



Research Article

Factors Associated with Complications of Severe Acute Malnutrition in Children Under 5 Years Admitted in Two Health Facilities in Ngaoundere

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Abstract

Background: Severe Acute Malnutrition (SAM) is a major global health problem. In Cameroon, the prevalence of SAM remains high and estimated at 1.3% in 2014. In Adamawa Region, it has remained constant, due to socio-demographic factors and greatly contributes to childhood morbidity and mortality.

Objective: To determine the prevalence and factors associated with complications of SAM in hospitalized children in two hospitals in Ngaoundere.

Materials and methods: The study was a hospital-based cross-sectional prospective study carried out over a period of 9 months. A structured questionnaire was used to collect information with respect to past medical history, socio-demographic data and clinical data. Data were entered and analyzed with SPSS 26. We used a weighing scale to take the weight of the patients, MUAC measuring tape and stadiometer for length measurement.

Results: The prevalence of SAM was 5.8%. The most represented age group of our 82 participants was 12 to 23 months with 34 (41.5%) males and 43 (52.4%) were female. The most represented maternal age group was 24 to 28 years, 25(30.5%). 53(64.6%) children presented with complications. Dehydration was the most frequent complication, 40(75.5%). Children who were not exclusively breastfed for at least 6 months of age ($P=0.038$), had < 4 meals a day ($P=0.036$), monogamous marriage ($P<0.001$), resident in an urban area ($P<0.001$) and internal displaced families ($P=0.002$) were associated with complications of SAM. A total of 73(89%) of children were discharged alive and 9(11%) died during hospitalization.

Conclusion: Severe acute malnutrition in Adamawa region is still high (5.8%) with dehydration being the main complication during hospitalization. Both socio-demographic and nutritional factors were associated with complications of SAM. We therefore recommend intense nutritional counselling in these health facilities to curb SAM and its complications.

Keywords: Severe Acute Malnutrition; Prevalence; Risk Factors; Complications; Ngaoundere

Introduction

Severe Acute Malnutrition (SAM) is defined by a very low weight for height (below $-3z$ scores of the median WHO standards), by visible severe wasting or by the presence of nutritional edema [1]. In Cameroon, the prevalence of SAM remains high and estimated at 1.9% in 2011 and 1.3% in 2014 [2]. Regions like Adamawa, North and Far north regions have a higher prevalence of

malnutrition of 5.2%, 6.7%, 9.0%, respectively [3]. In Addition to that, 1289 children have been admitted for therapeutic care due to malnutrition from the above regions [3]. The main forms of childhood malnutrition occur predominantly in children <5 years of age living in low-income and middle-income countries and include stunting, wasting and kwashiorkor, of which severe wasting and kwashiorkor are commonly referred to as severe acute malnutrition [4]. It is estimated that 19 million preschool-age children, mostly from the WHO African Region and South-East Asia Region, are suffering from severe wasting. Here, we use the term 'severe malnutrition' to describe these conditions to better reflect the contributions of chronic poverty, poor living conditions with pervasive deficits in sanitation and hygiene, a high prevalence of infectious diseases and environmental insults, food insecurity, poor maternal and fetal nutritional status and suboptimal nutritional intake in infancy and early childhood [5]. Severe acute malnutrition remains a major cause of child mortality worldwide [6]. It contributes to childhood morbidity, mortality, impaired intellectual development, suboptimal adult work capacity and increased risk of diseases in adulthood. Children with severe malnutrition have an increased risk of serious illness and death, primarily from acute infectious diseases [7]. Of the 7.6 million deaths annually among children who are under 5 years of age, approximately 35% are due to nutrition-related factors and 4.4% of deaths have been shown to be specifically attributable to severe wasting [1]. For this reason, the improved management of severe acute malnutrition is an integral part of the World Health Resolution on Infant and Young Child Nutrition (WHA 63.23), to improve child survival and to reduce the global burden of disease [1]. International growth standards are used for the diagnosis of severe malnutrition and provide therapeutic end points. The early detection of severe wasting and kwashiorkor and outpatient therapy for these conditions using ready-to-use therapeutic foods form the cornerstone of modern therapy and only a small percentage of children require inpatient care. However, the normalization of physiological and metabolic functions in children with malnutrition is challenging and children remain at high risk of relapse and death [5]. There is an increased number of causes of malnutrition in developing countries with the majority as a result of socio-cultural factors. This is also responsible for the incidence of infant malnutrition in Cameroon, with particular emphasis on Northern zone where it is most accentuated. Those Socio-cultural factors are related to child feeding and maternal health (breast-feeding, food taboos and representations of the colostrum as dangerous for infants) are widespread throughout Cameroon. Poverty-related factors (lack of education for mothers, natural disasters and unprecedented influx of refugees, inaccessibility and inequity in the distribution of health care services) are pervasive in Northern Cameroon. This conjunction of factors accounts for the higher incidence of infant malnutrition and mortality in Northern Cameroon [8].

