

Original Research Article

Study of social and demographic determinants of severe acute malnutrition in children aged 6-59 months in a tertiary care centre of Odisha, India

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ABSTRACT

Background: The objective is to study the various social and demographic determinants of severe acute malnutrition in children aged 6 months to 59 months in a tertiary care centre of Odisha, India.

Methods: This is a hospital based prospective observational study done in a tertiary care centre of Odisha during the period of Nov 2015 to Oct 2017 in which all children with severe acute malnutrition as per WHO criteria in the age group 6 months to 59 months were enrolled and their socioeconomic and demographic details were evaluated.

Results: Present study revealed a prevalence of severe acute malnutrition as 2.8%. Males (54.2%) were more affected than females (45.8%). Most common age group affected was 6-12 months (37.4%). Most of the children were from low socioeconomic status (96.4%) and from rural areas (84.8%). 63.7% of the study population were unimmunised. Only 12.6% of the participants were exclusively breast fed. 100% of the children in the study population received top feeding with cow's milk.

Conclusions: The prevalence of malnutrition is high in Odisha but most of the causative factors are preventable. Adequate education regarding exclusive breastfeeding, complementary feeding, immunisation, promotion of proper referral and health care services can help to improve nutritional status in the state of Odisha.

Keywords: Demography, Odisha, Severe acute malnutrition

INTRODUCTION

One of the leading causes of morbidity and mortality worldwide is childhood malnutrition, particularly in developing countries.

Around 2.2 million deaths in children less than 5 years of age are attributed to severe wasting, stunting and intrauterine growth restriction. Prevalence of malnutrition is very high accounting for 1 out of every 3 pre-school children in developing countries.¹ Causes of malnutrition as outlined by United Nations International Children's

Emergency Fund (UNICEF) include environmental, economic and socio and political factors, with one of the major cause being poverty.² Malnutrition can lead to shorter adult height, poor scholastic performances, decreased economic productivity, and birth of more growth restricted babies.³ Diseases like obesity, hypertension and diabetes in adults are more common in those who suffered from childhood malnutrition.⁴

According to NFHS-4 reports on the nutritional status of children, stunting (short for age) was reported for 38% of children less than five years; wasting (thin for their

height) for 21% and 36 % for underweight (thin for their age). Undernutrition was particularly common in children with mothers with poor educational status and those families belonging to the lowest wealth quintile.⁵ Although the prevalence of stunting and underweight has declined from 48% in 2005-06 to 38% in 2015-16, the prevalence of wasting has remained about the same. Children in rural areas (41%) are more likely to be stunted than urban areas (31%). With an increase in wealth quintiles, the prevalence of stunting decreases from 51% in households with the lowest wealth quintile to 22% in households with the highest wealth quintile. In Odisha, children under 5 years who are severely wasted (weight-for-height < -3 SD) is 6.3% in urban and 6.4% in rural areas which has increased from 5.2% as reported by NFHS 3(2005-2006). The aim of this study was therefore to determine the prevalence and socio-demographic factors associated with severe acute malnutrition among under-five year old children in a tertiary care centre of Odisha.

METHODS

This study was a prospective observational study of children admitted with severe acute malnutrition in the department of pediatrics in a tertiary care centre of Odisha during the period of November 2015 to October 2017.

Inclusion criteria

- Children from 6 months to 59 months of age with
- Weight-for-height less than -3 SD (WHO/NCHS median height) and/or
- Mid arm circumference (MUAC) < 11.5 cm and/or
- Bilateral pedal edema.

Exclusion criteria

- Children < 6 month and >5 years
- All cases of secondary malnutrition as in chronic diseases like cleft lip and palate, gastroesophageal reflux diseases, pyloric stenosis and other surgical condition, chronic renal failure, congenital heart diseases, liver disorders, asthma, mental retardation, cerebral palsy, inborn errors of metabolism etc.
- Parents who did not give consent.

The parents of the children who satisfied the inclusion criteria were informed and a written consent was taken from them. This study was approved by the Ethics and Research Committee of hospital.

Demographic details and clinical examination:

A detailed history of all cases with reference to residence, nutritional history, socioeconomic status, birth history, family order, duration of breastfeeding, methods of weaning, complementary feeding, immunization history were taken.

