

## ORIGINAL ARTICLE

# A Study on the Clinicosocial Profile of Severe Acute Malnutrition Cases Admitted to Nutritional Rehabilitation Centre, Davanagere, Karnataka

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## ABSTRACT

**Background:** Protein-energy malnutrition is an important public health problem which contributes to a significant number of under-five deaths. About 7.6 million under-five deaths occur globally among which 35% deaths are due to nutrition-related factors. Apart from the social and environmental factors, the clinical profile of the children with severe acute malnutrition also plays a role in morbidity and mortality of SAM. Thus, the following study was conducted in the nutritional rehabilitation center. **Methods:** A hospital-based cross-sectional study was conducted in the nutritional rehabilitation center, Chigateri General Hospital, Davanagere, among the SAM (Severe Acute Malnutrition) cases who were admitted during the study period. Data were collected using a pre-designed, pre-tested, semi-structured questionnaire, and analyzed using SPSS software version 16. **Results:** The study population comprised 75 (48.4%) males and 80 (51.6%) females. Mean age of the children was  $22.32 \pm 13.52$  months and majority of the children 65 (41%) belonged to 13–24 months age group. Most of mothers 73 (43.09%) were illiterate and were unemployed (homemakers) 123 (79.3%). Majority of the children belonged to lower socio-economic class 72 (46.5%). Majority of 64 (41.3%) children were of second birth order—70 (45.16%) children presented with not gaining weight as the presenting complaint. The most common associated comorbidity in SAM children was an acute respiratory infection. **Interpretation and Conclusion:** Sociodemographic factors such as lower education of parents, Hindu by religion, lower socioeconomic status, and satisfactory living conditions were the profile of the majority of children. Majority of children presented with not gaining weight. The most common comorbidity associated was ARI.

**Key words:** Clinical profile, comorbidities, NRC, SAM children

## INTRODUCTION

Today's children are tomorrow's future of the nation. Their health has a direct impact on the nation's future. 0–14 years children contribute about 26% of the world's population<sup>[1]</sup> and in India, they contribute to 26.5% of the total Indian population.<sup>[2]</sup>

In India, under 5-year children constitutes about 8.5% of the total population.<sup>[2]</sup> According to 2017 estimates, about 5.5 million had died due to various causes of under-five mortality.<sup>[2]</sup> One of the targets of sustainable development goals is to end preventable causes of infant and under-five mortality.<sup>[3]</sup>

Protein-energy malnutrition (PEM) affects children at the most crucial period of development which can lead to permanent impairment in life.<sup>[4]</sup> About 7.6 million under-five deaths occur worldwide among which 35% deaths are due to nutrition-related factors and significantly 4.4% are due to significant wasting.<sup>[5]</sup>

According to WHO, about 19 million children are suffering from severe acute malnutrition (SAM) worldwide, among which 8 million children are from India. SAM significantly impacts under-five mortality as SAM children have increased

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susceptibility to infections and children can have a recurrent episode of diarrhea, acute respiratory tract infections (ARTI), and measles.<sup>[6]</sup>

In India, one child dies every minute of severe acute malnutrition.<sup>[7]</sup> In India, according to NFHS-4 the prevalence of children who are wasted are 20% and 21.5% from urban and rural areas, respectively. The prevalence of children who are severely wasted is about 7.5% and 7.4% from urban and rural areas, respectively. The prevalence of children who are underweight (weight for age) is about 29.1% from urban areas and 38.3% are from rural areas.<sup>[8]</sup>

In Karnataka, the percentage of children who are wasted is 9.7% and 11%, respectively, from urban and rural areas. The prevalence of children who are underweight (weight for age) is about 31.5% from urban areas and 37.7% from rural areas.<sup>[9]</sup>

According to NFHS-4, the prevalence of children who are wasted in Davanagere district is about 23.9% which is contributed by urban areas and 18.9% by rural areas. The children who are severely wasted are 7% contributed by urban areas and 4.8% by rural areas. The prevalence of children who are underweight in Davanagere district is estimated to be about 43.6% which is contributed by urban areas and 41.2% is contributed by rural areas.<sup>[10]</sup>

The common signs and symptoms of PEM are lethargy – physical and mental, low weight in relation to height and age, exaggerated skeletal contours, loss of elasticity of skin, dull dry hair, thin hair, depigmentation, easy pluckability of hair, moon face, dry conjunctiva, and edema.<sup>[11]</sup> The common medical comorbidities accompanied with SAM children are anemia, followed by vomiting, fever, and diarrhea.<sup>[12]</sup>