The survey conducted by the United Nations International Children's Emergency Fund (UNICEF) in 2018, targeted the four vulnerable regions (Far North, North, Adamawa and East) to assess the nutritional status of children aged below five years old as well as Infant and Young Child Feeding (IYCF) practices. The preliminary report estimated 21,259 cases of Severe Acute Malnutrition (SAM) and indicated that, on average, the prevalence of global acute malnutrition is close to 5% in the four Regions [8]. According to WHO 2006 standards, the situation can be classified as "serious" for SAM in the Far North, Adamawa and North regions [9]. Multiplication of the number of refugees coming from neighboring countries such as Nigeria, Central Republic of Africa, has increased population in this locality. The influx of migration from rural to urban area in Adamawa Region due to the insecurity, contributes to a total abandonment of activities, such as agriculture, pisciculture and breeding. These has led to scarcity of food supply in this Region, increase the child's vulnerability and expose them to SAM and its various complications. Hence, evaluating its prevalence, risk factors associated with its complications in this region will create awareness, improve the prevention of SAM and provide more accurate data in the Adamawa Region, thus ultimately improving on the management and also propose recommendations to stakeholder's to prevent malnutrition.

Material and Methods

A cross-sectional prospective study was carried out in the pediatrics units of Ngaoundere Regional Hospital (NRH) and the Sabongari Health Center (SHC) from September 2020 to May 2021. The Ngaoundere Regional hospital is in the Adamawa region of Cameroon in the town of Ngaoundere. The Ngaoundere Regional hospital is a secondary health care facility which has four main departments: Internal medicine, pediatrics, obstetrics and gynecology and surgery with each department having specialists, general practitioners and nurses. It also has some specialized units like Ophthalmology, Dentistry, Neonatology and a Medical Imaging unit.

The hospital has one nutritional unit under the pediatrics unit, one pediatrician, three general practitioners, one nutritionist and 10 nurses. The pediatrics unit is divided into three wards: the main ward is the general ward, containing 20 beds, one nursing station and two medical doctors. The second ward is the neonatology unit with 1 Medical Doctor. The last one is the nutritional

unit, containing 9 beds. The unit receives about 30 to 40 patients every month. Patients are assessed by examination's tools. The MUAC, weight/height, weight/age and physical appearance of the patient are assessed. The patients are then hospitalized to either pediatric ward or nutritional unit, based on the findings. A patient might be admitted at the general ward after several days, then develop signs of SAM. In this case, the patient is to be transferred to the nutritional unit. All 3 units are headed by the Paediatrician and nutritional unit receives support from UNICEF, such as beds, SAM management products and others materials. The Sabongari Health Center is in Sabongari health area with an estimated population of 93414 people. This health facility has 3 main departments. The Obstetric and gynecological unit, the medical ward and pediatrics unit. The nutritional unit of the pediatric ward is supported by UNICEF; it receives about 20 to 30 patients a month, mostly ambulatory care.