A thorough examination was carried out along with different anthropometric measurements expressed in standard deviation from the median of the reference population standards (NCHS). Clinical evidence of associated infections were considered. Data regarding residential area, sex, age and date of birth, socioeconomic status, perinatal history, feeding practice was collected by questionnaire method. Socio economic status was assessed by modified Kuppuswamy scale of socioeconomic status.⁷ All the evidence and finding are recorded in predefined proforma and data were analyzed statistically. A thorough clinical examination was done on all the enrolled patients and severe acute malnutrition was diagnosed as per WHO criteria. The anthropometric measurements done were as follows:

Weight measurement

Children <2 years of age were weighed using a 25 kg Salter hanging scale (CMS Weighing equipment, High Holborn, London United Kingdom) and those > 2 years of age were weighed while standing on the measuring board. Before each recording the scales were adjusted to zero. Weight was rounded off to nearest 100 grams and measured daily during morning. The reference which was applied was of WHO chart which compared weight/length or weight/height.

Length/ height measurement

For children <2 years length was measured using an infantometer in the recumbent position by two examiners. For > 2 years children and able to walk, height was measured while standing using a stadiometer. Weight for height/length and Z score of less than -3SD were included in the study.

Mid-upper arm circumference (muac) measurement

Midpoint between acromion process and olecranon process was chosen on the left arm by a non-stretchable measuring tape for measuring MUAC. The reading was recorded to the nearest 0.1cm. MUAC < 11.5cm were considered as severe acute malnutrition. MUAC can be measured above 6 months of age.

Data analysis

Data were entered into a Microsoft Excel 2007 using IBM SPSS 21 and Microsoft. Data was edited using SPSS software (version 11.5). Collected data was checked for its completeness and correctness.

RESULTS

A total of 311 children between 6 months to 59 months of age suffering from severe acute malnutrition as per inclusion criteria during a period of 2 years (November 2015 to October 2017) were enrolled in the study. 102 patients were excluded according to the exclusion criteria

and 19 patients left against medical advice during study period. So, the remaining 190 patients constituted the study population. Out of total 10878 patients admitted to the hospital during the 2 years of study period 311 that is 2.8% children were having features of severe acute malnutrition (SAM) so the prevalence in present study was 2.8% (Table 1).

Table 1: Prevalence of SAM in the study population.

Total no. of patients	No. Of SAM patients (%)	Others (%)
10878	311 (2.8)	10,567 (97.2)

In this study children aged 6 months to 12 months were 37.4% of total study population and children between ages of 12 months to 24 months constituted 33.7%, while children aged more than 24 months and up to 59 months constituted 28.9% of total study population of severe acute malnutrition.

The median age of presentation was 20 months. Male children constituted 54.2% and females constituted 45.8% with male to female ratio being 1.2.

Table 2: Demographic and socioeconomic determinants (n=190).

Characteristics	Category	Frequency	Percentage
Age	6-12 months	71	37.4
	12-24 months	64	33.7
	24-59 months	55	28.9
Sex	Male	103	54.2
	Female	87	45.8
Socioeconomic status	Upper	2	1
	Upper middle	5	2.6
	Lower middle	27	14.2
	Upper lower	115	60.6
	Lower	41	21.6
Place of living	Rural	161	84.8
	Suburban	21	11
	Urban	8	4.2

Out of 190 SAM patients, most were from upper lower class (60.6%) followed by lower class 21.6%, which was followed by lower middle class 14.2%. Children from both upper middle and upper class were very low which was 2.6% and 1% respectively. Most of the patients were from rural areas i.e. 84.8% and only a small proportion of the study population were from suburban and urban areas

i.e. 11% and 4.2% respectively (Table 2). Only 13.2% of the study population had completed their immunization schedule as per age and 23.1% of the study population were incompletely immunized as per age and rest 63.7% were unimmunized (Table 3).

Table 3: Distribution of the study population as per immunization status.

Immunization status	Frequency	Percentage
Complete	25	13.2
Incomplete	44	23.1
Unimmunized	121	63.7

12.6% of the study population were exclusively breastfed up to 6 months of age and nearly 75.2% children were exclusively breast fed up to two months of age and 26.9% up to 4 months. Only 9.5% of the study population had breast feeding more than 6 months. Mean duration of exclusive breast feeding was 2.6 ± 1.5 months (Table 4).

Table 4: Distribution of the study population as per duration of EBF.

