Risk factors for severe acute malnutrition among children aged 6-59 months admitted at Lubango Pediatric Hospital, Angola.

Francisco K[1], Florence K[1], Wanzala P[2]

1. Jomo Kenyatta University of Agriculture and Technology, Kenya
2. Kenya Medical Research Institute, Centre for Public Health Research, Kenya

Corresponding author: Francisco Ketha, Jomo Kenyatta University of Agriculture and Technology Kenya Medical Research Institute Email; bhaibbyketha@yahoo.fr

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ABSTRACT

Background: The 4th Millennium Development Goal (MDG) is to reduce the mortality rates among under-fives by two thirds between 1990 and 2015. Efforts to prevent child deaths need to be stepped up in order to meet that target but the challenge is how to reduce morbidity and mortality among children with SAM. In SSA, the nutritional and health situation is worsening. The hospital case fatality rates(CFR) for SAM remain high due to faulty case management in resource-poor settings. Despite the improved understanding of the clinical management of SAM, the CFR among admitted children in SSA has remained between 20- 30%. This study sought to determine the social demographic and clinical risk factors associated with severe acute malnutrition among children admitted at Lubango Pediatric Hospital.

Methods: This was a case-control design where cases were compared with age and sex -matched controls with weight for height. Data was collected using an interviewer administered structured questionnaire, with caregivers as respondents: Clinical history and examination was conducted by a trained clinician eliciting duration of illness and categorizing symptoms such as fever and cough among others. The Nutritional status of the child was determined using anthropometric measurement. A pre- HIV test counselling was done to the care takers and the ones who gave consent, an HIVantibody test was conducted to the child using Determine and unigold HIV rapid test followed by a post-test counselling for both the HIV positive and negative children.

For children who had been admitted the same year, the files were found for confirmation of the diagnosis of the previous admission(s).

Results: **The significant predictors of severe malnutrition were family order, HIV test results, previous history of admission with diarrhea and malnutrition, duration of breast feeding and number of previous admissions**

Conclusion: **The burden of severe malnutrition is still high among children admitted in hospital. There is need to strengthen breast feeding campaigns and family planning strategies. Further clinicians need to be proactive in assessing the risk of malnutrition in HIV positive children and children with recurrent admissions especially with malnutrition and diarrhea.**

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Introduction

Severe Acute Malnutrition is defined as weight for height less than -3SD Z scores and/or visible severe wasting and/or edema of both feet (excluding other causes of edema), mid arm circumference less than 11.5 cm in infant more than 6 months of age [1]. Malnutrition causes about 5.6 million of 10 million child deaths per year, Severe Acute Malnutrition contributing to about 1.5 million of these deaths2. The nutritional status of children is the best indicator of the wellbeing of children. Issues that cause a decline in the nutritional status of children are multidimensional and difficult to understand [3].

Worldwide there are about 60 million children with moderate acute and 13 million with SAM. About 50% of the 10-11 million children under-five years of age die due to preventable causes. According to a national survey in India 6.4% of children below 5 years were suffering from SAM. The median case fatality rate was 23.5%. This can be reduced by appropriate management of SAM1. Malnutrition in children is widely prevalent in developing countries and has been responsible for 60% of the 10.9 million deaths annually among children less than 5 years [1].

Over 2/3rd of these deaths which are often associated with inappropriate feeding practices occurred during 1st year of life [4]. Of all the children that die, 99% are in the developing world5. About 9% of Sub Sahara Africa(SSA) children have moderate acute malnutrition and 2% of children in developing countries have SAM. The case fatality rates (CFR) in hospitals treating SAM remain at 20-30% and coverage of those affected remains low in the treatment of SAM in SSA [6].

Mortality is related to the severity of the malnutrition, where severe wasting has a mortality rate of 73- 187 per 1000 children per year [7]. Poor hospital care of SAM contributes to high mortality rates5and the CFR in hospitals in developing countries is still about 20-30% and has changed little since the 1950s. SAM

affects approximately 13 million children under-five and is associated with over 1.5 million preventable child deaths each year [2].

Materials and methods

Study site

The study was conducted at Lubango Pediatric Hospital which is located in the core of the city of Lubango and occupies an area of 998m^2 and has a capacity of 150 beds.The hospital admits about 6783 children annually from which approximately 880 (12.9 %) have severe acute malnutrition (Lubango Pediatric Hospital medical records, 2011).

Study population

This consisted of all children aged 6 – 59 months admitted at Lubango Pediatric Hospital. The inclusion of the study subject was based on obtaining informed consent from parents/guardian of the children.

Study design

The study design was a case-control where cases were compared with age and sex -matched controls. The recruited subjects were assessed clinically and questionnaires were administered to patient's caregivers until a sample 163 subjects was attained.