The participants included all children aged above 6 months and below 5 years admitted in pediatrics units of the NRH and Sabongari health Center and children with diagnosed chronic pathologies which could be responsible for poor weigh gain were excluded from the study. The estimated sample size was 76 SAM children, using the Lorentz formula.

When patients were met in the ward, after informed assent, the following were done by the main investigator, collaborating with the staff of the units: Interview, physical examination (including the measurement of MUAC and evaluation of WHO z-score), confirmation of the diagnosis, assessment of the presence of complications by clinical and/or para-clinical findings and data collection. The diagnosis was confirmed when we have a patient with a MUAC < 115 mm, Z score < -3 and/or presence of bilateral pedal edema or prominent ribs, brown hair and skin desquamation. A follow up was done weekly to reassess progress of the patient. A data collection form was used to fill in the information with regards to socio-demographic data, nutritional history and physical examination. Data collection sheets were checked and verified each time they are brought from the field. The data was analyzed using Epi Info and Microsoft Excel. Ethical review of this protocol was obtained from the institutional Review board of the faculty of health sciences, University of Buea. Administrative approval was obtained from the Adamawa regional delegation of public health, Ngaoundere Regional Hospital and Sabongari Health Center. The investigator also ensured that participants knew of their right to withdraw from the study at any point. Subject to legislative laws, data protection act and information obtained about a participant during this study, was kept confidential.

Results

During our study, between September 2020 to May 2021, 783 children were admitted to the pediatrics units of the NRH and 621 at the SHC, 82 children out of 1404 admitted were diagnosed of SAM, giving a prevalence of 5.8%. Among the 82 children with SAM, 58 (4.1%) were from NRH and 24 (1.7%) were from the SHC.

Demographically, 43 (52.4%) were female and 39 (47.6%) were male, giving a female to male sex ratio of 0.90:1 with a slight female predominance. The most represented age group of our 82 participants was 12 to 23 months with 34 (41.5%) of children, followed by the age group of 6 to 11 months with 30 (36.6%). Out of 82 children recruited, the mean birth interval was greater than 2 years for 43 (52.4%) out of 82 participants. The minimum number of children in the family was 1 and the maximum was 12. The mean was 3.98 with standard deviation of 2.519. The most representative family size was 6-8 people 29 (35.4%). 51 (62.2%) were Fulani, followed by DII, 10 (12.2%). A great majority of children were Cameroonians with 77(93.9%), followed by Nigerians 3(3.7%) and Central Republic of Africans 2(2.4%).

Socially, 50(61%) out of 82 children were from Urban zone. 69(84.1%) participants used pit toilet, 11(13.4%) used modern toilet and 2(2.4%) did not have a toilet. 41(50%) drank pipe born water, 37(54.1%) drank well water, 3(3.7%) drank water from the stream and 1(1.2%) drank mineral water. 70(85.4%) participants had a traditional kitchen, 11(13.4%) had a modern kitchen and 1(1.2%) did not own a kitchen. 44(53.7%) participants were from polygamous families and 38(46.3%) were from monogamous families. 36(43.9%) mothers did not attain formal education; 29(35.4%) had primary education and 17(20.7%) had secondary education. 38 (46.3%) of fathers had primary education, 21(25.6%) did not attain formal education; 17(20.7%) had secondary school and 6(7.3%) had a university degree. 64(78%) of mothers were housewives and 18(22%) of them were employed. Majority of fathers, 56(68.3%) were self- employed, 20(24.4%) were employed and 6(7.3%) were unemployed.

Nutritionally, 35(42.7%) of the children were exclusively breast fed, 47(57.3%) were mixed fed with milk substitutes before 6 months of age, 21(46.7%) were mixed fed with breast milk and water, 13(28.9%) children were mixed fed with breast milk, water and pap. Also 50(61%) were in the range of low food security; 30(36.6%) were in marginal food security and 2(2.4%) were in high

food security. Most of these children, 52 (63.4%) were weaned between 12 to 23 months of age. Most of the children 50(61%) ate 4 times per day, 13(15.9%) ate 3 times per day, 14(17.1%) ate 5 times per day, 3(3.7%) ate 2 times and 2(2.4%) ate once daily. 42(51.2%) eat cereal/grain/tubers every day, 17(20.7%) ate legumes/nut every day, 4(4.9%) varied legumes/nut/yoghurt/cheese and 3(3.7%) varied cereal/grain/tubers/legumes/nut. In our study, the sero-prevalence of Human Immune Deficiency Virus (HIV) among mothers was 4(4.9%) and none of the children were tested positive.

