

Severe acute malnutrition among infants under 6 months of age in the teaching hospital of Borgou / Alibori in Northern Benin

Abstract

Background: Acute malnutrition in infants under six months is a scourge that is little studied in relation to the global problem of child malnutrition. This paper aims to describe the sociodemographic, clinical, therapeutic, and outcome features of this phenomenon in the Teaching Hospital of Borgou /Alibori based in Parakou in northern Benin.

Patients and methods: This was a two years case-control retrospective and descriptive study carried out in the pediatric care unit of the said hospital from January 1, 2016, to December 31, 2018. It included infants aged 1 to 6 months presenting with severe acute malnutrition defined according to the WHO criteria. Variables investigated were sociodemographic, clinical, therapeutic, and outcome-related.

Results: Total of 78 out of 508 infants less than 6 months of age were severely malnourished (5.35%). Their mean age was 4.65 months±1.28. Contributory factors were early dietary diversification (69.2%), and maternal death (14.1%). Marasmus and kwashiorkor were their clinical expressions. Associated complications were gastrointestinal infections (38.5%), septicemia (17.9%), and HIV infection (5.1%). Diluted F-100 was the most used therapeutic food (46.1%) with a recovery rate estimated at 41% and mortality at 19.3%.

Conclusion: Severe acute malnutrition in infants under six months of age is real and it involves three out of twenty infants admitted to the hospital. In-hospital mortality is significant. It is urgent to review the policies related to exclusive breast feeding promotion.

Keywords: severe acute malnutrition, young infant, Benin

Volume 13 Issue 2 - 2023

Agbeille MF,¹ Noudamadjo A,¹ Kpanidja G,¹ Falola B,² Ewassadja E,² Adedemy JD,¹ Agossou J¹

¹Faculty of Medicine, Mother & Child Department, University of Parakou, Benin

²Institute for Nursing and Obstetrical Care Training, University of Parakou, Benin

Correspondence: Agbeille M Falilatou, Faculty of Medicine, Mother and Child Department, University of Parakou, Benin, Tel 0022995768882, Email fmagbeille@yahoo.fr, fallychou2015@gmail.com

Received: July 12, 2023 | **Published:** July 24, 2023

Introduction

Acute malnutrition among infants under five years of age is a real public health concern. According to the WHO data released in 2018, it accounted for 45% of the burden of disease recorded in that age group.¹ Although attention was focused on children aged from 6 to 59 months, young infants under six months of age are not spared from this scourge; approximately 8.5 million of them are emaciated across the world with 3.8 million of severe wasting.² Due to their physiological and immune immaturity, they are exposed to a high risk for short-term morbidity and death.^{3,4} The first six months of life are characterized by maturation as well as fast and intense growth of the body, particularly the nervous system.⁵ Brain development among young children is sensitive to undernutrition with long-term impacts.⁶ The first 1000 days of life are a window of opportunity for having a positive influence on the nutritional status and health of infants and children in the short, medium, and long term. Breastfeeding plays a critical role during that period. Assuming that exclusive breastfeeding (EBF) till six months of age has a protective effect, acute malnutrition of infants less than six months of age should not happen. However, the practice of exclusive breastfeeding is globally low; according to the WHO (2018), only 40% of infants were exclusively breastfed during the first six months of life.¹ In Benin, according to the 2017-2018 Population and Health Survey (EDS), the prevalence of exclusive breastfeeding (EBF) was estimated at 42%.⁷ Therefore, infants under six months of age are exposed to severe acute malnutrition. While in the majority of cases, acute malnutrition in young infants is related to harmful nutritional practices,⁸ in some cases it can be the consequence of chronic pathologies, whether infectious or not.

The pediatric care unit of the Borgou/Alibori Teaching Hospital Regional is a referral unit in the Northern region of Benin. In 2018, the practice of exclusive breastfeeding in the District of Parakou was estimated at 26.7%.⁹ The frequency of severe acute malnutrition among children aged 1 to 59 months in the pediatric care unit was 32%.¹⁰ This study aimed to describe the sociodemographic, clinical, therapeutic, and outcome characteristics of infants less than six months suffering from severe acute malnutrition in this hospital, to help focus prevention and care interventions on this sensitive group of children

Patients and methods

This research work was a case-control and descriptive study carried out in the pediatric care unit of the Hospital; it covers the period running from January 1, 2016, to December 31, 2018.

