

A STUDY ON ETIOLOGICAL FACTORS AND COMORBIDITIES IN CHILDREN WITH SEVERE ACUTE MALNUTRITION ADMITTED IN A RURAL TERTIARY CARE CENTER

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ABSTRACT

Objectives: In India, children under 5 years of age suffer from varying degrees of malnutrition. As the severity of undernutrition increases, risk of other diseases increases exponentially. The aim of this study was to identify etiological factors for severe acute malnutrition (SAM) in children aged 6 months to 5 years.

Methods: This was a cross-sectional descriptive study conducted at Department of Pediatrics of a rural tertiary care center, Tamil Nadu, India, between January and December 2020. All children with SAM in the age group of 6 months to 5 years were included in the study while children with secondary causes of malnutrition were excluded. Sociodemographic data were entered in preformed proforma. Nutritional status was assessed using the World Health Organization (WHO) standard growth charts. Descriptive data were given in summary statistics while Student's t-test and Pearson's Chi-square test were used for analyzing variables. $p < 0.05$ was considered statistically significant.

Results: Among 111 children included, mean age was 25.2 ± 15.7 months, 55.85% were females, mean height was 82.4 ± 12.0 cm, 85.58% were from lower socioeconomic status, and mean duration of hospital stay was 5.9 ± 2.5 days. Mothers were the caregivers in 80.18%, 63.96% were unaware of breastfeeding practices, and 59.46% had exclusively breastfed for < 3 months. Complementary feed was unsatisfactory in 77.48%, and 75.67% of children were given cow's milk but inadequate. As maternal age increased, awareness of breastfeeding ($p = 0.0005$) and complementary feeding ($p = 0.0005$) significantly increased. The mean weight at admission was 8.09 ± 2.25 kg which increased to 8.26 ± 2.25 kg and was significant ($p = 0.0005$).

Conclusion: As mothers were the primary caregivers but with poor awareness on breastfeeding practices, awareness campaigns targeting mothers will be more effective. As awareness on breastfeeding and complementary feeding increased with increasing maternal age, age of childbirth can be increased to more than 20 years.

Keywords: Breastfeeding, Complementary feeding, Severe acute malnutrition.

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INTRODUCTION

The term malnutrition encompasses both ends of the nutrition spectrum, from undernutrition to overweight. Nutritional status is often assessed in terms of anthropometry. It has been estimated that in India, 36% of children suffer from stunting and 32% suffer from underweight [1]. As the severity of undernutrition increases, the risk of diseases increases exponentially, especially in critically ill children.

Severe acute malnutrition (SAM) is defined by weight for height < -3 standard deviation and/or mid-upper arm circumference (MUAC) < 11.5 cm and/or visible severe wasting and/or nutritional edema. It is a medicosocial disorder. Factors responsible are lack of breastfeeding, inadequate weaning, socioeconomic status, educational status, etc. It accounts for 45% under-five mortality rate, according to the WHO [2]. But, in India, malnutrition accounts for 68.2% of under-five deaths and is responsible for 17.3% of total disability-adjusted life years [3]. Diarrhea and pneumonia account for approximately half the under-five deaths in India and children with SAM have a higher risk of diarrheal deaths and pneumonia deaths.

The world has made substantial progress in reducing child mortality in the past few decades. Globally, the under-five mortality rate dropped from 93 deaths/1000 live births in 1990 to 38 deaths/1000 live births in 2021 according to the United Nations International Children's Emergency Fund data [4]. Despite an overall decrease in developing countries, stunting remains a major problem in public health. The

burden of malnutrition in India is that 6/10 children are malnourished. The aim of the present study was to identify etiological factors for SAM in children aged 6 months–5 years.

METHODS

This was a cross-sectional descriptive study conducted at the Department of Pediatrics, Government Villupuram Medical College, Mundiampakkam, Tamil Nadu, India, between January and December 2020. All children aged 6 months–5 years with any of the criteria for SAM, namely weight for height < -3 standard deviation (SD), mid-arm circumference < 11.5 cm, and visible severe wasting or nutritional edema of both feet were included in the study, after obtaining written informed consent from the caretaker. All children with other causes of secondary malnutrition such as congenital anomalies, endocrinological causes, and heart or liver diseases were excluded from the study. Sociodemographic data were collected in a preformed questionnaire from parents or caretakers. Kuppuswamy's modified socioeconomic scale was used to assess socioeconomic status. Nutritional status was assessed using the WHO (Z score) standard growth charts including weight for age, height for age, weight for height, mid-arm circumference, and head circumference. Considering the sickness of the children, recumbent length was calculated for all children up to 2 years. After treatment, weight at discharge was noted.