The social factors such as place of residence, household wealth, birth weight, age of child, awareness regarding diarrheal disease, acute respiratory tract infection control, maternal education, number of children under 5 years, and source of drinking water are strong predictors of child nutritional status in developing countries.<sup>[13]</sup> The case fatality rate of children with SAM with associated complications can be reduced by 90% through the protocol-based approach in NRCs.<sup>[14]</sup>

Theoretically, the social and demographic factors which influence children with SAM had been understood well. The signs and symptoms of SAM are fairly understood, but the subsequent clinical manifestations of SAM remain still unclear.

Keeping in view the above facts regarding SAM, a need was felt to carry a study which aims at studying the clinical profile and the social factors influencing children with severe acute malnutrition.

## Objectives

The objectives of the study were as follows:

1. To study the clinical profile of severe acute malnutrition in children admitted to nutritional rehabilitation center.
2. To study the sociodemographic profile of severe acute malnutrition children admitted to nutritional rehabilitation center.

## METHODOLOGY

A hospital-based cross-sectional study was conducted in the nutritional rehabilitation center, Chigateri General Hospital, Davanagere. Children with severe acute malnutrition who were admitted to nutritional rehabilitation center, Davanagere and whose parents who gave consent for the study during the period of 1 year from January 2018 to December 31, 2018, were included in the study.

## Sample Size

All clinically diagnosed cases of severe acute malnutrition confirmed by pediatrician admitted to nutritional rehabilitation center during the study period were enrolled in the study. A total of 155 cases were admitted in NRC during the study period.

## METHOD OF DATA COLLECTION

After establishing rapport with the mother/caretaker, the data collection procedure was explained in the local language, written informed consent was taken from the mother, and in the absence of mother, father, or the caretaker of the child was asked to give the consent for the study. A pre-designed, pre-tested, and semi-structured questionnaire was used for collecting data and interview method was used for collection of data, the questionnaire was validated by pilot study. The data regarding demographic profile was collected. Anthropometric measurements of the child were taken and clinical examination of the child was done.

## Data Analysis

The data collected were entered in MS Excel (2010) and data were analyzed using SPSS software version 16. Descriptive analysis of the data was done and was presented in the form of frequencies and percentages. The association of variables of interest and SAM in children was tested using Chi-square test. All statistical analysis was carried out at 5% level of significance and  $P < 0.05$  was considered significant.

## Ethical Clearance

Ethical clearance was obtained from Institutional Ethical Committee of JJM Medical College, Davanagere, before conducting the study.

**RESULTS**

A total of 155 under-five children were enrolled in the study. Out of 155 under-five children, 80 (51.6%) were females and 75 (48.4%) were males.

Table 1 depicts that majority of children 65(41.91%) belong to the age group of 13–24 months followed by 6–12 months age group. The mean age of children was  $22.32 \pm 13.52$  months.

Table 2 depicts the demographic profile of the children admitted to nutritional rehabilitation center. Majority of children 131 (84.5) were Hindu by religion, among which 67 (83.75) were females and 64 (85.3) were males. Majority of the children 74 (47.74%) belonged to father’s whose occupation was unskilled work and majority of mothers 123 (79.3%) were unemployed (homemakers). Majority 85 (54.8%) of the children lived in household which had two children who were under 5 years of age. In our study, majority of children 80 (51.6%) were of the birth weight 2.5–3 kg followed by 69 (44.5%) children whose birth weight was <2.5 kg. Majority of female children were of the birth weight 2.5–3 kg and majority of the male children were of the birth weight <2.5 kg.

In our study, it was observed that 64 (41.3%) of children belonged to the second order of birth followed by 57 (36.8%) of children who belonged to the first order of birth [Figures 1 and 2].

In our study, majority of the children 80 (52%) were from rural area and 75 (48%) were from urban area. In our study, most of the father’s 77 (49.6%) studied up to high school and majority of the mother’s 73 (43.09%) were illiterate. In our study, majority of the children 81 (52%) belonged to joint family and 74 (48%) belonged to nuclear family [Figure 3].

In our study, majority of children 72 (46.5%) belonged to Class V of socioeconomic status followed by Class IV of socioeconomic status.

Table 3 depicts that majority of children 56 (36.12%) were born to mothers who followed 1–2 years of spacing in between pregnancies.