Marasmus was the most frequent clinical form of SAM observed in 62(75.6%) of the children, followed by kwashiorkor observed in 20(24.4%) of the children, as shown in Fig. 1 below.

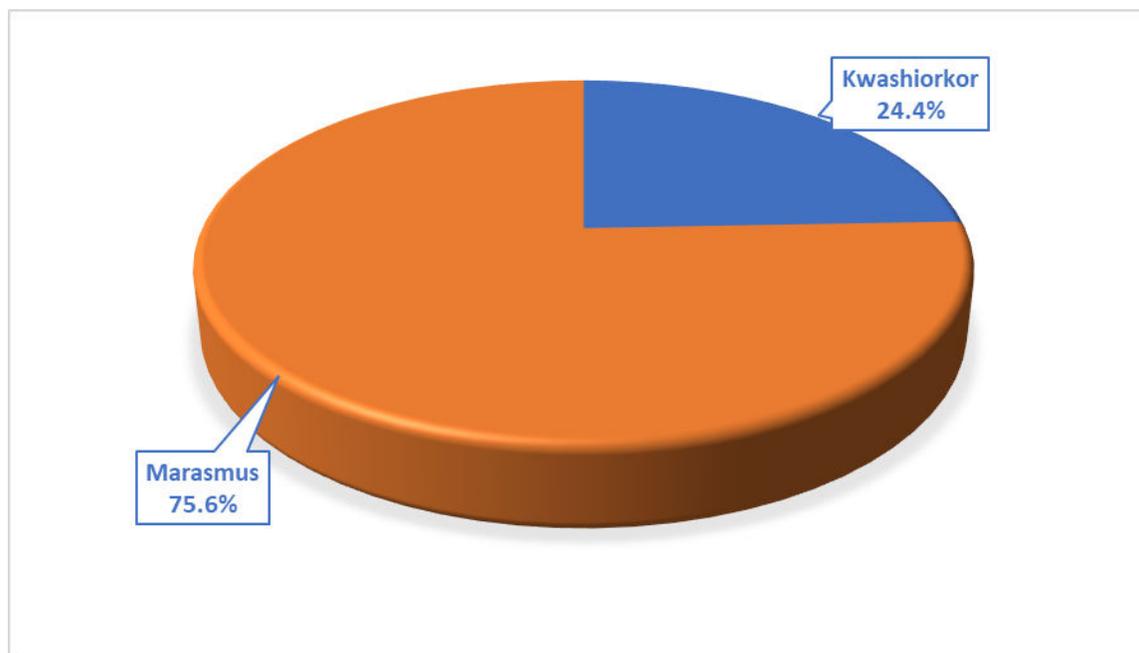


Figure 1: Clinical types of severe acute malnutrition.

On admission, the most common presenting complaints were fever, diarrhea and vomiting observed in 13% of children. Gastroenteritis was the first comorbidity observed in 33(40.2%); 26(31.7%) had Malaria; 19(23.1%) had Upper respiratory tract infection; 3(3.7%) had severe anemia and 1(1.2%) had a severe cutaneous infection as illustrated by Fig. 2 below.

