Original Research Article

Clinical profile and outcome of children with severe acute malnutrition

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Abstract

Introduction: Severe Acute Malnutrition (SAM) is a unique type of severe malnutrition and is different from severe underweight and severe stunting. This study evaluated the clinical manifestations among the children admitted to the SCB medical college and SVP PGIP and elucidated further the factors associated with severe malnutrition among the undernourished children and finally the outcome in terms of cured or mortality. **Materials and Methods:** This hospital-based cross-sectional time-bound study with follow-up component was conducted by using technique of sampling without replacement. Children aged 1-60 months admitted to SCB MCH and SVPPGIP during September 2013 to September 2015, having features of SAM were considered for the study population. After detailed history and physical examination, relevant investigations were done and critical analysis made. **Results:** Total 130 patients with SAM constituted the study population. The overall prevalence of SAM was 2.5%. Majority were non edematous SAM (Marasmus) (77%) and rest were oedematous (Kwashiorkor).There was no variation in sex as both male and female patients were with equal percentage (50%). About 12.3% of children with SAM were less than 2 months, 47.7% between 2 to 12 months, and 40% were above 12 months. **Conclusion:** Malnutrition is predicted by age less than two years, living with single parent, taking unbalanced diet, lack or incomplete immunization and low level of maternal education. Co-morbidities associated with malnutrition were pneumonia, pulmonary tuberculosis, urinary tract infection. Mortality is predicted by age less than one year, peasant parents, having severe malnutrition, dehydration, hypothermia, and hypoglycemia.

Keywords: - Severe Acute Malnutrition, Marasmus, Kwashiorkor.

Background

Malnutrition is one of the leading causes of morbidity and mortality in children throughout the world. In the developing world, prevalence of malnutrition among under-fives is 41% with an estimated 230 million (39%) children being chronically malnourished [1, 2]. It is responsible for 60% of the 10 million deaths annually among children under five [3]. In India; more than 33% of under 5 deaths are associated with malnutrition [4].

Severe Acute Malnutrition (SAM) is a unique type of severe malnutrition and is different from severe underweight and severe stunting. It affects about 20 million children globally and contributes to an estimated one million deaths every year [5]. In India, 6.4% of under–5 children suffer from SAM [4, 6]. Severe acute malnutrition (SAM) is defined by very low weight-for-height/length (Z- score below -3 SD of the median WHO child growth standards), or a mid-upper arm circumference < 115 mm, or by the presence of nutritional edema [4]. The spectrum includes severe as well as mild forms [7].

The case fatality rate in SAM can be brought down to 7-10% from the present rate of 23.5% to 50% [4]. SAM significantly increases the risk of death in children less than five years of age. In Odisha the prevalence of under nutrition is still high. Data from UNICEF global database on child malnutrition showed that 10% of under-fives were moderately and severely wasted [8].

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Abrupt weaning with diluted animal milk and lack of breast-feeding contribute to malnutrition in the first year of life, while in the second year it is due to the inadequate intake of protein and calories, which lead to starvation [9]. Malnourished survivors are left with mental developmental delay, poor school performance and reduced intellectual achievements [2,10,11,12].

There is paucity of data regarding prevalence, clinical manifestation and outcome of SAM in Odisha. This study therefore is aimed at determining the prevalence, clinical manifestation, outcome and the predictors of death among undernourished children admitted to SCB MEDICAL COLLEGE and SVPPGIP.

Aims and Objectives

To determine the:-

1. Prevalence of severe malnutrition among undernourished children,
2. Risk factors associated with SAM children,
3. Common co-morbidities in severe malnourished children, and
4. Outcomes of children with SAM, aged 1-60 months admitted to SCB medical college and SVPPGIP paediatric wards.

Materials and Methods

This hospital-based, cross-sectional, time bound, study with follow up component was conducted at SCB Medical College and SVPPGIP during a period extending from September 2013 to September 2015.The sampling technique adopted was "Sampling without Replacement".

All children aged 1 to 60 months, diagnosed with severe malnutrition were admitted for care and follow up in the general ward if any complications are present or in the Nutrition Rehabilitation Center (NRC) if no complications. All were screened for their nutritional status and those found to have severe acute malnutrition were included in this study after fully satisfying the following criteria.

