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Original research article

Severe acute malnutrition (SAM) in hospitalised children and related co-morbidities

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Abstract

Background and objectives: To determine the co-morbidities in children with severe acute malnutrition who are being treated in hospitals. To determine the mortality risk variables for SAM children being treated in hospitals.
Methods: All hospitalised children were included in accordance with WHO criteria in this hospital based descriptive study. An ethical committee gave its clearance before the probe was started. Parental approval was gotten knowingly. Demographic data, including age, gender, and location, as well as socioeconomic status, were obtained after gaining parental consent.
Result: 43.7% of the 250 children were ages 1-3, 34 were 3-5, and 48.1% were under one. 236 (95%) of 250 hospitalised SAM children had substitute milk, while 14 (5.6%) did not. (52.4%) and animal milk (42%). 5.6% of alternative milk recipients received appropriately diluted milk, while 87.6% did not. Bottle feeding was most prevalent (60.8%). Paladai (22%), cup and spoon (8%), and glass (4.4%) were other feeding ways. 22.4% of children were moderately stunted and 23.2% severely stunted. 47.1% of SAM patients with sepsis and 43.2% of those without died. (p 0.001). Seven retroviral-positive SAM patients died. HIV-positive SAM children have poor prognoses.
Conclusion: Hospitalised SAM children have worm infestation (13.5%), UTI (13.5%), skin infection (8%), measles (6%), retroviral infections (3.5%), TB (1%) and meningitis (0.5%). Sepsis and retroviral infections increased death risk.
Keywords: Severe acute malnutrition, mortality, worm infestation, meningitis, retroviral infection

Introduction

Each year, 1 to 2 million children die as a result of severe acute malnutrition (SAM). Each year, it is one of the major preventable causes of child mortality. Globally speaking, severe acute malnutrition has been disregarded by child survival programmes. The term "acute malnutrition" is not approved by WHO. Children with SAM in hospitals require a large number of qualified and motivated medical professionals for a better recovery [1, 2, 3].

SAM has a 20-30% case fatality rate. Children with SAM mortality at a rate nine times greater than children who receive enough nutrition. An estimated 8 million Indian children under the age of five are critically undernourished, which impairs their capacity to grow and reach their full potential. They will reach their full potential if they are managed properly [4, 5, 6].

All SAM children who have no problems receive outpatient care, which is one of the most economical forms of treatment. Numerous SAM instances are worse by infectious disorders such as acute respiratory tract infections, acute watery diarrhoea, gram-negative septicemia, urinary tract infections, measles, anaemia, organic diseases, HIV, TB, and Meningitis. Inpatient hospital treatment is used to manage these kids. 6.4% of children under the age of five have severe weight loss, according to the National Family Health Survey. Several SAM-related deaths can be avoided with good nutritional and therapeutic care. For deaths from pneumonia and diarrhoea, SAM is the main contributing factor. SAM-related deaths are typically avoidable if the right steps are done in a timely manner [7, 8, 9].

Every year, SAM causes the deaths of 10-11 million children under the age of 5. SAM requires specialised care and preventative actions because it is linked to high rates of death and morbidity. One of the most frequent causes of paediatric hospital hospitalisations in India is SAM. The level of wasting has a direct impact on the mortality risk in SAM kids. 73-187 deaths per 1000 children per year are associated with severe wasting. 17.3 (2.6%) million children worldwide suffer from severe malnutrition. 8.4 million children in India are thought to be afflicted by SAM, with a frequency of 6.8% [9, 10].

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Material and Methods

A hospital-based descriptive investigation was conducted on 250 children at Department of Paediatrics, DR VRK Women's Medical College, Aziz Nagar, RR District, Hyderabad, Telangana, India from January 2022 to November 2022. All hospitalised children were included in accordance with WHO criteria. The investigation was initiated after receiving approval from an ethical committee. Parental consent was obtained with knowledge. After obtaining parental consent, demographic information such as age, gender and location, as well as socioeconomic status, was received.