Data entry and statistical analysis were performed with SPSS version 23.0 (IBM, New York, USA). Descriptive data were given in summary statistics. Student's t-test for paired samples was used

for bivariate samples and Pearson's Chi-square test for qualitative variables. $p < 0.05$ was considered statistically significant.

RESULTS

In the present study to determine etiological factors for SAM in children aged 6 months–5 years, data from 111 children were included for final analysis. Mean age of the study population was 25.2 ± 15.7 months. 27% of the study population were in the age group of 6–12 months (27.03%, $n=30/111$). Just more than half of the study subjects were female children (55.85%, $n=62/111$). The mean duration of hospital stay was 5.9 ± 2.5 days with a range from 2 days to 15 days. The mean height (length) of the children was 82.4 ± 12.0 cm with a range from 59 cm to 110 cm.

Most of the children were from a rural background (83.78%, $n=93/111$), from joint families (90.09%, $n=100/111$) and many lived in tiled houses (58.56%, $n=65/111$). Many of the children belonged to lower socioeconomic status (Grade IV, 85.58%, $n=95/111$) and the remaining were lower middle status. All the children were immunized as per the National immunization schedule (100%).

Mothers were the caregivers in 80.18% of the children ($n=89/111$). Nearly three-fourths of the mothers of affected children belonged to the 18–21 age group (73.87%, $n=82/111$). Most of these mothers had not crossed primary education (81.08%, $n=90/111$). Many of them did not have complete awareness about breastfeeding (63.96%, $n=71/111$). While 59.46% ($n=66/111$) had breastfed their children exclusively for <3 months, 37.84% had breastfed for more than 3 months.

While 65.76% of the children were receiving bottle feeds ($n=73/111$) and more than three-fourths were receiving cow's milk (75.67%, $n=84/111$), the complementary food was improper and unsatisfactory in 77.48% ($n=86/111$). There was inadequate food intake in 66.67% of the children ($n=74/111$). Pneumonia (38.74%, $n=43/111$) and fever (21.62%, $n=24/111$) were the most common comorbidities observed in this study population. Anemia was seen in 6.31% ($n=7/111$) of children.

Most of the households had <2 children (84.68%, $n=94/111$). More than half of these children were of birth order two (58.56%, $n=65/111$) and higher order of birth (≥ 3) was not seen in this study (15.31%, $n=17/111$). In the criteria for the diagnosis of SAM, MUAC <11.5 cm was the most common criterion (89.18%, $n=99/111$) followed by weight for length <3 SD in (10.81%, $n=12/111$). More than two-thirds of the children stayed for <7 days in hospital (70.27%, $n=78/111$).

There was a positive correlation between increasing maternal age and awareness of breastfeeding and it was statistically significant ($p=0.0005$). Similarly, positive correlation was seen between increasing maternal age and awareness of proper complementary feed ($p=0.0005$). Even though there was no correlation between maternal age and age of weaning their children from breastfeeding ($p=0.083$), women who became mothers at a later age, breastfed their children for longer duration ($p=0.0005$). There was no correlation between socioeconomic status and educational status of mothers with the incidence of SAM in children (Table 1).

While the mean weight at admission was 8.09 ± 2.25 kg, the mean weight at discharge was 8.26 ± 2.25 kg and this difference was statistically significant ($t=9.082$, $p=0.0005$).

DISCUSSION

Mean age of the children in the present study was 25.2 ± 15.7 months, while the mean age similar to the results obtained by was lower in the study by Kumar *et al.* (14.3 months) and Abeje *et al.* (17 months) [5,6]. Just more than half of the children were females (55.85%, $n=62/111$). This was similar to the study by Dhanalakshmi and Selvaraj while Abeje *et al.* (60.1%), Irena *et al.* (55.3%), and John *et al.* (58.5%) found more SAM prevalence in male children [7-9]. The mean duration of hospital stay was 5.9 ± 2.5 days which was shorter than in the study by Irena *et al.* [8].