Age group in months	Female no. (%)	Male no. (%)	Total no. (%)	P value
6–12	24 (15.48)	21 (13.54)	45 (29.02)	$X^2=32.7^*$ $P=0.5$
13–24	38 (24.51)	27 (17.41)	65 (41.91)	
25–36	9 (5.8)	15 (9.6)	24 (15.4)	
37–48	6 (3.87)	8 (5.16)	14 (9.03)	
49–60	3 (1.93)	4 (2.58)	7 (4.51)	
Total	80 (51.58)	75 (48.29)	155 (100)	

\*Chi-square test

Table 4 depicts feeding practices. In our study, two children out of 155 were not breastfed and majority of the children 144 (94%) were initiated on breastfeeding within one hour among which 73 (92%) were females and 71 (95%) were males. Majority of the children 144 (92.9%) were fed colostrum and minor proportion of children 16 (10.3%) were given prelacteal feeds, among which 9 (5.8%) children were given honey and 7 (4.51%) were given sugar water. In our study, majority 108 (70%) had recurrent illness and 47 (30%) did not have any recurrent illness.

Figure 4 depicts that 21 (13.5%) of children had a recurrent episode of diarrhea, followed by 16 (10.3%) children who had a recurrent fever, cough, and cold. Majority of children 70 (45.16%) presented with complaints of not gaining weight followed by diarrhea and vomiting as presenting complaints [Figure 4].

Figure 5 depicts that majority of children 147 (94.8%) had weight for height < -3SD, among which 76 (95%) were females

Demographic variable	Female no (%)	Male no (%)	Total no (%)	P value
Religion				$X^2=6.3^*$ $P=0.096$
Hindu	67 (83.75)	64 (85.3)	131 (84.5)	
Muslim	13 (16.25)	11 (14.6)	24 (15.4)	
Occupation				$X^2=22.8^*$ $P=0.1$
Father				
Professional	1 (1.25)	0 (0)	1 (0.6)	
Semi-professional	20 (25)	15 (20)	35 (22.5)	
Skilled	23 (28.7)	17 (22.6)	40 (25.8)	
Semi-skilled	1 (1.25)	4 (5.3)	2 (1.29)	
Unskilled	35 (43.7)	39 (52)	74 (47.74)	
Mother				$X^2=4.8^*$ $P=0.3$
Semi-professional	1 (1.25)	1 (1.3)	2 (1.29)	
Skilled	0	0	0 (0)	
Semi-skilled	0	0	0 (0)	
Unskilled	15 (18.7)	15 (20)	30 (19.3)	
Unemployed	64 (80)	59 (78.6)	123 (79.3)	
No. of under 5 children				$X^2=9.8^*$ $P=0.098$
1	18 (22.5)	29 (38.6)	47 (30.3)	
2	51 (63.7)	34 (45.3)	85 (54.8)	
3	9 (11.2)	8 (10.6)	17 (10.9)	
4	1 (1.25)	4 (5.3)	5 (3.2)	
5	1 (1.25)	0 (0)	1 (0.6)	
Birth weight (kg)				$X^2=18.7^*$ $P=0.7$
>3 kg	4 (5)	2 (2.6)	6 (3.87)	
<2.5 kg	32 (40)	37 (49.3)	69 (44.5)	
2.5–3 kg	44 (55)	36 (48)	80 (51.6)	