A) For infants 6 months to 5 years, a) Weight-for-height less than -3 SD and/or b) Visible severe wasting and/or Mid Upper arm circumference (MUAC) < 11.5 cm and/or c) Nutritional edema of both feet.
B) For infants <6 months of age, with length more than 49cm a) Weight-for-length less than -3 SD and/or, b) Visible severe wasting and/or Nutritional edema of both feet.
C) For infants < 6 months of age, with length less than 49cm, if there was severe visible wasting.

Following children were excluded from the study:-

a) Causes of Severe Acute Malnutrition like cleft lip, cleft palate, GERD, pyloric stenosis and other surgical condition, chronic renal failure, congenital heart diseases, liver disorders, asthma, mental retardation, cerebral palsy, suspected cases of inborn error of metabolism etc.
b) Children of less than 1 month of age and more than 5 years of age.
c) Other causes of edema like Nephrotic Syndrome.
d) Refusal of consent by parents or caregivers.

Out of 11,000 children (aged 1- 60 months) admitted during September 2013 to September 2015, 275 children were having features of SAM. 133 children were excluded basing on exclusion criteria.

Out of rest 142 children having features of severe acute malnutrition, 12 cases left against medical advice leaving 130 cases for the final study.

Results

The overall **prevalence** of severe acute malnutrition in our study population is 2.5%. Among 130 cases of SAM, majority were non edematous SAM (Marasmus) (77%) and rest (23%) belonged to oedematous SAM (Kwashiorkor). There is no variation in sex both males and females being equally distributed. About 12.3% children with SAM belonged to age group < 2 months, 47.7% between 2 months to 12 months whereas 40% were above 12 months. Low birth weight (14.6%), absence of exclusive breast feeding up to 6 months of age (45.4%), Delayed introduction of complimentary feeding beyond 6 months with inadequate quantity and improper dilution (10.8%) and incomplete immunization (20%) were major risk factors for SAM (Figure 1). About 50.8% presented with Lethargy, 35.4% had Skin changes, 34.6% had Diarrhoea, and 33.8% had Fever and 30.8% Cough. Visible Severe Wasting, Hair changes, Oedema, Vomiting, Dehydration and Shock were presenting features in 30%, 24.6%, 23 %, 22.3%, 15.4% and 10.8% respectively. (Figures 2 and 3). Among the co-morbid conditions precipitating the SAM, UTI (83.8%) was the commonest followed by Anaemia (48.5%) and Hypoglycaemia (15.4%) (Table 1). Mantoux test was reactive and chest x-ray was abnormal with positive contact history in 3.1% of the study population suggesting Tuberculosis.

The various predictors of outcome in SAM in our study population were found by descriptive statistical analysis. The various clinical manifestations having significant relationship with outcome in this study population of 130 SAM patients are vomiting (p=0.004), dehydration (p=0.001) shock (p=0.001), edema (p=0.037) acute respiratory tract infection (p=0.011), hair changes (p=0.001) lethargy (p=0.001). Among various socio-demographic factors, only exclusive breast feeding is having significant association with outcome (p=0.016). Of various co-morbidities and laboratory parameters, hypoglycaemia (p=0.001) mantoux status (p=0.007) CRP status (p=0.001) chest X-ray finding (p=0.001) and blood culture (p=0.001) are having significant association with outcome in our study.

But age class, sex, exclusive breast feeding, socio-economic status, skin changes, hair changes, anaemia, UTI, kidney and renal dysfunction does not have significant association with outcome in our study as p value in all these cases are >0.05.