Result

Table 1: Distribution of age and sex

Age Category	Sex		Total
	Male n (%)	Female n (%)	
<1 year	39 (48.1)	42 (51.8)	81
1-3 years	59 (43.7)	76 (56.3)	135
3-5 years	23 (67.6)	11 (32.4)	34

Of the 250 children, most of them (43.7%) were between the ages of 1-3. 34 youngsters aged 3-5 years and 48.1% of all children were under the age of one.

Table 2: Habit of feeding

Feeding with Milk Other Than Breast Milk			
Type of Other Milk	Animal	105	42%
	Commercial	131	52.4%
	Not given	14	5.6%
Dilution	Appropriate	14	5.6%
	Inappropriate	219	87.6%
	Not given	17	6.8%
Mode of Feeding	Cup & spoon	20	8%
	Paladai	55	22%
	Glass	11	4.4%
	Bottle	152	60.8%
	Not Given	12	4.8%

250 children with severe acute malnutrition (SAM) were hospitalised; 236 (95%) of them received alternative milk, while 14 (5.6%) did not. Commercially available infant formula was the most popular type of other milk (52.4%), followed by animal milk (42%). Only 5.6% of the children who received alternative milk had their milk properly diluted, whereas 87.6% received milk that had been improperly diluted. Bottle feeding was the most popular method of feeding (60.8%). Other feeding methods included using a paladai (22%), a cup and spoon (8%) or a glass (4.4%).

Table 3: Semisolids feeding

Age at Which Started	n	%
<6 months	83	33.2
6-8 months	88	35.2
8mths- 1year	53	21.2
>1year	26	10.4

Table 4: Anthropometry of height/length for age

Z Score	n	%
-2 to +2	136	54.4
-2 to -3	56	22.4
<-3	58	23.2

22.4% of children had moderate stunting, while 23.2% had severe stunting.

Table 5: Organic disease presence

Organic Disease	Died n (%)	Discharge n (%)	Total
Present	22(37.9)	36 (62.1)	58
Absent	24(12.5)	168 (87.5)	192
	46	204	250

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Table 6: Sepsis presence

Sepsis	Died n (%)	Discharge n (%)	Total
Present	24(47.1)	27(52.9)	51
Absent	22(43.2)	177(34.7)	199
	46	204	250

Children with SAM who had sepsis died in 47.1% of cases, and 43.2% of children without sepsis also passed away. According to statistics, this was significant (p 0.001). None of the seven SAM patients that were retrovirally positive survived; they all died. It goes without saying that HIV positive in a child with SAM is a poor prognostic indicator.

Table 7: Logistic regression and results of organic disease and sepsis

Risk Factor	Crude Odds	Adjusted Odds	95% CI	Significance
Organic Disease (Presence vs. Absence)	5.9	19.129	3.7-96	<0.001
Sepsis (Presence vs. Absence)	12.08	31.049	6.05-159	<0.001

Discussion

Acute watery diarrhea/AGE was found to be the most common comorbidity in this study of 250 hospitalised SAM children, followed by acute respiratory infections/pneumonia (44.5%), worm infestation (13.5%), UTI (13.5%), skin infection (8%), measles (6%), retroviral infections (3.5%), TB (1%), and meningitis (0.5%). The death rate per case was 10.5%. Significant death risk factors were sepsis, retroviral infections, and the presence of an underlying organic disease. The average age of presentation in our study is 17.75 months. It is in line with the findings of the studies by Mukesh Choudry *et al*. (14.92 months), Abel H Irena *et al*. (17 months), and Syed Tariq (16.5 months). In all of the investigations, the typical presentation age was under 24 months. This may be explained by the fact that throughout the first two to three years of life, fast growth occurs, increasing the need for nutrients for both energy and muscle growth. SAM will therefore develop in this age range if protein, energy, and other nutritional deficiencies exist [11, 12].

