

Risk factors for Severe Acute Malnutrition in children aged 6 months to 59 months: A case-control study

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Abstract

Background and Objectives

Introduction: Severe acute malnutrition (SAM) is one of the of the most common causes of morbidity and mortality among children under 5 years of age in developing countries including India. The aim of this was to determine risk factors for SAM among hospitalized children aged 6 to 59 months admitted in a tertiary health care center in a metropolis.

Materials and Methods: A case control study was carried out over 18 months. 30 cases of severe acute malnutrition children aged between 6 months to 59 months of age (diagnosed as per WHO definition) and 30 age matched controls with weight for height above - 2SD of WHO 2006 growth standards were included in the study. Data regarding socioeconomic parameters, feeding practices, Immunization, anthropometric

parameters, clinical profile was compared between the cases and controls.

Results: The significant risk factors for SAM were: maternal illiteracy, paternal illiteracy, low socioeconomic status, lack of exclusive breast feeding, early or late initiation of complementary feeding, incomplete immunization and interval between two siblings less than 2 years. The common presenting symptoms were fever (100%), loose stools 24(80%), cough and cold 20(66.66%), edema 17 (56.60%) and vomiting 12(40%).

Interpretation and Conclusion: The findings of this study have confirmed the association of SAM with parent’s illiteracy, poor family income, improper feeding practices, and short birth interval. Considering the burden of SAM in our community there is strong need to educate the parents, especially mothers about

nutritive diets. They should be counseled about importance of breast feeding, exclusive breast feeding for the first six months, complementary feeding, proper birth spacing, family planning and immunization.

Keywords: Breast feeding, Complementary feeding, Risk factors, Severe acute malnutrition.

Introduction

Severe acute malnutrition (SAM) is a major public health issue faced by many developing countries. Malnutrition occurs when there is deficiency of one or more macronutrients to sustain optimal bodily functions, which is usually accompanied by numerous micronutrient deficiencies.¹ The WHO (World Health Organization), has defined malnutrition as “the cellular imbalance between supply of nutrients and energy and the body’s demand for them to ensure growth, maintenance, and specific functions.”²

Severe acute malnutrition (SAM) between the ages of 6 and 59 months is defined as Weight/height or Weight/length < -3 Z score, using the WHO Growth Charts ,or mid arm circumference less than 115mm, or by the presence of bipedal edema of nutritional origin , Presence of visible severe wasting.³

Short-term consequences of malnutrition include mortality and morbidity for example pneumonia, diarrhea, fatigue and impaired thermo-regulation. In long term, children may affect adult size, intellectual ability, economic productivity and reproductive performance and increase the risk of metabolic disorders and cardiovascular disease.⁴ SAM being a major health problem has affected over 8.5 million under-five children in India and around 0.6 million deaths. The median case fatality rate is approximately 23.5%. This can be reduced to 7 to 10% by standard management a protocol that is why it is important to identify severe acute malnutrition and manage

appropriately.³ Despite concerted efforts in recent years involving policy makers, health care providers and social organizations morbidity and mortality of malnutrition remains a challenge. In addition to treatment of acute complications, a nutritional therapy followed by nutritional rehabilitation is a very important aspect for these children.⁵ This study was performed to evaluate risk factors of hospitalized children with severe acute malnutrition. Determining the risk factors for SAM will help in improving the effectiveness and efficiency of the intervention.

Material and Methods

This was an observational case-control study, carried out at a tertiary centre in Mumbai, India, and was approved by the institutional review board. Patient’s parents were explained regarding the evaluation and written informed consent were taken.

The cases were children with SAM of either gender, between 6 and 59 months of age who were admitted in the hospital. The controls were age-matched children with weight for height above -2SD of WHO 2006 growth standards admitted to the hospital for other medical reason. Children with chronic illnesses, congenital anomalies, congenital heart disease were excluded. The clinical profile of the study subjects analyzed and a detailed history for both cases and controls including age ,sex, address, clinical symptoms and duration, birth history, developmental history, demographic and social profile, diet pattern including breast feeding history and complementary feeding, immunization status, personal and family history details recorded from the parents, patients and/or guardian. The socio economic status of the family determined as per Kuppuswamy score for social classification.

Detail Anthropometric measurements of the cases and controls (Weight, height, mid arm circumference) were taken. After obtaining above mentioned details in cases and controls the risk factors were compared and clinical profile of the cases studied in detail.

Based on the data from previous study⁷, considering immunization as a main risk factor, for incomplete immunization 42% cases and 6% control were included. Thus using 80% power and 5% alpha error (95% confidence interval), for cases sample size of 27 and for control sample size 27 was calculated using comparison of proportion method. 30 cases of severe acute malnutrition in children aged between 6 months to 59 months of age and 30 controls without severe acute malnutrition, considering Immunization as main risk factor were included in the study.