Inclusion criteria

- i. Be 1 to 6 months old
- ii. Meet the WHO diagnostic criteria for severe acute malnutrition¹¹ and the ones included in the National Protocol for acute malnutrition management currently applicable in Benin i.e.:
 - a) an infant too weak to suck efficiently (whatever may be his weight-for-height index, weight-for-age index, or any other anthropometric measure), or
 - b) an infant who is not gaining weight at home (after a series of weight measurements during the growth monitoring, for example, a change in the Weight-for-Age index) or
 - c) a Weight/Height index <-3Z-score, or

- d) presence of bilateral edema
- iii. Have a usable medical record i.e. including accurate information on general enquiries about mothers or their caregivers, and infants, the child's feeding pattern since birth, the child's immunization status, and antimalarial prophylaxis, the main clinical signs presented in the child, on admission to hospital, diagnosis, treatment, and evolution, particularly of weight.

Exclusion criteria

All the medical records of infants having a history of low birth weight (Weight lower than 2500g) and those which do not include a minimum of information, particularly child feeding pattern since birth, general information or features on mothers; diagnosis, and treatment.

The dependent variable was the existence of severe acute malnutrition defined according to the criteria mentioned above. The independent variables were socio demographic features of mothers and infants, data related to infant feeding since birth, as well as clinical, therapeutic, and outcome features.

On admission, all the infants meeting the inclusion criteria were provided care according to the national protocol currently applicable in Benin. This treatment rest on:

- i. The medical therapy that is based on the management of acute complications; antibiotic therapy is systematic and is based on amoxicillin with a dose of 30mg/Kg two times a day associated with gentamicin (3 to 5mg/kg/j) during 4 to 5 days and the one of management of acute complications.
- ii. The nutritional treatment: the milk used for supplementation utilizing suction may be either an infant formula for preterm babies, either of some diluted F100 or expressed breast milk. In the presence of an emaciated child, the choice can be made between diluted F100, expressed maternal milk, or infant formula for premature babies. The amount of milk to be administered through supplementation by suction is estimated in kg of weight. F75 is used in the presence of bilateral edema. When edemas vanish and the infant suckles firmly, he can be put on diluted F100 or first-age infant formula milk.

In addition to systematic antibiotic therapy, infants receive vitamin A with a dose of 50000UI and 5mg folic acid as a single daily treatment. Fluconazole is administered in case of severe infections and the presence of fungal infections.

The care provided to the mother, particularly utilizing hydration using 3 liters a day, vitamin A at 200000UI if the infant is under 2 months of age or if the mother has had her menses again, and 25000UI per week if the infant is above two months; supplements with micronutrients are administered to the mother and advice on local recipes known to stimulate milk production (fermented porridge) are given even though their positive effect is not demonstrated. As far as mothers are concerned, in addition to the nutritional advice given to them, they receive some Plumpy Nut which is a ready-for-use therapeutic food used for the management of non-complicated severe acute malnutrition with a dose of 3 small bags a day in addition to 200000UI of Vitamin A. We conducted a complete census of all the children meeting our inclusion criteria. The investigated variables were sociodemographic, clinical, therapeutic, and outcome features. The data have been entered and then processed using the software Epi Info version 3.5.3.

Results

Frequency of acute malnutrition among the young infants

There were 78 infants aged 1 to less than 6 months presenting with severe acute malnutrition included in the study with a total of 508 infants of the same age attending in the unit during the period i.e. a frequency of 15.3%.

Ratio of infants less than 6 months of age affected by severe acute malnutrition among severely malnourished children under five years of age

A total of 1645 children less than 5 years of age suffering from severe acute malnutrition were also identified during the period; including 78 infants under six months of age i.e. 4.7%.

Socio-demographic characteristics of severely malnourished infants and their mothers/guardians

Male infants were predominant in 64.1% of cases (50/78). Sex ratio was 1.71.

The mean age on admission was 4.65 months \pm 1.28 with extremes. Infants in the 3-5 month age group were predominant (48.7%). They came from the district of Parakou in 84.62% of cases. Among them, 11 (14.1%) were maternal orphans and were being cared for by their grandmothers or a female guardian from the family.

As regards their mothers, they were illiterate in 57.7% of cases. The predominance of housewives and traders was noted, respectively 47.4% and 18%.