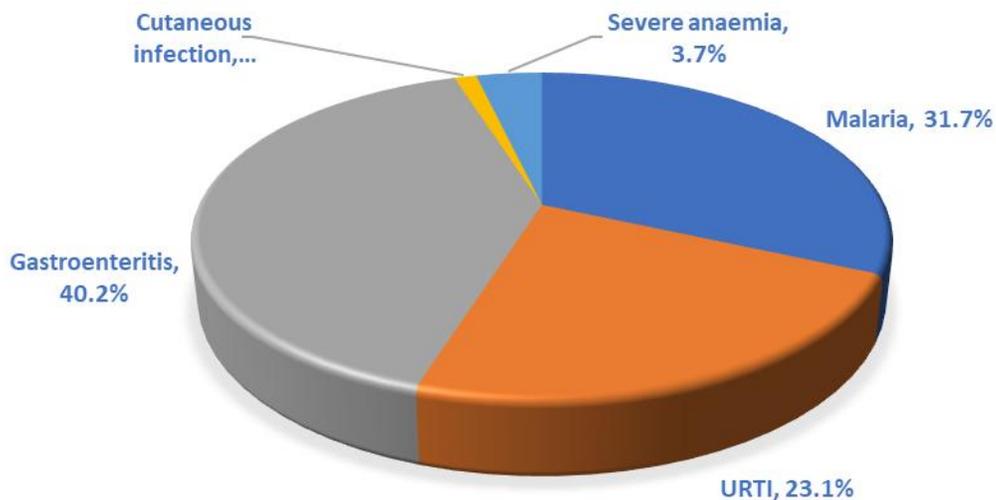


Figure 2: Associated diagnosis on admission.

Amongst the 82 children with SAM, 53(64.6%) children presented with complications, dehydration was the most frequent complication with an occurrence of 75.5%, followed by hypoglycemia 17.0% and hypothermia 5.7% and 1.9% were infections as seen on Table 1.

	Variable	Frequency	Percent	Valid Percent	Cumulative Percent
Complications					
	No	29	35.4	35.4	35.4
	Yes	53	64.6	64.6	100
	Total	82	100	100	
Clinical Complication					
	Dehydration				
		40	47.6	75.5	75.5
	Hypothermia				
		3	3.6	5.7	81.1
	Hypoglycemia				
		9	10.7	17	98.1
	Infections				
1		1.2	1.9	100	
	Total	53	63.1	100	

Table 1: Diagnosed clinical complications amongst children with SAM.

The bivariate analysis revealed that the risk of complications during hospitalization was significant among children who were not breast fed up to 6 months of age ($P=0.038$) and those who ate < 4 time a day ($P=0.036$), being in a Monogamous family ($P<0.001$), internally displaced ($P=0.022$) and living in urban zone ($P<0.001$) as shown on Table 2.

Variable (N=82)	Complications		P-value
	Yes	No	
Sex			
Male	25 (64.1%)	14 (35.9%)	0.255
Female	28 (65.1%)	15 (34.9%)	
Age of the child (month)			
Jun-24	43 (67.2%)	21 (32.8%)	0.839
>24	10 (55.6%)	8 (44.4%)	
Number of children			
01-May	35 (64.8%)	19 (35.2%)	0.529
>5	18 (64.3%)	10 (35.7%)	
Exclusively breastfed up to 6 months			
Yes	22 (66.7%)	11 (33.3%)	0.038
No	27 (61.4%)	17 (38.6%)	
Frequency of meal a day			
<4	44 (64.7%)	24 (35.3%)	0.036
>4	8 (61.5%)	5 (38.5%)	
Marital Status of the parents			
Monogamous	28 (71.8%)	11 (28.2%)	<0.001
Polygamous	25 (57.1%)	18(42.9%)	
Internally displaced			
Yes	24 (68.6%)	11 (31.4%)	0.022

No	29 (61.7%)	18 (38.3%)	
Agro-ecological zone			
Urban	34 (68.0%)	16 (32.0%)	
Rural	18(58.1%)	13 (41.9%)	<0.001

Table 2: Association between socio-demographic profile and complications.

A total of 73(89%) of children were discharged alive and 9(11%) died during the first two weeks of hospitalization (Fig. 3). Those who died were those who had complications during the hospitalization. On bivariate analysis, there was no statistically significant difference between the socio-demographic profiles of the children and parents and the outcome of SAM.