Statistical Analysis

Statistical analysis done to determine proportion of the SAM cases. Results analyzed by student t-test (for quantitative parameters) and Chi-square tests (for qualitative parameters) using SPSS 20 version.

Results

A total of 60 children (30 cases and 30 controls) were enrolled in this case control study. Out of the 30 cases, we found that 16 (53.3%) were males and 14 (46.7%) were females. The male to female ratio was 1.14:1 in children with SAM. The mean age of presentation of cases and controls were 26.3 ± 17.4 and 20.67 ± 13.40 months respectively.

We found significant association of SAM with maternal illiteracy, paternal illiteracy, low socioeconomic status, lack of exclusive breast feeding, early or late initiation of complementary feeding, incomplete immunization and interval between two siblings less than 2 years (Table 1). The illiteracy rate was higher in mothers of the cases 20(66.7%) than the control 9(30%), which

was statistically significant. (P-value 0.004 and OR=4.667). The illiteracy rate was higher in fathers of the cases 13(43.30%) than the control 0(0%), which was statically significant. (P-value 0.001). Most of the cases belonged to lower class of kuppusswamy scale 96.6%(class IV-93.3% and class V-3.3%) as compared to controls were only 6.7% belonged to lower class (class IV-6.7% and class V-0%). This highlights strong association of lower socioeconomic class with SAM (p-Value 0.001) Table 1.

Lack of exclusive breast feed was seen in 23(76.7%) cases and 4(13.3%) controls. There was a strong association between severe acute Malnutrition and lack of exclusively breast feeding in first 6 months of life (p-value 0.001) (OR=21.36). CF was started in 76.7% of cases before 6 months and 23.3% started after 6 months of age. Maximum cases had started complementary feeding before 6 months. There was a strong association between severe acute malnutrition and time of initiation of complementary feeding (p-value was 0.001). In our study incomplete immunization was found in 25(83.3%) cases and 5(16.7%) controls, which was statistically significant (P-value 0.001 and OR=25). In our study out of 30 SAM cases; 12 cases (57.1%) had sibling with birth interval equal to or less than 2 year and 9 cases (42.9%) had sibling with birth interval more than 2 years. In control group all 16 children had birth interval more than 2 years. Hence there was strong association found between siblings with birth interval equal to or less than 2 years and Severe Acute Malnutrition (p-value 0.001). There was no association found between number of siblings and severe acute malnutrition (p-value 0.204). In our tertiary care center, out of 30 cases of SAM; All patients had fever, 24(80%) had loose stools,

20(66.60%) had cough and cold, 17(56.60%) had edema and 12(40%) had vomiting (Figure 1).

Discussion

The study was done to identify the risk factors associated with SAM among children aged 6 to 24 months.

We found that the mean age of presentation of SAM cases was 26.3 ± 17.4 months. Amsalu S et al.⁶ found mean age of presentation of cases 24.1 ± 14.8 . Another study by Kumar P et al.⁷ found mean age of presentation of cases 19.1 ± 15.4 . In initial 2 to 3 years of life, rapid growth occurs and requirement of substrates for energy and building of tissue also increases, thus deficiency of protein, energy and other micronutrients in these years' results in malnutrition.

In our study, maternal illiteracy rate was found as risk factor for SAM which is consistent with previous studies.⁶⁻⁹ Education level of mother is very important in preventing malnutrition as they can give better care, proper diet and follow good hygiene. Educated Mothers also know importance of immunization, and breast feeding.

In our study paternal illiteracy was also found as risk factor for SAM which is also reported in previous studies.^{6,7,10} This higher illiteracy rate found in our study could be because of more number of patients belonging to the slum areas.

This highlights strong association of lower socioeconomic class with SAM (p Value 0.001). Our findings were similar to the study done by Soni et al.¹¹ and Ashraf et al.¹² where they found that majority of SAM children belonged to lower socioeconomic status (IV and V i.e. 72.8% and 90% respectively). Similar finding was seen in other studies.⁵⁻⁷ However study done by Basit A et al.¹³ found 32.1% SAM cases belonging to lower class and 67.9% from middle/high

class. He didn't find significant association between lower class of Kuppaswamy and SAM. Maternal and paternal illiteracy, low monthly income, large family size with overcrowding and inadequately spacing have been implicated as a risk factor for SAM.

Breast milk is the best available food for infant and those who have been deprived of this, are expected to show a greater prevalence of malnutrition. We found lack of EBF during first 6 months of life to be a risk factor for SAM, similar to results of others.^{5, 6, 7, 17} Exclusively breast feeding in the initial 6 months of life decreases the chances of infections as well as malnutrition.