Clinical characteristics and features of infants suffering from severe acute malnutrition (SAM) Reasons for consulting a medical practitioner

Fever was the main reason for consulting a medical practitioner (66.7%) followed by diarrhea (42.3%) and vomiting (30.8%).

Feeding pattern and difficulties related to exclusive breastfeeding practice

Among the 78 infants, 24 i.e. 30.7% had been exclusively breastfed. Dietary diversification was early in 69.3% of them, with diversification age oscillating between 1 month and 3 months in 44.9% of cases. The main diversification foods were water associated with grain porridge in 46.1% of infants and the introduction of water and herbal infusions in 23% of cases; and exclusive introduction of grain porridge was noted in 20.5% of cases.

Many obstacles related to the practice of breastfeeding had been identified: lack of milk (28.2%), mother's death (14.1%), severe maternal diseases (2.6%), and breast abscess (1.3%). The severe maternal illnesses noted were postpartum cardiomyopathy and postpartum psychosis.

Type of severe acute malnutrition and associated acute medical complications

Considering the type of acute malnutrition, marasmus was predominant in 72 infants (92.3%) followed by the mixed form (kwashiorkor-marasmus) in 6 cases (7.7%).

The main diseases associated with acute malnutrition were respectively gastrointestinal infections (38.5%), septicemias (17.9%), bronchopneumonia (16.6%), and severe malaria (15.4%).

HIV infection was observed in 4 children (5.2%). In five children, severe acute malnutrition was associated with non-communicable chronic diseases, particularly congenital heart diseases, congenital hydrocephalus, and the effects of anoxic-ischemic encephalopathy.

Therapeutic and outcome features

The therapeutic foods used were diluted F100 in 46.1% of cases, infant formulas in 34.7%, and F75 in 7.7% of cases according to supplementation utilizing suction (TSS). Expressed breast milk given into a cup was used in 11.5% of cases.

Systematic medical treatment consisted of Vitamin A (50 000UI) and folic acid (5mg) in all infants. Amoxicillin was administered in 56.4% of cases and fluconazole was administered to children in 55.5% of cases. The other treatments were administered depending on medical complications.

As regards outcome, average weight gain was $12.76 \text{ g/kg/j} \pm 2.1$ with extremes of 1.6 and 57g /kg/day; the average length of stay (ALOS) was 10.3 ± 4.8 days with extremes of 5 and 17 days.

41% of the infants (32/78) were cured and in-hospital mortality was estimated at 19.3% (15/78). Among the 15 deaths registered, 12 infants had diarrhea (80%) and 3 had HIV infection (20%). 39.7% (31/78) of the infants left the hospital against medical advice.

Discussion

The frequency of severe acute malnutrition was estimated at 15.35% in infants under 6 months of age. In 2015, in Burkina Faso, Kabore and *al.* observed a frequency of 8.8%.¹² Diouf and *al.* from Senegal in 2000 found in rural areas a prevalence of 11.5%.¹³

As regards the ratio or share of infants under six months with a severe form of wasting among children aged five years, it was 4.7%. This ratio is higher than the one found by Vygen and *al.* in a therapeutic nutrition center located in the Southern region of Niger in 2013.¹⁴

Mothers' illiteracy and ignorance of good nutritional practices may explain high frequency. Breastfeeding is recognized as a traditional practice for infant feeding in Africa but studies suggest that even if its overall frequency is high and reaches around 96% in Benin, exclusive breastfeeding remains below 45% both at the national level and in the District of Parakou.^{7,9}

These data suggest that the assessment of the nutritional status of infants less than 6 months, very often neglected, must be a matter of concern both at the operational and decision-making level, within the strategy for the reduction of infant and child mortality. As evidence, Population and Health Surveys (EDS) do not take it into account.⁷

Infants' mean age on admission was $4.65 \text{ months} \pm 1.28$. The infants in the 3-5 months age group were predominant (48.7%). Lower mean ages have been noted in Burkina and Togo.^{12,15} Acute malnutrition usually does not represent the main reason for consulting a medical practitioner but rather the presence of acute medical complications; as our findings demonstrate, only 9% of the children had been admitted to the pediatric care unit for wasting.

