of the whole family which needs national authority's intervention.

4.2 Clinical Aspects

Regarding the mode of feeding, mixed feeding before the age of 6 months was represented in 55.36% of cases, breastfeeding with pharmaceutical milk in 15.74% of cases and insufficient breast milk production was the most represented cause of mixed feeding followed by maternal illness and ignorance. Doumbia [24] in 2014 in Mali reported that maternal illnesses were the main causes of mixed feeding, i.e. 44.14%.

Breastfeeding should be exclusive until the age of 6 months because breast milk is a living liquid that constantly adapts to the metabolic, nutritional and immunological needs of the child [25]. Exclusive breastfeeding is represented in a proportion of 28.88% of cases. Our results were lower than those of MAMADOU T in Mali which reports 30,66% of cases of exclusive breastfeeding. This percentage depends on the large number of malnourished children [26].

As for the vaccination situation of children, the study showed that 78.06% of SAM children have their vaccination records not up to date. This makes children vulnerable to certain preventable diseases such as measles and tuberculosis. As recurrent infections contribute to the pathogenesis of malnutrition [27], it seems logical that vaccination may play an important role in preventing malnutrition. Observational analyses across countries show an association between coverage of vaccination and the prevalence of wasting [28] and stunting [29]. The combination of diarrhoea and vomiting is the first reason for consultation with a percentage of 27%. This couple very often drifts due to poor cleanliness during breastfeeding. We must educate mothers about respecting cleanliness when breastfeeding.

During this study, wasting was the most observed form with 74.34% of cases compared to 19.46% mixed form and 6.18% edematous form. This result is comparable to that of BARRY et al. [18] who found respectively in Mali, 80.30% of wasting form and 94.3% of edematous at the Donka Nutrition Institute in Conakry and

corroborates the literature data which stipulates that the wasting form is the most common.

Regarding infections in our cohort, all malnourished people presented a gastroenteritis infection (100 %), 70.06% cases of malaria and 3.78% cases of severe anaemia. This result is higher than that of NGUEFACK F., et al. who found 34% of gastroenteritis and 20% of malaria in Cameroon [30] and ADEBO et al., who found 30% of cases of severe anaemia in the Benin Republic [31]. Infection, more often associated with malnutrition, could be explained by the fact that malnutrition may cause secondary immunodeficiency, which makes it vulnerable to any infection. Antibiotic therapy was systematic in our patients. The national protocol recommends systematic antibiotic therapy to patients suffering from SAM, even if the patient does not present clinical signs of infections because, despite the absence of clinical signs, they could suffer from infections [32].

In our study, pulmonary infections constituted 2.06% of cases, and diarrhoea represented 11.96% of cases. This result was low in comparison to the findings in other studies with NGUEFACK F. and al. and GOLDEN M., where the proportion of pulmonary infections was 22 % [30,33]. This can be explained by the fact that malnutrition is accompanied by immunosuppression which is the cause of various infections. According to Beau and al. [34], these medical complications, apparent or not, of a metabolic and infectious nature, are often frequent and are observed in 70% of cases of advanced severe acute malnutrition.

5. CONCLUSION

The results of this work show that the clinical situation of malnourished children is strongly linked to epidemiological profiles. The majority of children were wasted followed by edematous and mixed forms during this study.

We found that most of the children come from a polygamous home with fathers who were farmers and mothers who were unemployed.

Having less information on infant nutrition, parents did not encourage exclusive breastfeeding in their children and were more likely to practice force-feeding and uvula removal, which are practices that make children vulnerable to infections and malnutrition.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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