Table 1: Correlation between parameters and their significance

S. No.	Correlation between parameters	Pearson's Chi-square test	p-value
1.	Increasing maternal age×awareness of breastfeeding	43.367	0.0005
2.	Increasing maternal age×proper complementary feeds	43.840	0.0005
3.	Increasing maternal age×age of weaning	8.260	0.083
4.	Increasing maternal age×duration of breastfeeding	29.947	0.0005
5.	Educational status of mothers×incidence of SAM in children	2.431	0.488
6.	Socioeconomic status of mothers×SAM in children	0.403	1.000
7.	Awareness of breastfeeding in mothers×SAM in children	0.185	0.667
8.	Duration of breastfeeding×SAM in children	0.419	0.811
9.	Introduction to cow's milk×SAM in children	0.429	0.727
10.	Type of complementary feed×SAM in children	0.901	0.462

($p < 0.05$ – significant), SAM: Severe acute malnutrition

Most of the children were from a rural background (83.78%, $n=93/111$) which was similar to the results obtained in the study by Choudhary *et al.* (83.3%) and Syed *et al.* (85%) [10,11]. In the present study, 85.6% children were from lower socioeconomic status which was similar to the results by Kumar *et al.* and Choudhary *et al.* who showed that malnourished children were more from low economic status [5,10]. The reason behind the high prevalence of SAM in children from low socioeconomic background was poor hygiene, poor housing, illiteracy, low purchasing power for adequate nutrition, poor feeding practices, and unavailability of healthy food.

All the children were immunized as per the national immunization schedule. But, in the study by Choudhary *et al.* (42.7%) and Gupta *et al.* (43.7%), less than half of children were completely immunized [10,12]. The reasons for incomplete immunization in all these studies were low socioeconomic status and difficult accessibility to health-care system but these factors were not a deterrent in the present study population.

In the present study, complementary feeding was started very lately (after 9 months) in most of the children. Choudhary *et al.* registered that 25% of children weaning was started early and 9.86% children were started weaning after 1 year [10]. The prevalence of SAM was seen more in children who were exclusively breastfed for prolonged duration because breast milk is nutritionally inadequate as age advances. Early weaning from breast and start of semisolid and complementary formulas will lead to gastroenteritis, which is a leading cause for developing SAM. Thus, early weaning and delayed weaning were important contributory factors for the development of SAM. Ideally, complementary feeding should be started along with breastfeeding after 6 months.

The most common mode of feeding in the present study was bottle feeding (65.8%). Bottle-fed children are more prone to infections due to poor cleaning practices, leading to poor hygiene of bottle and nipple, which act as a source for microbes. Pneumonia (37.8%), fever (21.6%), and diarrhea (12.6%) were the most common comorbidities in the present study but there were no deaths recorded. But, acute gastroenteritis was the most common comorbidity in the studies by Kumar *et al.*, Irena *et al.*, Choudhary *et al.*, and Syed Tariq *et al.* [5,8,10,11]. SAM affects immune system of the child and makes them more vulnerable to life-threatening infections such as age, pneumonia, sepsis, and tuberculosis.

Anemia was seen in only 6.31% in the present study. But, it was more prevalent in the studies by Choudhary *et al.* (85.3%) and Thakur *et al.* (81.1%) [10,13]. Anemia in SAM children can result from infections, blood loss due to worm infestation, nutritional inadequacy, malabsorption, ineffective erythropoiesis due to folate or vitamin B12 deficiency, and anemia of chronic disease. Sepsis is a common and life-threatening comorbidity in SAM children. In the present study, only 7.21% of children had sepsis. This was similar to the results by Sunguya *et al.* (6%) but the prevalence was higher in the study by Saradha *et al.* (44.1%) [14,15]. The high prevalence of sepsis in SAM children could be explained by defective humoral and cell-mediated immunity, defective skin barrier, and poor hygiene of caretakers.

CONCLUSION

To conclude, as mothers were the primary caregivers but with poor awareness of breastfeeding practices, awareness campaigns can be conducted targeting young mothers, which will be effective. As the present study found that awareness of breastfeeding and complementary feeding increased with increasing maternal age, age of childbirth can be increased to more than 20 years.

ETHICAL APPROVAL

This study was obtained from the Institutional Ethical Committee of Government Villupuram Medical College and Hospital, Mundiampakkam, Villupuram, Tamil Nadu, India.

AUTHORS CONTRIBUTIONS

SV: Designed and approved the study. NK: Conceptualized study, collected data, and analyzed the data. JC: Analyzed and interpreted data. BK: Compiled and prepared manuscript.

CONFLICT OF INTEREST

None declared.

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