In our cohort, many difficulties related to the practice of exclusive breastfeeding had been identified. Among those factors, there are bad nutritional practices with the introduction of water added to grain porridge in 66.7% of cases, and the exclusive introduction of grain porridge in 29.6% of cases. These harmful traditional practices of infant feeding have been described by other authors in Sub-Saharan Africa.¹³⁻¹⁶ Those factors lead to diarrhea which is recognized as a key factor in child malnutrition.¹⁷

Except for those factors, a mother's death also represented an obstacle to breastfeeding and involved 14.1% of the infants included in our cohort. In Togo, Azoumah and *al.*¹⁵ noted 11.1% of maternal orphans. Mother's death impedes breastfeeding. Orphaned infants were under the care of their grandmothers or female guardians who had also used harmful traditional nutritional practices. Furthermore, eight of those orphans had benefitted from feeding based on reconstituted infant formula under poor hygiene conditions and non-compliance with amounts. The same applies to infants whose mothers suffered from a serious disease. In addition to those factors, lack of breast milk and breast diseases was also found as obstacles to the practice of exclusive breastfeeding. Those factors are also described in the literature.^{12,15,18} They may not only be due to delay in early breastfeeding¹² but also to early dietary diversification since the introduction of foods other than breast milk reduces feeds and therefore milk production. Moreover, the lack of milk was one of the current arguments put forward by mothers to justify early dietary diversification; infants' cries after feeds would be the expression of a lack of satiety in children according to those mothers and would reflect the lack of milk. Some authors have identified other causes of the lack of milk such as mothers' psychological problems in general; especially depression and the absence of support from the husband or the family.¹⁴

Marasmus was the main type of acute malnutrition noted followed by the mixed form. This remark confirms the data published in the literature.^{14,15}

Gastrointestinal infections were the main acute complications noted (38.5%). Indeed, chronic diarrhea is a key factor associated with child malnutrition.¹³ HIV infection was noted in 5.2% of children. Bachou and *al.* observed in Kampala that HIV-infected children had a higher risk to get chronic diarrhea, a frequent co-morbidity of acute undernutrition.¹⁹ In addition to those diseases, severe acute malnutrition occurred in children presenting with non-communicable chronic diseases. Those diseases, namely congenital heart diseases, are the source of overall malnutrition due to the increased consumption of energy; those with neurological disorders presented with difficulties while sucking.

As regards their nutritional needs, the children were cared for in accordance with the national protocol applicable in Benin in most cases. Breast milk expressed into a cup and given was used in 11.5% of cases. The technique of supplementation by means of sucking helps associate therapeutic milk with breast milk. For Rana and *al.*²⁰ breastfeeding support is a priority during this nutritional care.

As well as the outcome is concerned, the mean weight gain was 12.76 g/kg/day ; these results are comparable to those observed in Niger.¹⁴ But, according to the WHO guidelines, the mean weight gain recommended for children's nutritional care is higher than 5 g/kg/day .²¹ As regards the average length of stay, it was estimated at 10 ± 4.8 days, lower than those observed in Niger and Togo, and it may be due to the high rate of wastage in our cohort. In our study, the recovery rate is 41% lower than that of the WHO which must be above 50%. This is negatively influenced by the significant number of dropouts (39.7%) whereas the WHO recommends less than 15% of dropouts. The mortality rate estimated at 19.23% in our study is similar to the one found in Burkina¹² but higher than the 15% recommended by the WHO.²² However, some researchers from the West African sub-region had found lower rates.^{14,15} Their studies had been conducted in nutritional therapeutic centers more structured than our own, with facilities and staff exclusively dedicated to providing care to malnourished children. Those deaths were associated with

diarrhea and HIV infection which have been identified as predictors of mortality in the context of acute malnutrition.^{12–15}

Conclusion

Severe acute malnutrition among infants under six months of age affects three in twenty infants in our unit. Early dietary diversification is the main contributory factor. Significant in-hospital mortality involves one out of five malnourished young infants. To curb this phenomenon, it is important to strengthen the promotion of exclusive breastfeeding. Furthermore, it may be suggested to include a systematic assessment of the nutritional status of subjects in that age range as an indicator of good medical practice.

Authors' contribution

Agbeille Mohamed Falilatou and Noudamadjo Alphonse have contributed to the writing of this manuscript. Bernadin Falola and Expédie Ewassadja participated in the data collection. Kpanidja Gérard, Adédemy Didier and Agossou Joseph have contributed to the proofreading of the document.