Duration	Frequency	Percentage
Up to 2month	143	75.2
Up to 4 months	51	26.9
Up to 6 months	24	12.6
More than 6 months	18	9.5

Out of 190 patients, in 140 (73.7 %) children complementary feeding was started when they were admitted, out of which in 35 (25 %) children it was started before 6 months of age, in 49 (35%) between 6 to 9 months, in 43 (30.7 %) between 9 to 12 months and in 13(9.3%) children after 12 months of age.

Table 5: Complementary feeding related findings, (n=140).

Characteristics	Category	Frequency	%
Age of beginning complementary feeding	<6 months	35	25
	6-12 months	49	35
	12-24 months	43	30.7
	>24 months	13	9.3
Type of complementary feeding	Top feeding with cow's milk	140	100
	Mashed chapati	59	42.1
	Khichdi/daliya	46	32.8
	Dal/rice	28	20
Method of complementary feeding	Katori, spoon and cup	105	75
	Bottle	24	17.1
	Bottle and katori	11	7.9

50 (26.3. %) children of different age groups had not started complementary feeding at the time of hospitalization, among them 38% were from 6 to 9 months of age, 41.5% were between 9 to 12 months of age and 20.5% were above 12 months of age. Those who had started complementary feeding, most commonly used food was cow's milk in all cases (100%). Along with cow's milk only 59(42.1%) children were fed with mashed chapati and 46(32.8%) children were fed with khichdi /daliya and 28(20%) children fed with mixed dal/rice. Most common method of feeding complementary feeding was by katori spoon and cup in 105(75 %) children, then bottle in 24(17.1%) and both bottle and katori spoon in 11(7.9%) children suffering from severe acute malnutrition (Table 5).

DISCUSSION

In present study the prevalence of severe acute malnutrition was found to be 2.8% which is less in compared to NFHS 4 reports of 2015-16 in which the prevalence of severe acute malnutrition in Odisha is 6.4%. The low prevalence may be due to poor referral services, lack of access to health care or due to ignorance in present study area 5. The majority of the age group with severe acute malnutrition was 6-12 months (37.4%), followed by 12-24 months (33.7%). 28.9% were above 24 months. So, 70% of this study population were below 2 years of age which is similar to a study in Jharkhand done by Aguayo et al, where 77.7% of SAM patient were 6-23 months old.⁸ Another study done by Hyder et al also showed 72.6% of SAM children are <2 years old.⁹ These results were similar to studies done in Sudan, Nigeria and Bangladesh by Ibeziako et al, Mahgoub et al and Rayhan et al.⁹⁻¹¹ The median age of presentation is 20 months in this study which is similar to study by Nozoki et al where median age was 13 months and 17 months found by Irena et al in 2011 in Zambia.^{12,13} In this study, SAM was more common in the age group of 6 to 12 and 12 to 24 month, followed by 24 to 59 month with 37.4%, 33.7% and 28.9% respectively.

These findings are similar to that of Ibeziako et al.¹⁰ Probable explanation of these findings may be inadequate knowledge about exclusive breastfeeding, timing of complementary feeding and importance of complementary feeding, inappropriate selection of complementary food and poor and unhygienic methods of food administration. 6 and 12 months was the most affected population which can be explained by the fact that food supplementation starts at this time and proper food diversification is required which if not properly done can result in occurrence of severe acute malnutrition. Present study shows male predominance in comparison to females (54.2% v/s 45.8%) with a ratio of 1.2 which was similar to studies done by Irena et al, Ashraf et al, and Aneja et al.¹³⁻¹⁵ But studies done by Singh et al and Rao et al and Mittal et al in Punjab showed a statistically significant female predominance ($p < 0.05$).¹⁶⁻¹⁸ Male predominance in present study may be