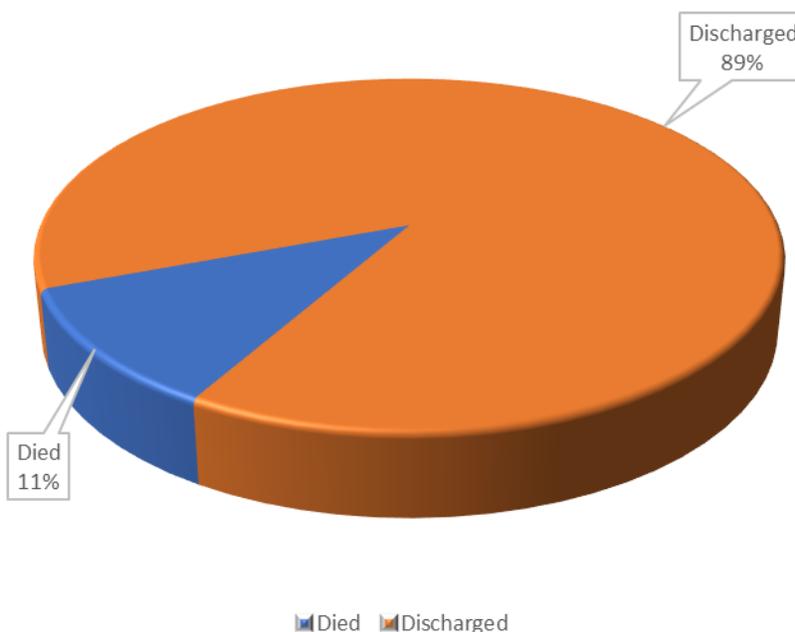


Figure 3: Outcome of the hospitalized children with SAM.

Discussion

Childhood undernutrition is a major global health problem, contributing to childhood morbidity, mortality, impaired intellectual development, suboptimal adult work capacity and increased risk of diseases in adulthood. This study was carried out to evaluate the prevalence of SAM and factors associated with its complications in hospitalized children in two hospitals in Ngaoundere. The prevalence of severe acute malnutrition in our study population was 5.8%. This figure is above the 1.7% reported in the Adamawa region in 2018, according to UNICEF [9]. This surge in the number of SAM could be due to an increase in the number of internally displaced people fleeing from the increasing insecurity in villages since 2018. This has resulted in the total abandonment of agricultural activity, thus exposing the population to hunger. The increasing influx of refugees and low maternal education levels.

The age group 24-28yrs was the most represented 25(30.5%). This is the child bearing age in Cameroon according to the 2011 Demographic Health Survey in Cameroon [10]. In this study, 44(53.7%) of children were from polygamous families, with large family sizes. This can be explained by the fact that, in northern Cameroon, most families are polygamous, thus exposing the children to SAM. Our study revealed that, 64(78%) out of 82 mothers were housewives and 65(79.2%) of mothers did not have any formal education. This is most likely due to the high rate of early marriages and the belief that educated girls have less respect for elderly people. This is similar to the study conducted by Kandala, et al., who reported that, malnutrition was higher among children from non-educated mothers as well as finding obtained by Gabbad, et al. [11,12]. The role of education of mothers is for them to assimilate healthy habits as regards nutritional value of nutrients and prevention of infectious diseases associated with malnutrition such as diarrhea.