Acknowledgements

None.

Funding

None.

Conflicts of interest

The Authors declare that there are no conflicts of interest.

References

1. WHO. Infant and young child feeding. Key facts. 2021.
2. Kerac M, Blencowe H, Grijalva-Eternod C, et al. Prevalence of wasting among under 6-month-old infants in developing countries and implications of new case definitions using WHO growth standards: a secondary data analysis. *Arch Dis Child*. 2011;96(11):1008–1013.
3. Kerac M, McGrath M. Management of acute malnutrition in infants under 6 months of age; the biology of the first 1,000 days 2017. 2018:207.
4. Grijalva-Eternod CS, Kerac M, McGrath M, et al. Admission profile and discharge outcomes for infants aged less than 6 months admitted to inpatient therapeutic care in 10 countries. A secondary data analysis. *Maternal & child nutrition*. 2017;13(3):e12345.
5. Kerac M, McGrath M, Grijalva-Eternod C, et al. Management of Acute Malnutrition in Infants (MAMI) Project. Technical review: current evidence, policies, practices and program outcomes.
6. Grantham-McGregor S, Baker-Henningham H. Review of the evidence linking protein and energy to mental development. *Public Health Nutr*. 2005;8(7A):1191–1201.
7. National Institute for Statistics and Economic Analysis (INSAE) Benin and Macro International Inc. Population and Health Survey. Benin 2017-2018: 211.
8. van Immerzeel TD, Camara MD, Ly ID, et al. Inpatient and outpatient treatment for acute malnutrition in infants under 6 months ; a qualitative study from Senegal. *BMC Health Serv Res*. 2019;19(1):69.
9. Noudamadjo A, Agossou J, Adédemy JD, et al. Sociodemographic and cultural factors associated with the practice of breast feeding in the District of Parakou. *Annals of the University of Parakou, "Health Sciences" Series*. 2018;8(1):18–20.
10. Statistical Data, Pediatric Care Unit, Borgou /Alibori Regional University Teaching Hospital. 2018.
11. Ministry of Health, Benin. National Protocol for the management of acute malnutrition 2015 Edition, 125–134.
12. Kaboré A, Ido R, Ouédraogo S A P, et al. Severe acute malnutrition among children under 6 months of age: in hospital prevalence. *African and Malagasy Review for Scientific Research / Health sciences*. 2019;1(2):28–35.
13. Diouf Diallo A, Camara B, Diagne I, et al. Protein-calorie malnutrition in children under five years in Senegalese rural areas (khombale). *Med Afr noire*. 2000;5:225–228.
14. Vygen SB, Roberfroid D, Captier V, et al. Treatment of severe acute malnutrition in infants aged <6 months in Niger. *J Pediatr*. 2013;162(3):515–521.e3.
15. Azoumah KD, Segbedji KAR, Douli KN, et al. Early acute undernutrition among infants aged 1 to 6 months in the district of Kara (Togo) from 2011 to 2015.
16. Matsuyama A, Karama M, Tanaka J, et al. Perceptions of caregivers about health and nutritional problems and feeding practices in infants: a qualitative study on exclusive breastfeeding in Kwale, Kenya. *BMC Public Health*. 2013;13:525.
17. Janvier E, Lemdani M, Fall M, et al. Protein-energy malnutrition among children under five years in ten villages of the rural community of Bandafassi. *Med Afr Noire*. 2009;56:327–337.
18. Ake-Tano O, Ekou F, Yao EK, et al. Feeding practices in 0 to 2 year children attended in a health facility of Abidjan. *Revinscméd*. 2014;16(2):89–93.
19. Bachou H, Tylleskar T, Downing R, et al. Severe malnutrition with and without HIV1 infection in hospitalized children in Kampala, Uganda: differences and clinical features, hematological findings and CD4+ cell counts. *Nutr J*. 2006;5:27.
20. Rana R, McGrath M, Gupta P, et al. Feeding Interventions for Infants with Growth Failure in the First Six Months of Life: A Systematic Review. *Nutrients*. 2020;12(7):2044.
21. WHO. Updates on the management of severe acute malnutrition in infants and children (2013 Guidelines).
22. World Health Organization. Management of severe malnutrition: A manual for physicians and other senior health workers. Geneva. 2000;101:63.