\*Chi-square test

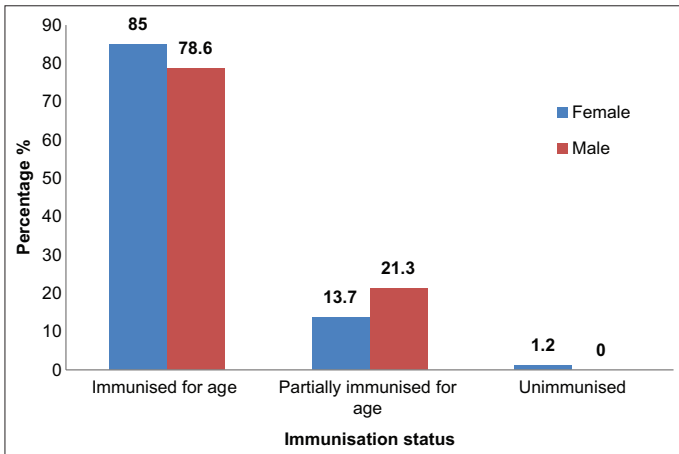


Figure 1: Distribution of children according to immunization status

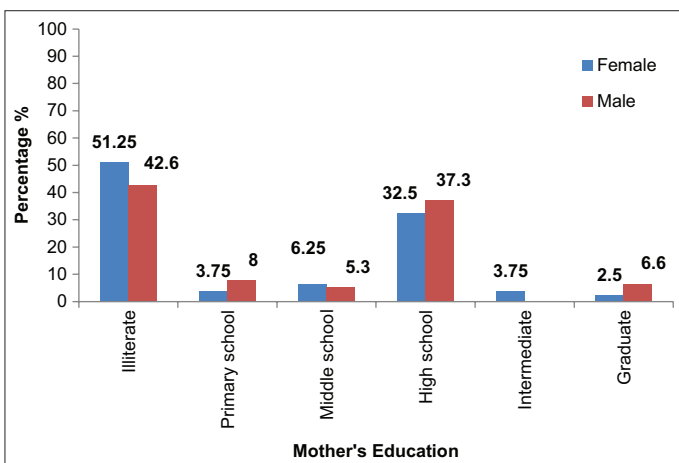


Figure 2: Distribution of children according to mother's education

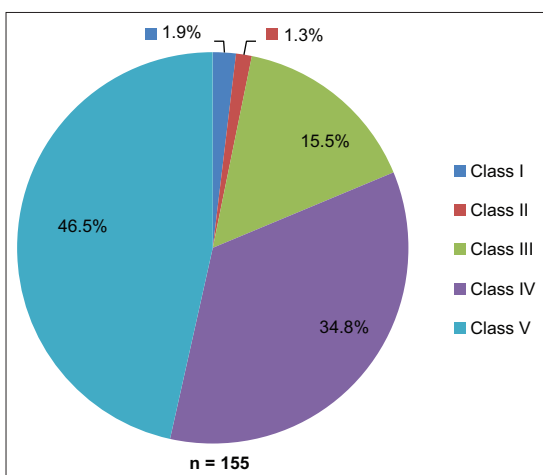


Figure 3: Distribution of children according to socioeconomic status

and 71 (94.6%) were males. The mean weight of the children was  $6.59 \pm 1.5$ . Children with -1SD were admitted in NRC if they satisfy other criteria of MUAC < 11.5 cm and presence of edema.

Table 6 depicts that the majority of children 71 (45.8%) had mid-upper arm circumference < 11.5 cm. On general physical

Table 3: Distribution of children according to number of years of spacing followed by the mother in between pregnancies (n=98)\*

No. of years of spacing	Female no. (%) (n=52)	Male no. (%) (n=46)	Total (%) (n=98)
<1 year	11 (21.15)	11 (23.9)	22 (22.4)
>3 years	1 (1.92)	2 (4.34)	3 (3.06)
1-2 years	32 (61.5)	24 (52.17)	56 (57.14)
2-3 years	8 (15.3)	9 (19.56)	17 (17.34)
Total	52	46	98

Table 4: Distribution of children according to feeding practices

Feeding practice	Female (%)	Male (%)	Total (%)	P value
Colostrum				
Yes	74 (92.5)	70 (93.3)	144 (92.9)	$X^2=0.41^*$
No	6 (7.5)	5 (2.6)	11 (7.09)	$P=0.8$
Prelacteal feeds				
Yes	7 (8.75)	9 (12)	16 (10.3)	$X^2=0.4^*$
No	73 (91.2)	66 (88)	139 (89.6)	$P=0.5$
Type of prelacteal feed (n=16)*				
Honey	4 (5)	5 (6.6)	9 (5.8)	$X^2=0.2^*$
sugar water	3 (3.75)	4 (5.3)	7 (4.51)	$P=0.9$
Exclusive breastfeeding				
Yes	66 (83.5)	59 (79.7)	125 (80.6)	$X^2=4.1^*$
No	13 (16.4)	15 (20.2)	28 (18)	$P=0.7$
No breastfeeding	1 (1.25)	1 (1.3)	2 (1.29)	
Bottle feeding				
No	74 (92.5)	70 (93.3)	144 (92.9)	$X^2=0.041^*$
Yes	6 (7.5)	5 (6.6)	11 (7.09)	$P=0.8$
Time of initiation of complimentary feeding				
<6 m	9 (11.2)	7 (9.3)	16 (10.3)	$X^2=7.8^*$
6 m	6 (7.5)	12 (16)	18 (11.6)	$P=0.3$
>6 m	65 (81.2)	56 (74.6)	121 (78.06)	

\*Chi-square test

examination, majority of children 96 (61.9%) had pallor and minor proportion of children 6 (3.87%) had icterus and edema.