This age group is more susceptible to famine, conflict, chronic illness, poverty, political unrest, and family migration. These are the explanations for why children under 24 months are the most prevalent age group. Male: Female ratio of 0.87:1 (46.5% male, 53.5% female) indicates a little feminine predominance in our study. It agrees with studies by Rajendra K. Gupta *et al*., Singh and Rao *et al*., and Rakesh Kumar *et al*. However, it is comparable to research by Ashraf *et al*., Aneja *et al*., and Syed Tariq *et al*., Due to gender disparity, neglect of the female child, parental delaying of seeking medical attention, poverty, low socioeconomic level, and low maternal education, female children are more frequently afflicted. Children in our study came from urban regions in 39% and rural areas in 61%. These findings are consistent with research by Mukesh Choudry *et al*., and Syed Tariq [13, 14].

Other Indian studies also agree with this scenario. Due to less favourable living conditions like subpar housing, inadequate access to clean drinking water, consumption of less nutrient-dense food, insufficient antenatal, natal, and postnatal check-ups during pregnancy, subpar complementary feeding quality, early weaning, inadequate immunisation status, and low maternal education, children from rural areas are most frequently affected by SAM. This rural predominance may also be caused by the neglect of rural areas by policymakers. Another factor is the inaccessibility of medical services lack rural locations. Weaning was initiated extremely early (1 year) in our study. According to the Singh *et al*., study, only 24.7% of children began weaning before the age of 6 months. According to a study by Mukesh Choudry *et al*., weaning was initiated early in 25% of children and late in 9.86% of children. Weaning practises like as early and delayed weaning play a significant role in the emergence of SAM. SAM prevalence was also higher in children who were exclusively breastfed for a longer period of time because breast milk becomes less nutrient-dense as children age [15, 16].

Early breast-feeding cessation combined with the introduction of semisolid and supplementary formulae might result in gastroenteritis, which is one of the main risk factors for SAM development. After 6 months, complementary feeding should be introduced in addition to breastfeeding because infants' nutritional and caloric needs rise. Exclusive breastfeeding stops providing the infant with enough calories and nourishment after six months. This is the reason why SAM develops with early and delayed weaning. Commercially available formula ranks first in our survey among other milk types (51.5%), followed by animal milk (46.5%). In our study, bottle feeding accounted for 69% of all feedings, followed by paladai (22%), cup and spoon (4.5%), and glass (2.5%). In a study by Mukesh Choudry *et al*., the most popular feeding method was the katori spoon and cup (75%), followed by the bottle (17.3%), and the bottle and katori spoon (7.7%). Children who drink from a bottle are more likely to have infections because of poor cleaning techniques, unclean bottle conditions, and unclean nipples, which can harbour infectious microorganisms. Thus, bottle feeding presents the greatest risk to a baby's

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health. Therefore, we need to take serious action to stop bottle feeding. 52.5% of the kids in our research had some kind of developmental impairment. Children in the age group of 52.5% had a 6.5% global developmental delay, a 41.5% motor delay and a 4.5% verbal delay [16, 17, 18].

This is comparable to the Rajendra K. Gupta *et al*. study in which 62.5% of the kids exhibited developmental delays. 70% of the children in another study by Syed Tariq *et al*. showed developmental delays, while 1.36% had developmental regression. This delayed growth could be attributed to poor nutritional intake, poor feeding techniques, an early end to breastfeeding, a depressing atmosphere, and chronic illness. All of these variables cause neurological defects in SAM children. According to Mukesh Choudry *et al.'s* study in India, only 13.3% of children their age were fully immunised, while 44% had only received a partial dose. It conflicts with the results of our study, in which 59.5% of kids had received all their shots and 40% had received only a portion of them. According to Rajendra K. Gupta et al., 43.7% of people were fully immunised, 52% were only partially immunised, and 4.75% had never received any vaccinations. 42.3% of the study's participants received all three immunisations, according to Rakesh Kumar *et al.* According to a study by Syed Tariq *et al*., only 13% of children were fully immunised, although 62.3% of them had received all of their recommended vaccinations. Low socioeconomic level, difficulty accessing the health care system, lack of knowledge about vaccination, incorrect customs and beliefs towards vaccination, and low maternal education are the causes of inadequate immunisation in all the research mentioned above. 91.5% of the kids in our survey came from lower socioeconomic backgrounds [19, 20].