There was a virtual equality between gender with a slight female predominance. We had a female to male sex ratio of 1:0.90. This was like the study conducted by Gabbad, et al., in Sudan who had a sex ratio of 0.91:1 [12]. The most represented age group out of our 82 participants was 12 to 23 months with 34 (41.5%) of children. This is most likely due to poor food diversification, poor weaning practices and a low rate of exclusive breast feeding. Ubesie, et al. [13] also documented a high number of cases of SAM among children aged 6-24 months. In their study, this age group accounted for 92.5% of the total number of children admitted for SAM. In this study, 57.3% of children were diversified before 6 months of age. This is most likely due to the influence of cultural belief about breast feeding, where the decision to introduce foods other than breast milk at a very early age is largely cultural and belief that breast milk is incomplete food that does not increase the infant's weight. Our study revealed 68(82.9%) of our participants ate less than 4 times per day and 42(51.2%) ate cereal, grain and tuber constantly. This could be due to low socioeconomic status, poor hygiene, large family size and the fact that poor families have low purchasing power for adequate nutritious foods for their families. These likely influence the ability of a household to secure reliable source of food for children, leading to insufficient protein and calorie supply. The main birth interval was greater than 2 years, with 43 (52.4%). This is most likely due to the unstable and unreliable childcare. This is in contrast with the study conducted by Pravana NK, et al., in Nepal in 2017, where the most common birth interval was below 2 years and the reason was the inadequate knowledge of the spacing method [14].

Gastroenteritis was the most recurrent diagnosed associated pathology 33(40.2%) among the children with SAM. This could be so because of lack of proper hygiene, low educational levels of mothers and poor socio-economic levels. Ubesie, et al., found a predominance of diarrhea in 72.7% [13].

Marasmus was the most frequent type of SAM in our study 62(75.6%) because of the poor protein intake (51.2% were mostly fed with cereal, grain and tubers), most families were farmers and the family size was large and lead to scarcity of food. This finding was similar to that of the study by Chiabi, et al., where the most predominant clinical form of SAM was marasmus (88.8%), followed by kwashiorkor (7.8%) [2]. In Sudan, Gabbad, et al., found a predominance of kwashiorkor in children under 5 years (43.8%) [12]. In our study, the most common complication was dehydration 40(47.6%). This was probably due to the large proportion of diarrhea (13%) in our study.

Recovery rate in our study was 73(89%), which can be justified by the implementation of guidelines for the management of SAM and trained staff in these health facilities, of which they had multiple support from N.G.O such as UNICEF. We observed a mortality rate of 9(11%), which is almost what was outlined in the WHO/SAM management guidelines (<10%). But this slight increase in mortality could be due to delay in seeking treatment in the hospital, leading to complications. Nonetheless, mortality in our study was lower than the figure reported in Yirgalem hospital in Ethiopia with 16.2% [15]. These differences between our findings could be due to differences in severity of cases and frequency of co-morbidities. No exclusive breast feeding up to 6 months of age ($P=0.038$), frequency of <4 meals a day ($P=0.036$) were associated with complications of SAM and statistically significant. This most likely be due to poor food diversification practices, negligence and food scarcity. In our study, some of the Socio-demographic profiles of the parents were associated with complications of SAM and were statistically significant. Specifically, Monogamous marriages ($P<0.001$): where, when a child is sick in a monogamous family, the mother will pay more attention to him while neglecting others. The situation gets worse when the patient is hospitalized because other children will be left home without care. However, in polygamous families, a sick child will be with his/her mother and other children will be with other women at home and culture believes that there are no different between children at home. Internally displaced families ($P=0.022$) and agro-ecological zone ($P<0.001$) were also statistically significant to complications of SAM. These might be due to low socio-economic status, food instability and poor hygiene. Our study revealed that there was no statistical significance between the socio-demographic profile of both the children, parents and the mortality rate.

Conclusion

The prevalence of severe acute malnutrition in the Adamawa region is still high (5.8%). Predisposing factors related to low maternal education, socio-demographic factors and poor child feeding practice were leading in our findings. Dehydration was the main complication observed in hospitalized children with SAM. None exclusively breast feeding and number of meals a day <4, monogamous marriage, agro-ecological zone and being internally displaced were factors associated with complications of SAM ($P<0.05$). Despite these risk factors, recovery rate was encouraging and the mortality rate needs to reduce the more. These results go a long way to advocate the importance of educating the girl child, thus educating the nation.

Conflict of Interests

The authors declare that they have no conflicts of interest.

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Author Contributions

NM conceived the study and drafted the initial manuscript, YA, BO, ME and DX participated in data extraction and analysis, ME reviewed and corrected.

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