In our study maximum cases (76.7%) were started on complementary feeding in less than 6 months. Introduction of CF before 6 months or after 6 months was found to be significantly associated with SAM. Amsalu S et al.⁶ found that late initiation of CF was an independent risk factor for SAM. Other studies also showed similar findings.^{14, 15} It is suggested that not only early starting of CF in less than 6 months but also late starting i.e. after 6 months of age is significantly associated with SAM. Exclusive breast feeding should be given for first 6 months of life to achieve optimum growth and development. Thereafter nutritionally adequate CF needs to be started while breast feeding continues for two years of age or beyond.

In our study incomplete immunization was found to contribute significantly to SAM. Similar to our study, Kumar P et al.⁷ and, Owor JT et al.¹⁶ found most of the unimmunized children in the case group. In our study higher rate of incomplete immunization as compared to found in literature could be because of migrant population who form the lower socioeconomic strata of the society, their lack of awareness regarding importance of immunization, poverty and their

ignorance. Lack of complete immunization significantly contributes to the occurrence of SAM, which can be explained by the fact that unimmunized children suffer from various infections which retard their growth.

We found strong association between siblings with birth interval equal to or less than 2 years and Severe Acute Malnutrition. Some other studies^{13,17} also found more children with sibling having birth interval \leq 2 years in cases than in control group.

There was no association found between number of siblings and Severe Acute Malnutrition. A study done by Amsalu S et al.⁶ found more than 3 siblings in 40.2% of cases and 25.5% of controls (OR=1.96). In a similar study done by Eshetu A et al.¹⁷ more than 3

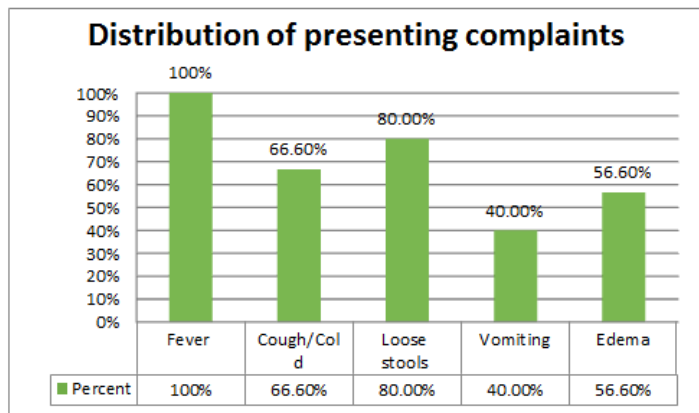
siblings were found in 63% of cases and 25% of controls. This could be due to low per capita income and poor childcare practices. Our finding is not consistent with other 2 studies which may be due to small sample size and study based on admitted children only.

In our center all cases of SAM presented with febrile illness. Other common presenting symptoms were loose stools, cough and cold, edema and vomiting. A study done by Choudhary M et al.⁵ found fever to be the most common presenting complaint of SAM patients. Other symptoms were vomiting, loose stools, cough, cold, edema, loss of appetite, weight loss, rash, convulsion and ear discharge.

Table 1: Risk factors for SAM

Risk factor	Incomplete immunization status in patients		P Value
	Cases (30)	Controls (30)	
Maternal Education			
Illiterate	20 (66.7%)	9 (30%)	0.004
Literate	10(33.3%)	21(70%)	
Paternal Education			
Illiterate	13(43.3%)	0	0.001
Literate	17(56.7%)	30(100%)	
Class IV Kuppaswamy Lower/Upper lower	28(93.3%)	2(6.7%)	0.001
Class V	1 (3.3%)	0	
Lack of EBF in first 6 months of life	23(76.7%)	4(13.3%)	0.001
Complementary feeding started(months)			
<6			0.001
>6	23(76.7%)	3(10%)	
At 6 months	7(23.3%)	1(3.3%)	0.001
	0	26(86.7%)	
Immunization status	25(83.3%)	5(16.7%)	0.001
Number of Siblings			
< than 3 siblings	19 (90.5%)	16 (100%)	0.204(Not significant)
>than 3 siblings	2 (9.5%)	0	
Interval between 2 siblings			
Less than or equal to 2 yrs	12 (57.1%)	0	0.001
More than 2 years	6 (42.9%)	16(100%)	

Figure 1: Distribution of presenting symptoms among cases



Conclusion

The present study identifies improper infant and young child feeding practices, lower socioeconomic status, maternal, paternal illiteracy, incomplete immunization as risk factor for SAM. We need to develop targeted programs to improve infant and young child feeding practices, education, maternal nutrition and family income. The problem of severe acute malnutrition is multi-dimensional. It is very important to address the problem of severe acute malnutrition to policy planners and health regulators.

Mothers should be counseled about importance of breast feeding, effectively promoting exclusive breast feeding for the first six months, starting adequate complementary feeding from six months onwards, birth spacing, family planning and immunization. The other thing which should be focused is the proper follow up of these malnourished children and to monitor adequate growth of these children.

As this was a hospital based study, further larger community based study is needed to identify problem of SAM in children.

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