According to studies by Mukesh Choudry *et al*. and Rakesh Kumar *et al*., low socioeconomic level was very common. Low purchasing power for proper nutrition, poor housing quality, bad hygiene, poor feeding practises, and a lack of access to wholesome food and drink are the causes of the high prevalence of SAM children in low socioeconomic class. In our study, acute gastroenteritis, which was present in 57.5% of children, was the most frequent co-morbidity. Children were diagnosed with 44.5% pneumonia (ARI), 13.5% worm infestation, 13.5% urinary tract infection, 6% measles, 8% skin diseases, 3.5% retrovirus, 1% tuberculosis, and 0.5% meningitis. The comorbid illnesses diarrhoea, malaria, sepsis, and severe anaemia are listed in descending order in a Nigerian study by Agozie C. Uberie *et al*. According to an Indian study by Rakesh Kumar *et al*., acute gastroenteritis (33%), ARTI (27.9%), TB (22.1%), sepsis (10%), measles and malaria (3.8% each) and UTI (1%), are the most common related comorbidities. The comorbidities in another Indian study by Mukesh Choudry *et al*. included TB (9.3%), AGE (60%), ARTI (52%), and UTI (4%) [20, 21].

Additionally, two African investigations found that hospitalised SAM children had a significant rate of gastroenteritis (49% and 67%, respectively). In a research conducted by Abel H. Irene in Zambia on SAM children who were hospitalised, diarrhoea was a primary cause of death. However, the findings of our study do not agree with those of Anil Thappa *et al*., who found pneumonia to be prevalent in 51% of cases, AGE to be prevalent in 21%, and bacterial meningitis to be prevalent in 8% of cases. Additionally, the findings of our study do not agree with those of a different Indian study conducted by Rajendra K Gupta et al, which found that malaria was prevalent in 21% of hospitalised SAM children and that ARTI was present in 37.3%, AGE 24.1%, TB 23%, pyogenic skin infections 14.7%, meningitis 4.9%, measles 4.2%, HIV 29.2% and TB. According to Syed Tariq *et al*., diarrhoea is the most prevalent comorbidity. Because severe acute malnutrition weakens the child's immune system and increases their susceptibility to life-threatening infections including AGE, pneumonia, sepsis and TB, diarrhoea is the most prevalent comorbidity in all the studies mentioned above [21].

Children with SAM have suppressed humoral and cell-mediated immunity, a compromised skin barrier, a compromised mucosal defence system and a compromised phagocytic and free radical scavenging function. SAM kids are also more likely to get sick if carers don't practise good cleanliness and treatment of them. One of the causes of a life-threatening illness in SAM children is immune dysfunction syndrome. Children in our study who had anaemia were 27%. Among the 27% of kids who had anaemia, 20.4% had iron deficiency anaemia and 79.6% had dimorphic anaemia. This contradicts studies by Soni *et al*., Neha Thakur *et al*., and Mukesh Choudry, which found anaemia in 81.1% of children and anaemia in 60% of children, respectively. Microcytic hypochromic anaemia, which was the most prevalent type of anaemia among them (38.6%), was followed by megaloblastic anaemia (30.6%). These outcomes don't match those of our research [21, 22].