Figure 6 depicts that majority of the children 41 (26.4%) had sparse hair among which 27 (33.7%) were females and 24 (32%) were males.

The physical changes in severe acute malnutrition children which were observed were scalp changes in the form of seborrheic dermatitis in 2 (1.2%). Minor proportion of children 4 (2.5%) had eye changes in the form of

blepharitis and eye discharge. Five (3.1%) children had ear changes in the form of otitis media, skin tags on the ear lobule. Abdominal distension was present in 2 (1.3%) of children. In a minor proportion of children, 1 (0.6%) had congenital anomalies in the form of bowing of legs, and polydactyl and about 3 (1.9%) had depressed nasal bridge. Majority of children 86 (55.4%) had dryness of skin. Minor proportion of children 10 (6.45%) had visible wasting.

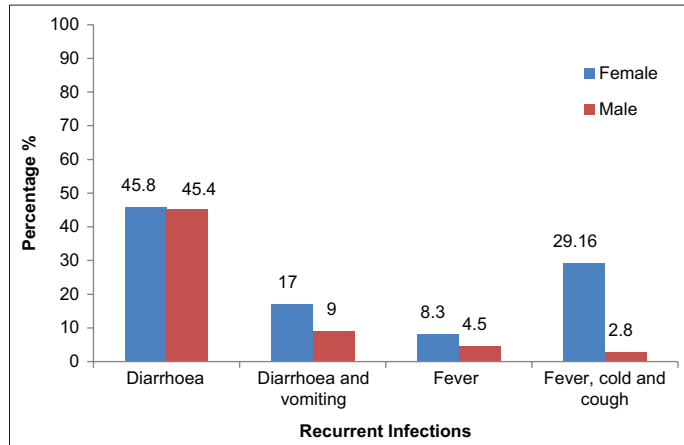


Figure 4: Distribution of children according to recurrent infections

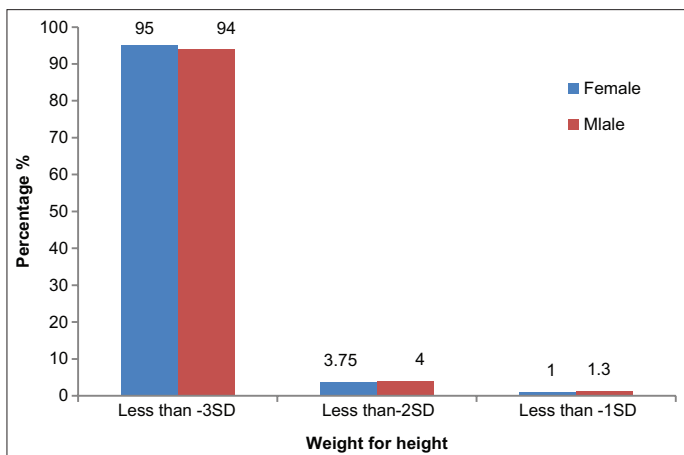


Figure 5: Distribution of children according to weight for height

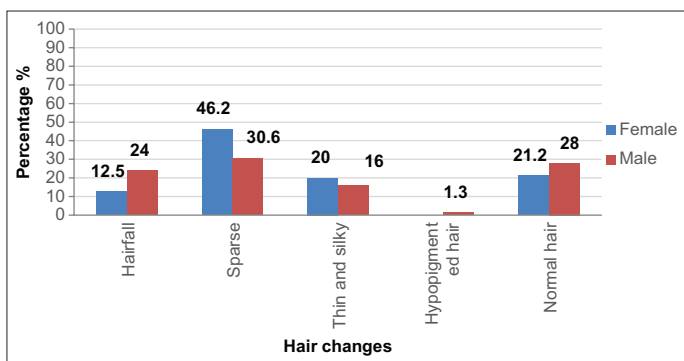


Figure 6: Distribution of children according to hair changes

In our study, 89 (57.5%) had associated comorbidity and 66 (42.5%) did not have any associated comorbidity.