Data collection

Data was collected using an interviewer administered structuredquestionnaire.

The respondents were the mothers/caregivers of children admitted in the pediatric ward.

Clinical examination was conducted by a trained clinician eliciting information on- duration of illness and categorizing symptoms such as fever and cough among others.

Anthropometric measurements such as weight, height/length and mid upper arm circumfrence(MUAC) was also obtained from the study subjects.This was conducted using weighing uniscale seca 877, stadiometerseca 210 mobile measuring mat, high Kawe Medizintechnk seit 1890 and Pediatric Mid Upper Arm Circumference (MUAC) tapes. A pre HIV test counselling was done to the care takers and the ones who give consent, an HIV antibody test was conducted for the child using Determine and unigold followed by a post-test counselling for both the HIV positive and negative children.

For children who had been admitted the same year, the file was found for confirmation of the diagnosis of the previous admission(s).

Between august 2014 and October 2014 a total of 163 participants (caregivers-child pairs) were recruited into the study.

A matched case control study design was applied. The case were 53 severely malnourished children aged between 6 months and 5 years and the controls (110)

were recruited concurrently for children admitted with other medical problem.

The controls were age and sex matched and without severe acute malnutrition

Statistical Analysis

Data entry was done using Microsoft access using unique identifiers in duplicate for Validation (double entry) and exported to SPSS version 17. The data was cleaned, cross-checked for entry errors and range checked. Data storage was done in flash disks and desktops while questionnaires were kept in a drawer under lock and key. Data was analyzed using SPSS version 17, Descriptive statistics was reported to describe the variables. Bivariate statistics was done to establish association between SAM and the explanatory factors using a chi-square while logistic regression was used to determine the predictors of SAM. Variables with $P < 0.05$ in the logistic regression were considered to have a significant association with SAM. Logistic regression was performed on multiple variables hypothesized to explain association between exposure risk factors and SAM. A child was classified as having SAM if they satisfied any of the WHO criteria:

- Weight for Height Z-score less than -3SD and/or
- Visible severe wasting and/or
- Edema of both feet and/orMid arm circumference less than 11.5 cm (in Infants > 6months)

Ethical consideration

Permission was also sought and obtained from the relevant hospital administration at Lubango Pediatric hospital, Research department and medical officers of research from the hospital and from the Provincial Ethical Committee. Written consent was obtained from the caregivers/guardians who were willing to participate in the study. While abstracting the information, records were handled with a high level of confidentiality and privacy and the data was used only for the study. During the interview privacy and confidentiality was observed and there was no anticipated harm to the client.

Results

Socio demographic characteristics of the caregivers of the respondents

Majority of the respondents were single (52.7%), lived in an urban setting (73.7%), Christian (62.7%), self-employed (37.7%) and accessed information from a T.V 55.2% (table 1). Only 16.5% had no education; however majority had primary education while those with secondary education and tertiary education were 33.1% and 3% respectively. Those with an income of more than 50USD were 58%.

Table 1a: Socio demographic characteristics of the care takers of the respondent

Characteristic		N(%)
Marital status		
	Married	**75 (46.0)**
	Single	**86 (52.7)**
	Widowed	**2 (1.2)**
Parent alive		
	Father	**9 (6.5)**
	Mother	**129 (93.5)**
Residence		
	Rural	**43 (26.3)**
	Urban	**120 (73.7)**
Access to information		
	Radio	**57 (35)**
	TV	**90 (55.2)**
	Others	**16 (9.8)**
Religion		
	Christian	**99 (62.7)**
	Traditional	**59 (37.3)**

Socio-demographic characteristics of the study children.

Socio-demographic characteristics of children are shown in Table 2

Most children recruited into the study were male (66.8%) and were not attending any schooling (94.4%). They were evenly distributed across the various birth orders with the majority being in the 2nd order (23.9%) and the least being those in the birth order of greater than four (14.7%).

Table 1b: Socio demographic characteristics of the care takers of the respondent

Highest education		
	None	**27 (16.5)**
	Primary	**77 (48.1)**
	Secondary	**54 (33.1)**
	Tertiary	**5 (3)**
Occupation		
	Unemployed	**47 (29.0)**
	Student	**14 (8.6)**
	Self employed	**61 (37.7)**
	Civil servant	**17 (10.5)**
	Others	**24 (14.7)**
income		
	<50 USD	**68 (41.7)**
	51USD and above	**95 (58.3)**

Angolan currency is Kwanza which is the equivalent to 0.1 USDollar

Clinical Characteristics of the study children

Among children recruited in the study,70% had fever probably because this study was conducted in an hospital setting (Lubango pediatric Hospital) in which febrile illnesses (malaria, pneumonia,gastro-enteritis…) are the most important cause of admission , 31.3%% were severely wasted, 8% had lymphadenopathy, 44.2% and 24.5% had diarrhea and vomiting, respectively. Only 2% had jaundice.Among children recruited in this study, 55% had history of previous admission, the majority

(44%) with past history of two admissions, 27% and 28.2% admitted previously for pneumonia and diarrhea respectively, and only 9.8% with past medical admission of SAM. This data are consistent with the one found in a study in Ethiopia[8] in which the majority of admitted children had Diarrhea and pneumonia.