In our study the most common type of anemia was dimorphic anemia. Infections, blood loss brought on by worm infestations, inadequate nutrition, malabsorption, hemolysis, erythroid hypoplasia, ineffective erythropoiesis brought on by folate and vitamin B12 deficiencies, and chronic disease-related anaemia all contribute to anaemia in SAM children. 3.5% of SAM children in our survey had HIV prevalence. Results are comparable to Ashagire Terife Abeja *et al.'s* study (2%), but they differ from those of C John *et al.* and Abel H Irena *et al*., in which the prevalence of HIV was respectively 21.5% and 38.9%. The most prevalent and potentially fatal comorbidity in SAM kids is sepsis. In our study, sepsis affected 13% of the kids. This differs from studies by Sarada *et al*., where the prevalence was 44.1%, and B.F.P. Sunguya *et al*., where it was 6%. The high prevalence of sepsis in SAM children can be attributed to a number of factors, including impaired humoral immunity, impaired cell-mediated immunity, impaired

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epidermal barrier, impaired mucosal defence mechanism, impaired phagocytic and free radical scavenging function, and inadequate caretaker hygiene. In our study, 13.5% of hospitalised SAM children had UTI, which is greater than in the studies of Rakesh Kumar *et al*. (1%) and B.F.P. Sunguya (8%). Reduced fluid intake, extended hospital stays, iatrogenic causes, and lowered immunity could all be reasons for SAM's UTI [22].

In our study, a hospital stay lasts an average of nine days. According to a Nigerian study, the period was 16 days, therefore this is inconsistent. According to investigations by Syed Tariq *et al*. and Abel H. Irena, the length is 16 and 19 days, respectively. In contrast to a study conducted in Nigeria by Agozie C. Ubesie *et al*., where the case fatality rate was 40.1%, our study's rate was 10.5%. A study by Syed Tariq *et al*. indicates that mortality is 23.5%. The two most significant contributing factors affecting the case fatality rate in our study were sepsis and organic illness. Improved hospital treatment, nutritional rehabilitation, timely detection and management of co-occurring diseases such acute watery diarrhoea and pneumonia and low mortality in our study as compared to other studies are all contributing factors. Therefore, effective care of co infections is crucial for lowering the case fatality rate [22, 23].

Conclusion

The most common concomitant illnesses found in hospitalised SAM patients are acute gastroenteritis or AWD (57.5%), acute respiratory infections or pneumonia (44.5%), worm infestation (13.5%), urinary tract infection (13.5%), skin infection (8%), measles (6%), retroviral infections (3.5%), tuberculosis (1%), and meningitis (0.5%). Meningitis accounts for only 0.5 percent of cases. Significant risk factors for mortality included the presence of an underlying organic condition, as well as sepsis and infections caused by retroviruses.