Table 7 depicts that the most common comorbidity was acute gastroenteritis which was found in 21 (13.54%) children followed by acute respiratory infection in 20 (12.9%). Developmental delay was seen in about 5 (8.16%) children. Other comorbidities included conditions such as congenital heart disease, glycogen storage disease, Tb, rickets, hypomyelination disorder, hypothyroidism, ichthyosis, laryngomalacia, otitis media, and septic arthritis.

In our study, 124 (80%) were residing in satisfactory living conditions, 25 (16.12%) in poor living conditions. In our study, majority of the severe acute malnutrition cases, 97 (62.58%), are referred by pediatrician followed by Anganwadi workers who had referred 43 (27.7%).

**DISCUSSION**

In the present study, out of 155 children majority, 80 (51.6%), were females and 75 (48.4%) were males. This was similar to the study conducted by Mittal *et al.*<sup>[15]</sup> wherein during the study period, 156 children were admitted, among them 86 were males and 70 were females and in other study done by Das *et al.*<sup>[16]</sup> in NRC at a tertiary care and referral center, Kolkata, in which 281 were males and 349 were females with male:female ratio of 1:1.24. This shows that female child is more prone to malnutrition.

In the present study, most of the children belonged to the age group of 13–24 months with the mean age of 22.32 ± 13.52

**Table 5: Clinical profile of the children admitted to nutritional rehabilitation center**

	Female no. (%)	Male no. (%)	Total no. (%)	P value
Type of recurrent illness				X <sup>2</sup> =15.6* P=0.2
Diarrhea	11 (45.8)	10 (13.3)	21 (13.5)	
Diarrhea, vomiting	4 (16.6)	2 (2.6)	9 (5.8)	
Fever	2 (8.3)	1 (1.3)	3 (1.93)	
Fever cough cold	7 (29.16)	9 (12)	16 (10.3)	
Presenting complaint				X <sup>2</sup> =51.6* P=0.5
Not gaining weight	38 (47.5)	32 (42.6)	70 (45.16)	
Diarrhea, vomiting	18 (22.5)	15 (20)	33 (21.2)	
Cold cough fever	8 (10)	13 (17.3)	21 (13.5)	
Cold cough	6 (7.5)	9 (12)	15 (9.6)	
Diarrhea	4 (5)	1 (1.3)	5 (3.2)	
Edema	0 (0)	3 (4)	3 (1.93)	
Delayed milestones	3 (3.75)	0 (0)	3 (1.93)	
Ear discharge, cold	1 (1.25)	1 (1.3)	2 (1.29)	
B/L knee swelling	1 (1.25)	0 (0)	1 (0.6)	
Fever	0 (0)	1 (1.3)	1 (0.6)	
Eye discharge	1 (1.25)	0 (0)	1 (0.6)	

\*Chi-square test



**Table 6: Distribution of children according to mid-upper arm circumference**

Mid-upper arm circumference	Female no. (%)	Male no. (%)	Total no. (%)	P value
<11.5 cm	36 (45)	35 (46.6)	71 (45.8)	X <sup>2</sup> =28.9* P=0.90
11.5–12.5 cm	38 (47.5)	23 (30.6)	61 (39.3)	
>12.5 cm	6 (7.5)	11 (14.6)	18 (11.6)	
Total	80	75	155	

\*Chi-square test

**Table 7: Distribution of children according to associated comorbidity (n=89)**

Associated comorbidity	Female no. (%)	Male no. (%)	Total no. (%)
ARI	9 (19.5)	12 (27.9)	21 (23.59)
Acute gastroenteritis	14 (30.43)	6 (13.9)	20 (22.47)
Anemia	6 (13)	12 (27.9)	18 (20.2)
Developmental delay	6 (13)	2 (4.6)	8 (8.9)
Congenital heart disease	2 (4.3)	4 (5.3)	6 (6.7)
Tuberculosis	2 (4.3)	3 (6.9)	5 (5.6)
Glycogen storage disease	2 (4.3)	2 (4.6)	4 (4.49)
Others	5 (10.8)	2 (4.6)	7 (7.8)
Total	46	43	89

months. In a similar study conducted by Mittal *et al.*<sup>[15]</sup> most of the children were of the age group 12–24 months, with the mean age of the children being  $17.21 \pm 13.94$  months. In another study done by Aprameya *et al.*<sup>[17]</sup> in NRC Wenlock Hospital Mangalore, it was found that majority of the children 38 (41.8%) were below the age of 2 years.