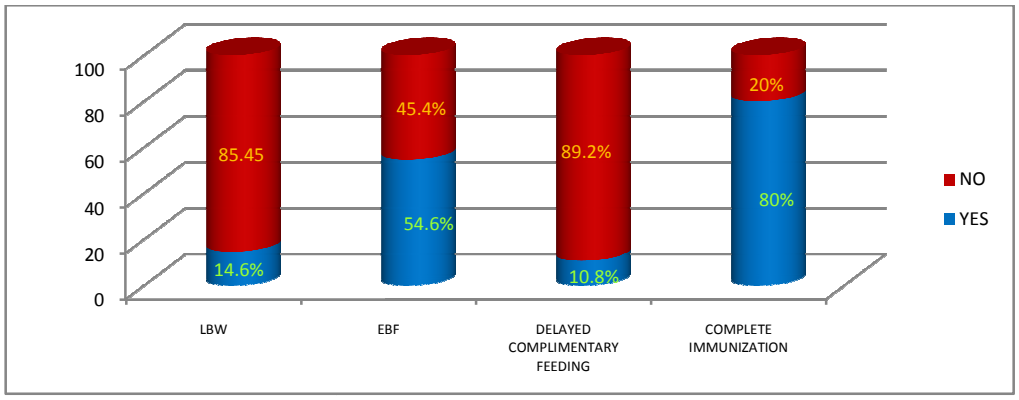

Figure 1- Risk Factors of SAM in the Study Population (N=130)

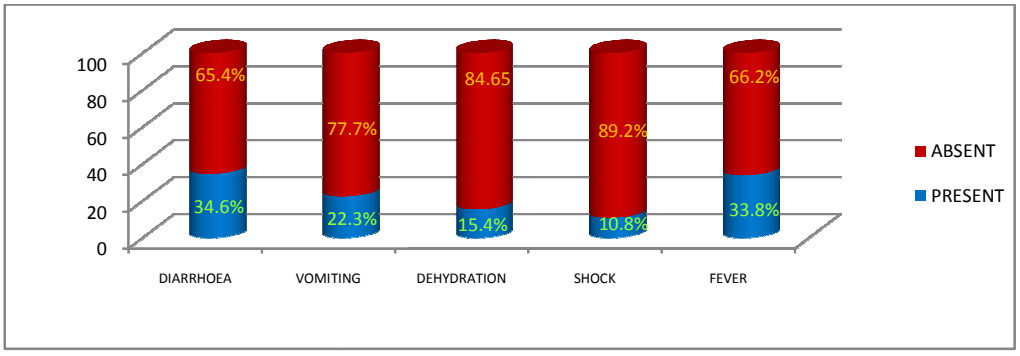

Figure 2- Clinical Manifestations of SAM in the Study Population (N=130)

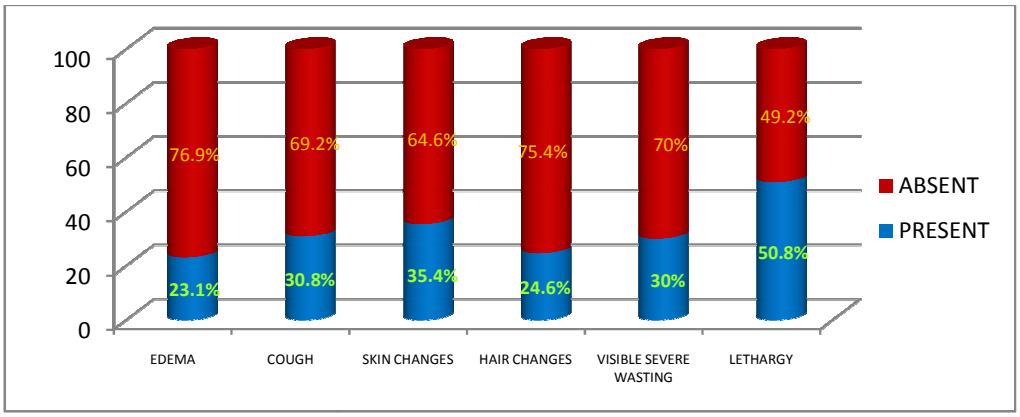

Figure No-3: Clinical Manifestations of SAM in the Study Population (N=130)

Table No-1: Categorisation of study population according to co-morbidities (n=130).

Variables		Frequency	Percentage (%)
Hypoglycemia	Present	20	15.4
	Absent	110	84.6
Anaemia	Present	63	48.5
	Absent	67	51.5
UTI	Present	21	83.8
	Absent	109	16.2

Table-2: Outcome in Relation to Baseline Characteristics in the Study Population (N=130).