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References

1. Comorbidities in hospitalized children with severe acute malnutrition. Indian paediatrics journal, Rakesh Kumar, Jyothi Singh, Karan Joshi, H P Singh, S Bijesh, 2014 Feb, 51.
2. Patent of comorbidities in children with severe acute malnutrition admitted in MTC of a teaching hospital in South East Rajasthan, India. Journal of pharmaceutical and biomedical sciences. Rajendra K Gupta, Gowtham L Nagori, Poonam Nagori, Ram P Patidar. 2015;5(5):403-407.
3. Analysis of comordities in children with severe acute malnutrition in Eastern Nepal. Journal of Nepal pediatric society. Anil Thapa, Gauri Shankar Shah, Om P Mishra, 2015, 35(2).
4. Association of severe acute malnutrition wit infections in under 5 children admitted to nutritional rehabilitation center-Study from Central India. International Journal of Medical science and public health. Yogesh Shukla, Prathibha Verma, Rajesh Tiwari, Pradeep Kumar Kasar, Shahi Prabha Tomar. 2016;5(4):758-763.
5. Analysis of hospital records on treatment outcome of severe acute malnutrition: The case of Gondar University Tertiary hospital. Ashagrie, Terefe Abeje, Temesgen Worku Gudayu, Yewunetu Dessalengn, Malefia and Birhanu Boru, Befftu.
6. To study the outcome of SAM children using F75/F100 milk based formula. C John, H Abdu, P Ukat.
7. Diarrhea is a major killer of children with severe acute malnutrition admitted to inpatient setup in Lusaka, Zambia. Nutrition journal. Abel H Irena, Mwate Mwambazi, Veronica Mulenga. 2011;10:110.
8. Infections associated with severe acute malnutrition among hospitalized children in East Africa, Tanzania Health research bulletin. BFP Sunguya, JI Koola, S Atkinson. 2006;(8):3.
9. Severe acute malnutrition among hospitalized children, Aden, Yemen. Open journal of epidemiology. Mohammed Ali Badi, Imman Ali Ba-Saddik. 2016;6:121-127.
10. Demographic, clinical profile of severe acute malnutrition and our experience of nutritional rehabilitation center at children hospital, Srinagar, Kashmir. International Journal contemporary pediatrics. Syed Tariq, Suhail Ahamad Naik, Wasim Rafiq A, Rehana Saleem. 2015 Aug;2(3):233-237.
11. Mortality in children with severe acute malnutrition. Saradha G, Rafiq Ahmed K, Sudhakar G, Dr Srilatha
12. Anemia in severe acute malnutrition. Nutrition journal. Neha Thakur, Jagdish Chandra, Harish Pemde, Varinder Singh, 2014 April, 30(4).
13. Risk factors for severe acute malnutrition in central India. International journal of medical science research and practice. Shweta Goyal, Neetu Agarwal, 2015, 2(2).
14. Clinical profile of severe acute malnutrition in Western Rajasthan: A prospective observational study from India. Journal of paediatrics and neonatal care Mukesh choudhary, Deepak Sharma,

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 08, 2022

Rajendra Prasad nagar, Brahma dutt gupta, Teena nagar, Aakash pandita, 2015 Feb.

15. WHO child growth standards and the identification of severe acute malnutrition in infants and children, a joint statement by the WHO and UNICEF.
16. Nutritional status of congenital heart disease (CHD) patients: Burden and determinant of malnutrition at University of Nigeria teaching hospital Ituku-Ozalla, Enugu. Pakistan journal of medical sciences. Ijeoma Arodiwe, Josephat Chinawa, Fortune Ujunwa, Dabere Adiele, Mildred Ukoha, and Egbuna Obidike.
17. Severe acute malnutrition in very low birth preterm infants. Enweronu Laryea CC, Aryee IN, Adei EA.
18. Treatment outcome and associated factors among under 5 children with severe acute malnutrition admitted to therapeutic feeding unit in Woldiahospital, North Ethiopia. Journal of nutrition and food sciences. Tefera chane, Lemessa Oljira, Gudina Egata, Atomesa and Eskezyiaw Agedew.
19. Prevalence, profile and predictors of malnutrition in children with congenital heart defects: a case control observational study. BMJ/Arch dis Child. Christy A N Okoromah, Ekanem N Ekure, Foluso E A Lesi, Wahab O Okunowo, Bolande O Tijani and Jonathan C Okeiyi. 2011 Apr;1-96(4):354-360.
20. Severe acute malnutrition and infection. Pediatr Int. Child Health. Kelsey DJ Jones, James A Berkley, 2014.
21. A prospective descriptive study of risk factors and outcome. Alison Talbert, Nahashon Thuo, Japhet Karisa, Charles Chesaro, Eric Ohuma, James Ignas, James A, Berkley *et al*.
22. Management of severe acute malnutrition in children. The Lancet, Steve Collins, Nicky Dent, Paul Binns, Paluku Bahwere, Kate Sadler, Alistair Hallam, 2006 Sep.
23. Efficacy and safety of therapeutic nutrition products for home based therapeutic nutrition for severe acute malnutrition-a systemic review. Indian Pediatrics journal, Tarun Gera, 2010 Aug, 47.