Table 2: Socio-demographic Characteristics of children recruited into the study

Characteristic		**N(%)**
Sex		
	Male	**109 (66.8)**
	Female	**54 (33.2)**
Family order		
	First	**34 (20.8)**
	Second	**39 (23.9)**
	Third	**37 (22.6)**
	Fourth	**29 (17.7)**
	Others	**24 (14.7)**
Schooling		
	No	**154 (94.4)**
	Yes	**9 (5.59)**
Breast feed upto	**Mean(SD)**	**15[7]**

Social Demographic Risk factors

In the bivariate analysis, children whose caregivers were single had a significantly increased odds of severe malnutrition by 2.9 times (95% CI 1.42 – 5.86; p- value =0.003) when compared to those whose caregivers were married as the reference group. Children of caregivers who lived in urban settings had significantly decreased odds of severe malnutrition (OR 0.16; 95% CI 0.08 – 0.35; p-value<0.001) when compared to those living in a rural setting as the reference group. All other socio-demographic factors were not significantly associated with severe acute malnutrition.

There was a significant association between family order and the risk for severe acute malnutrition. With first order children as the reference group, second order children had significantly increased odds of severe acute malnutrition by 3.5 times (95% CI 0.1.25 – 9.62; p- value =0.05). Although the third and those born beyond the fourth order had increased odds of severe acute malnutrition, this increase of 1.38 (95% CI 0.47 – 3.99) and 1.67 (95% CI 0.52 – 5.37) respectively, was not significant. For every increase in one point in MUAC, weight, height and weight-for-height Z (WHZ) score, there was a significant decline in the odds of severe malnutrition by 0.87, 0.62, 0.93 and 0.97 times, respectively. All other children characteristics were not significantly associated with severe acute malnutrition

Dietary Risk factors

Of the dietary factors, none were significantly associated with severe acute malnutrition. However, compared to households that got their food from the farm as the reference group, children from households

that got food from the market had an increased odd of severe acute malnutrition of 1.75 times (p= 95% CI 0.74 – 4.15).

Clinical Risk Factors

The prevalence of wasting among the study children was 31.3%. HIV test results were significantly associated (p value <0.001) with severe malnutrition. With negative results as the reference group, children who tested positive had significantly increased odds of up to 6.38 times (95% CI 1.24 – 32.82). When compared to those who reported no previous diagnosis as the reference group, children with a previous diagnosis of pneumonia, diarrhea and malnutrition had a significantly increased odds of severe malnutrition by 2.17 (95% CI 1.06 – 4.45; p value =0.035), 7.66 (95% CI 3.59 – 16.37; p value <0.001) and 11.59 (95% CI 3.14 – 42.83; p value <0.001) times respectively. Immunization status, previous diagnosis of malaria and anemia were not significantly associated with severe acute malnutrition.

Multivariate model for significant predictors of severe acute malnutrition

The significant predictors of severe malnutrition were family order, HIV test results, previous history of admission with diarrhea and malnutrition, duration of breast feeding and number of previous admissions (Table3).

Table 3: Multivariate model for significant predictors of severe malnutrition

		Odds ratio	**95% CI**		**P value**
Family order	**First**	1.00			
	Second	90.65	2.96	2776.89	0.01
	Third	1.88	0.10	34.86	0.672
	Fourth	6.08	0.13	289.70	0.36
	Others	13.07	0.55	311.37	0.112
HIV test	**Negative**	1.00			
	Positive	20.95	1.09	404.42	0.044
Diarrhea	**Yes**	1.00			
	No	0.05	0.01	0.44	0.007
Malnutrition	**Yes**	1.00			
	No	**0.01**	**0.00**	**0.19**	**0.003**
No of previous admissions					
		2.95	**1.08**	**8.08**	**0.036**

Discussion

The nutritional status of children between 6 and 59 month is affected by a large spectrum of factors, making it a multidimensional entity. This study aimed to identify socio demographic and clinical risk factors for Severe Acute Malnutrition in children age 6 to 59 months admitted at Lubango Pediatric Hospital in Lubango-Angola.