Variables		Outcome		P Value
		Cured (n=117) (%)	Death (n=13) (%)	
Age class	<2 months	14 (12%)	2 (15.4%)	0.776
	>2 months-<12 months	55 (47%)	7 (53.8%)	
	12months to 60 month	48 (41%)	4 (30.8%)	
Sex	MALE	59 (50.4%)	6 (46.2%)	0.77
	FEMALE	58 (49.6%)	7 (53.8%)	
Low Birth Weight	yes	18 (15.4%)	1 (7.2%)	0.456
	No	99 (84.6%)	12 (92.3%)	
Exclusive Breast Feeding	yes	68 (58.1%)	3 (23.1%)	0.016
	No	49 (41.9%)	10 (76.9%)	
Delayed Complimentary Feeding	yes	13 (11.1%)	1 (7.7%)	0.706
	No	104 (88.9%)	12 (92.3%)	
Complete Immunization	yes	94 (80.3%)	10 (76.9%)	0.77
	No	23 (19.7%)	3 (23.1%)	
Socio Economic Status	upper	3(2.6%)	0(0.0%)	0.482
	upper middle	33(28.2%)	1(7.7%)	
	lower middle	47(40.2%)	7(53.8%)	
	upper lower	32(27.4%)	5(38.5%)	
	lower	2(1.7%)	0(0.0%)	
Latrine	present	32(27.4%)	1(7.7%)	0.122
	absent	85(72.6%)	12(92.3%)	
Diarrhoea	present	39(33.3%)	6(46.2%)	0.357
	absent	78(66.7%)	7(53.8%)	
Vomiting	present	22(18.8%)	7(53.8%)	0.004
	absent	95(81.2%)	6(46.2%)	
Dehydration	present	13(11.1%)	7(53.8%)	0.001
	absent	104(88.9%)	6(46.2%)	
Shock	yes	3(2.6%)	11(84.6%)	0.001
	no	114(97.4%)	2(15.4%)	
Fever	present	37(31.6%)	7(53.8%)	0.108
	absent	80(68.4%)	6(46.2%)	
Edema	present	24(20.5%)	6(46.2%)	0.037
	absent	93(79.5%)	7(53.8%)	

Acute Respiratory Tract Infection	present	32(27.4%)	8(61.5%)	0.011
	absent	85(72.6%)	5(38.5%)	
Skin Changes	present	39(33.3%)	7(53.8%)	0.142
	absent	78(66.7%)	6(46.2%)	
Hair Changes	present	24(20.5%)	8(61.5%)	0.001
	absent	93(79.5%)	5(38.5%)	
Signs of vitamin deficiency	present	21(17.9%)	4(30.8%)	0.266
	absent	96(82.1%)	9(69.2%)	
Visible Severe Wasting	present	33(28.2%)	6(46.2%)	0.18
	absent	84(71.8%)	7(53.8%)	
Lethargy	present	53(45.3%)	13(100%)	0.001
	absent	64(54.7%)	0(0.0%)	
Hypoglycemia	present	11(9.4%)	9(69.2%)	0.001
	absent	106(90.6%)	4(30.8%)	
Anemia	present	57(48.7%)	6(46.2%)	0.861
	absent	60(51.3%)	7(53.8%)	
Mantoux	positive	2(1.7%)	2(15.4%)	0.007
	negative	115(98.3%)	11(84.6%)	
CRP	positive	40(34.2%)	11(84.6%)	0.001
	negative	77(65.8%)	2(15.4%)	
Chest x ray	normal	98(83.8%)	6(46.2%)	0.001
	abnormal	19(16.2%)	7(53.8%)	
Renal function	Normal	114(97.4%)	12(92.3%)	0.31
	Abnormal	3(2.6%)	1(7.7%)	
Liver function	Normal	116(99.1%)	12(92.3%)	0.057
	Abnormal	1(0.9%)	1(7.7%)	
Urinary tract infection	Present	19(16.2%)	2(15.4%)	0.937
	Absent	98(83.8%)	11(84.6%)	
Blood culture	Positive	7(6.0%)	11(84.6%)	0.001
	Negative	110(94.0%)	2(15.4%)	

Discussion

In this study population comprising of 130 cases of SAM, majority were non edematous SAM (Marasmus) (77%) and rest (23%) were oedematous (Kwashiorkor).