was due to the fact that male children are given more importance in our society and are brought earlier to hospital and given more benefits. 96.4% children of the study population belonged to lower socioeconomic status as evaluated by Kuppuswamy scale. Only 1% of study group belonged to upper socioeconomic class. Soni et al and Ashraf et al found in their studies that majority of malnutrition was frequent in children belonging to upper lower and lower socioeconomic status (Kuppuswamy IV, V) i.e. 72.8% and 90% respectively.^{19,14} Rao et al, Singh et al and Swaminathan et al all in their studies reported that malnutrition is inversely related to socioeconomic status and per capita income.^{17,16,20} Wagstaff and Watanabe also found in their study that underweight and socioeconomic inequality are inversely related.²¹ The results in the above studies may be due to inadequate food availability, poor purchasing capability, improper distribution and utilization of food in people belonging to poor socioeconomic background. 84.8% of the children were from rural areas. Some studies as done by Rao et al and Ashraf et al revealed more prevalence of malnutrition ($p < 0.01$) in children living in nonindustrial than industrial area (82.8% versus 17.1%).^{17,14} Rural children suffer more than their urban counterparts because of poverty, poor maternal education and nutrition, lack of prenatal and neonatal care, poor health promoting activities, inadequate complementary feeding and lack of immunization. Immunization status in present study population was very low with 63.7% being unimmunized and 23.1% being partially immunized which were similar to observations by Sharma et al, Devdas et al and IAP report.²²⁻²⁴ Low immunization rates may be attributed to rural residences with maternal illiteracy, poverty and lack of proper health care services. Residents of rural areas are mostly unaware of the protective value of immunization.

Exclusive breastfeeding till 6 months of age was found in only 12.6% of children. Nearly 75.2% children were exclusively breast fed up-to two months of age. Mean duration of exclusive breastfeeding was 2.6 ± 1.5 months. In a study done by Aneja et al 41% were exclusively breastfed for less than two months and only 20 % were exclusively breastfed till 5-6 months.¹⁵ Malnutrition was observed significantly more in those children where breastfed duration was much less (<2mon) than in those where breastfeeding duration was 5-6 months as shown in a study done by Mallik et al.²⁵

Breast milk is a complete and rich source of proteins, fat and carbohydrate as well as vitamins and immunoprotective ingredients for a growing child thus not only supplying nutrition but provides resistance to infections in the first 6 months of life. 26.3% of children in present study did not start complementary feeding at the time of admission and among them 38% were from 6-9 month of age, 41.5% were between 9 to 12 months of age and 20.5% were above 12 months of age with the mean age of complementary feeding being 8.4 ± 3.9 months. Out of this population 25% started before 6

months, 35% started between 6-9 month, 30.7% between 9-12 month and 9.3% beyond 12 months. So, in 35% cases complementary feeding began at an optimum age. In a study done by Rasania and Sachdev complementary feeding was started in 42.9% children at an optimum age that is 4-6 months, 24.5% children had early initiation of complementary feeding (<4mon) and in rest it was delayed beyond 6 months of age.²⁶ Severe malnutrition was significantly higher ($p<0.05$) in children where food supplementation was delayed as reported by Hossain et al.²⁷ Continuation of breastfeeding for a very long time without adequate addition of complementary feeding is detrimental to health. Breastfeeding needs to be supplemented with additional feeding after six months of age as caloric and nutritional requirements in these infants are not fulfilled by breast milk alone. Not only the age of introduction of complementary food but also type of supplementary food and method of administration of food are also important determinants of malnutrition. 100% children of present study group received top feeding with cow's milk. Preferred supplementary semi solid foods given were mashed chapati followed by khichdi/daliya. Common method of feeding milk was katori spoon (75%) followed by bottle (17.1%) and both katori spoon and bottle in 7.9% of children. Katori spoon feeding was also the predominant mode of feeding complementary food in 67.7% of malnourished children in a study done by Aneja et al¹³ followed by bottle in 28.3% of children. Most common complimentary semi solid food was khichdi followed by rice in their study. Rasania and Sachdev observed that 65.8% of mothers used bottle for cow's milk administration in their study population and overall malnutrition prevalence was higher ($p<0.001$) in bottle fed children (83%).²⁶ Preferred complementary foods were milk, rabadi, rice, and roti. Prevalence of bottle feeding is around 25% in the community which is a very high rate and needs to be eradicated to prevent malnutrition. Poor hygiene by using bottles for feeding increases the risk of infections like diarrhoea, vomiting and starts the vicious cycle of malnutrition and therefore should be strictly discouraged.

CONCLUSION

The overall prevalence of SAM in present study was 2.8%. SAM was more prevalent in males as compared to females. The most vulnerable age group of SAM was found to be 6-12 months. Maximum patients were from rural background and belonged to lower socioeconomic status. Most common factors associated were inadequate breast feeding and weaning practices and improper food choices for weaning. This study highlighted the prevalence and basic causes associated with severe acute malnutrition in Odisha however for true prevalence much larger study population is required. As most of the factors associated with malnutrition are preventable, adequate measures can be taken to implement proper educational activities which promote breastfeeding, adequate, complementary feeding and also promote immunisation and other health care facilities.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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