In our study, majority of the children 131 (84.5%) were Hindu by religion and 24 (15.4%) Muslim by religion. In a community-based cross-sectional study done by Sanjit Sarkar *et al.*<sup>[18]</sup> in West Bengal, it was found that the prevalence of wasting was 23% in Hindu religion and in Muslim religion, it was 18%. In another hospital-based study done by Choudary *et al.*<sup>[19]</sup> revealed that 88% of the children admitted in NRC were Hindu by religion.

In our study, majority of mothers 73 (43.09%) were illiterate and 77 (49.6%) of the fathers studied up to high school. Similar findings were found in the study done by Choudary *et al.*<sup>[19]</sup> where 89.3% mothers were illiterate and father was literate in 66.2%. In a hospital-based study done by Das *et al.*<sup>[16]</sup> it was found that majority of the mothers 41.58% were educated up to primary and middle school and majority of father 50% were educated up to primary and middle school. This shows that literacy status of the mother plays a significant role in the nutritional status of the child.

In our study, majority 74 (47.74%) of fathers were involved in unskilled work and majority of mothers 123 (79.3%) were

unemployed (homemakers). In a community-based study done by Ahmed *et al.*<sup>[20]</sup> it was found that majority of parents 58.9% were semi-professionals.

In our study, 81% belonged to lower socioeconomic status according to modified BG Prasad classification 2019 in which 72 (46.5%) belonged to Class V and 54 (34.8%) belonged to Class IV socioeconomic status. This was similar to the finding in the study done by Choudary *et al.*<sup>[19-21]</sup> in which 96% of the children were from lower socioeconomic status.

In our study, majority of children 80 (52%) belonged to a joint family followed by 75 (48%) who belonged to nuclear family. In a prospective study done by Goyal and Agarwal,<sup>[22]</sup> it was found that majority of children 22 (60%) were from joint family and 16 (40%) were from nuclear family. In a hospital-based study done by Das *et al.*<sup>[16]</sup> it was found that 51% children belong to nuclear families having more than three children.

In the present study, majority of children 64 (41.3%) were of second birth order. Similar findings were found in the study done by Aprameya *et al.*<sup>[17]</sup> it was found to be 42.9%. However, in a study done by Gautham *et al.*<sup>[23]</sup> 34.6% were of the first order of birth, indicating that the second order of birth plays an important role in malnutrition.

In the present study, majority of children 80 (52%) were from rural areas and 75 (48%) from urban area. Similar findings were found in the study done by Das *et al.*<sup>[16]</sup> in which the majority of children 75% were from rural areas and 158 (25%) were from urban areas.

In our study, majority of children 127 (85%) were immunized till date and 2 (1.2%) were unimmunized. In a study done by Das *et al.*<sup>[16]</sup> in which 7.95% children were fully immunized and 4.35% children were unimmunized.

In our study, majority of children 85 (54.5%) belonged to households with 2 under-five children in the household. In a study done by Mengistu *et al.*<sup>[24]</sup> it was found that majority of children belonged to households with one under-five children.

In our study, majority of children 56 (57.14%) belonged to mothers who practiced 1–2 years of spacing in between pregnancies. In a case-control study done by Basit *et al.*<sup>[21]</sup> majority of children 55.4% belonged to mothers who practiced >2 years of spacing in between pregnancies and in the control group it was found to be 55.4%.

In our study, majority of children 80 (51.6%) had birth weight between 2.5 and 3 kg. In a community-based cross-sectional study done by Shreyaswi Sathyanath *et al.*<sup>[25]</sup> revealed that underweight was found in 81.9% children with the birth weight of >2.5 kg.

In our study, in majority of children 144 (94%) breastfeeding was initiated within 1 h of delivery. In a study done by Aprameya *et al.*<sup>[17]</sup> majority of children 41.7% late initiation of breastfeeding was found. In another study done by Mengistu *et al.*,<sup>[24]</sup> 66.6% children breastfeeding was initiated immediately after delivery.

In the present study, majority of children 125 (80%) were exclusively breastfed. In a study done by Mengistu *et al.*<sup>[24]</sup> in 93% children exclusive breastfeeding was followed.

In our study, prelacteal feeds were given in about 16 (10.3%) of children. In a study done by Mengistu *et al.*<sup>[24]</sup> prelacteal feeds were given in 45.4% of children. In a study done by Das *et al.*<sup>[26]</sup> in about 32% children prelacteal feeds were given.