Socio demographic characteristics

The majorities of caregivers were single mothers and had a monthly income more than 50 USD. Most of these study participants lived in urban area surrounding the hospital, have at least primary education and as the majority of Angolan population, they are Christians. These data are consistent with work done elsewhere which has shown that in developing countries the majority of caregivers in pediatric ward were single mothers [9,10]and from low-income household [11] Among children recruited in this study, the majority were male and not attending any schooling. Similar results were found in a study conducted in Ethiopia [11]and another one done by Abubaker et al 201112

Clinical characteristics

Among children recruited in the study, 70% had fever, 31.3%% were severely wasted, 8% had lymphadenopathy, 44.2% and 24.5% had diarrhea and vomiting respectively and only 2% had jaundice.

Regarding past medical history, Among children recruited in this study, 55% have history of previous admission, the majority (44%) with past history of two admission,27% and 28.2% admitted previously for pneumonia and diarrhea respectively and only 9.8% with past medical admission of SAM.

Socio-demographic risk factors

In this study, among the socio-demographic factors studied, marital status and residence were significantly associated with SAM in a bivariate analysis; consistent with work done in other developing countries which showed association between being single mother and SAM among children below 5 years [9,10] and between SAM and rural dwelling [11]. This may be explained by the fact that urban population in Angola is often in formal employment and has a relatively higher monthly income than their rural counterparts. Maternal education has been implicated as a risk factor for Severe Acute Malnutrition in studies done by Chakrabortes et al [13]; Turyashemererwa ,Kikafunda and Agabe [14].The South African National consumption survey revealed a decrease in the prevalence of under-nutrition as maternal education increases [15]. In the current study, there was no significant association between maternal education and SAM. This is in line with a study done by Owor, Tumwine and Kikafunda [16] who found that formal

education did not appear to influence the nutritional status of children. There was not significant association between family in-come and SAM, a finding which differs from a study conducted in India [17] and other studies done in Zimbabwe [18] and in Nigeria [19], which showed an increase risk of SAM when the monthly in-come is less than 50 USD.

This could be explained by the fact that in the current study, the large majority of care givers earned more than50USD and only the monthly in-come of the caregiver were considered and not the family monthly in-come.

Although no significant difference was identified in the breastfeeding practices, our finding suggests that children with SAM were breastfed for shorter periods. This is consistent with reports that demonstrate that poor breastfeeding practices (lack of exclusive breastfeeding in the first 6 months of life and early cessation of breastfeeding) are risk factors for under nutrition17and support the global public health recommendation that infants should be exclusively breastfed for the first 6 months of life to achieve optimal growth, developmental health.(World Health Assembly resolution 2010) [20].

While other studies have demonstrated that the type and number of meals are significantly associated with severe acute malnutrition [21], this study found no association. Although the quality and nutritional content of food were not assessed in this study, the fact that the majority of study participants had at least 3 meals per day may explain this difference.

Clinical risk factors

In this study, a significant association was observed between a history of previous admission principally with a diagnosis of pneumonia, diarrhea /dehydration, and HIV positive children and the risk of severe acute malnutrition. Although it is difficult to establish whether the malnutrition led to illness or the illness led to a decline in immunity, decreased appetite, increased basal metabolism could explain the consequent Severe Acute Malnutrition.

A study in Pakistan [22] reported that frequent illness undermines child growth, reduce appetite, decrease absorption of nutrient form the intestine(seen in some diseases) and increase metabolic rate.

Similarly a study conducted by Ruwan, Casie and Mark (2012) [23] showed a significant association between previous Diarrhea and fever with Severe Acute Malnutrition and another study done in Tanzania [24] which demonstrated an association between Severe Acute Malnutrition and pneumonia.

This confirms the multidimensional aspect of childhood malnutrition as demonstrated by Mosley and Chen (1984). The findings of this study have several implications. Firstly, they provide an estimate of the burden of severe acute malnutrition at the hospital. Secondly, they highlight the significant factors associated with severe acute malnutrition that

clinicians may use in identifying children at high risk of severe malnutrition. Thirdly, although this population comprises of people who can afford 3 meals a day it highlights there is need for nutritional education to promote consumption of foods with appropriate nutritional content by children.

Finally, there is need for more advocacies for better breastfeeding practices, management and follow up of children with history of previous admission, principally for diarrhea, pneumonia, previous admission with SAM and a particular nutritional and clinical support to HIV positive children.

Conclusion

The findings of this study confirm that Severe Acute Malnutrition is a socio demographic and clinical problem. Among the socio demographic factors, poor breastfeeding practice, single mother and living in rural area are risk factors for SAM in children between 6 to 59 months admitted at Lubango Pediatric Hospital. Clinically, previous admission, principally with Diarrhea, pneumonia, SAM and HIV positive status has been identified as risk factors in this study. Nutritional education to promote consumption of nutritious food by infants and young children could help.

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