Similar results were found in studies by Amsalu et alin North West Ethiopia with marasmus (75%) and kwashiorkor (25%) [3]. In this study population, there is no variation in sex as both male and female patients were with equal percentage (50%) which was the observation in other studies [7]. About 12.3% with SAM were of < 2 months age group, 47.7% between 2months to 12 months and 40% were above 12 months (60% belonged to <1 year of age). It is similar to the observation made by Aguayo et al, where 77.7% of SAM patient were 6-23 months old in Jharkhand [7].

Low birth weight is a major risk factor for SAM due to low level of immunity status and high incidence of infection in them. In this study, low birth weight was present in 14.6% of study population. Lack of vaccination was related to poor care, families with major problems in education, low social economic class and single parents, all of whom had lower care for their children both in nutrition and disease prevention. Similar result was found in the study by Oworetalin, East Africa showing strong association between SAM and incomplete immunization [8].

Lethargy was the most common presenting feature (50.8%). Among other features, Skin changes, Diarrhoea, Fever, Cough, Visible Severe Wasting, Hair

changes, Oedema, Vomiting, Dehydration and Shock were presenting features in 35.4%, 34.6%, 33.8%, 30.8%, 30%, 24.6%, 23%, 22.3%, 15.4% and 10.8% respectively. Study by Aguayo et al done in Jharkhand [7] showed diarrhoea / severe dehydration in 2.3% SAM cases. Hypoglycaemia was found in 15.4% of SAM children in this study and anaemia was found to be present in 48.5% cases. UTI was found as co-morbidity with SAM in 16.2% in the study population.

Sex, parents' occupation, family income, family sizes were not statistically significant in this study similar to other studies which showed no association between malnutrition and these factors [9, 10, 11, 12].

Outcome of interest were determined after following up the patients in the hospital. The outcome of the study was categorized into two categories i.e. cured and death. Out of the 130 patients of SAM in the study group, 117 patients (90%) were cured and discharged with variable number of admission days and 13 patients (10%) died due to various complications.

The various predictors of outcome in SAM of the study population were found by descriptive statistical analysis. The various clinical manifestations having significant relationship with outcome in this study population of 130 SAM patients have been summarized in **Table-2** along with the p values.

Summary and Conclusions

The overall prevalence of severe acute malnutrition in our study population is 2.5%. Among 130 cases of SAM, majority were non edematous SAM (Marasmus) (77%) and edematous SAM (Kwashiorkor) is less (23%). Most cases were from Cuttack (30.8%) followed by Jaipur (12.3%) and Kendrapada (8.5%). There is no variation in sex as both male and female patients were with equal percentage (50%). In this study 12.3% children with SAM were of < 2months, 47.7% are between 2months to 12 months and 40% were above 12 months.

Prevalence of under-nutrition in our setting is high and majority of the admitted children have marasmus type of malnutrition. Malnutrition is predicted by age less than two years, living with single parent, taking unbalanced diet, lack or incomplete immunization and low level of maternal education. Co-morbidities associated with malnutrition were pneumonia, pulmonary tuberculosis, urinary tract infection.

Severely malnourished children are staying longer at hospital and have a higher mortality. Mortality is high in our setting in under-nutrition which is predicted by age of less than one year, peasant parents, having severe malnutrition, dehydration, hypothermia and hypoglycemia.

Abbreviations Used: - S.C.B- Sriram Chandra Bhanj, SVPPGIP- Sardar Vallabhbhai Patel Post Graduate Institute of Paediatrics, SAM-severe acute malnutrition, Nutrition Rehabilitation Center (NRC), HIV-Human Immunodeficiency virus, LBW-Low Birth weight, EBF-Exclusive Breast Feeding, CRP-C-reactive protein.

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Perission from IRB: Yes

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