In the present study in majority of children 121 (78.06%) complimentary feeds were started after 6 months of age. In a study done by Aprameya *et al.*<sup>[17]</sup> in majority of children 60.4% children complimentary feed was started in <6 months. In a study done by Mengistu *et al.*<sup>[24]</sup> in 48.7% children complementary feeds were started at 6 months of age.

In our study in about 30% children had episodes of recurrent infections. In a case-control study done by Basit<sup>[21]</sup> in about 82% children had episodes of recurrent illness.

In our study, majority of children 70 (45%) presented with not gaining weight as the most common presenting complaint and 33 (21.2%) presented with diarrhea and vomiting. In a study done by Choudary *et al.*,<sup>[19]</sup> it was found that in 70% children fever was the most common presenting complaint and in 52% children vomiting was found to be presenting complaint. In a study done by Chiabi *et al.*,<sup>[26]</sup> 58% children presented with weight loss, 53% children presented with fever as presenting symptom.

In our study, majority of children 147 (94.8%) had weight for height <-3SD. In a study done by Das *et al.*,<sup>[16]</sup> 32% had weight for height < -3SD. In another study done by Mittal *et al.*,<sup>[15]</sup> 34.9% children had weight for height < -3SD. In a study done by Chaurasiya *et al.*,<sup>[27]</sup> 79.6% children had weight for height < -3SD.

In the present study, 71(45%) children had mid-upper arm circumference <11.5 cm. In a study done by Das *et al.*,<sup>[16]</sup> 9.4% children had mid-upper arm circumference <11.5 cm and 53% children had both weight for height < -3SD and MUAC <11.5 cm. In a study done by Chaurasiya *et al.*,<sup>[27]</sup> it was found that 48.6% had MUAC <11.5

In our study, hair changes were found in 117 (75%) children in the form of hair fall, sparse hair, hypopigmented hair, thin, and silky hair. In a study done by Chaurasiya *et al.*,<sup>[27]</sup> 28.8% children had hair changes. In a study done by Das *et al.*,<sup>[16]</sup> hair changes were found in 34% had hair changes.

In our study, 92 (60%) of children had skin changes. In a study done by Das *et al.*,<sup>[16]</sup> 32% children had skin changes. In our study, 5(3.1%) children had otitis media. In a study done by Das *et al.*,<sup>[27]</sup> otitis media was found in 0.79% of children. In a study done by Choudary *et al.*,<sup>[19]</sup> otitis media was found in 2.7% of children. In our study, 10(6.45%) children had visible wasting. In a study done by Chaurasiya *et al.*,<sup>[27]</sup> 41% children had visible wasting.

In our study, the most common comorbidity which was observed was Acute respiratory infection and it was found in 21(23.5%) of children. According to Das *et al.*,<sup>[16]</sup> Bijaykumar *et al.*,<sup>[28]</sup> and Chaurasiya *et al.*,<sup>[27]</sup> the most common comorbidity which was observed was anemia which was observed in 74%, 94%, and 84% of children. However, according to a study done by Ashutosh Rathore *et al.*,<sup>[29]</sup> the most common comorbidity was acute respiratory infection and it was found in 42% of children.

In our study, majority of children 124 (80%) were living in satisfactory living conditions which are in accordance with Joshi *et al.*<sup>[30]</sup> who concluded that 56% of children lived in satisfactory living conditions. However, in a community-based study done by Singh *et al.*<sup>[31]</sup> revealed that 79(81%) of underweight children were living in poor living conditions.

### Limitations

If follow-up would have been done till the end of children stay in NRC, we would have arrived at better understanding of the factors influencing severe acute malnutrition would have been possible. The study cannot be generalized to the entire population as the study subjects were recruited in the hospital settings. Recall bias could have arisen during the procedure of data collection

### CONCLUSION

Our study revealed that SAM was most common in 13-24 months age group and with increasing age a lesser proportion of children were affected with SAM. Sociodemographic factors such as sex of the child, lesser educational level of parents, lesser occupational level of parents, Hindu by religion, coming from rural background with joint family with households having more than 2 under-five children, lower socioeconomic status, presence of overcrowding, and satisfactory living conditions was the profile of the majority of children. Second birth order, less spacing followed by the mother was factors associated with severe acute malnutrition in children. Even though timely initiation of breastfeeding, exclusive breastfeeding, and timely initiation of complementary feeds were started in the majority of children still the children are below the mark. Episodes of recurrent infections in a minor proportion of children in the study imply that recurrent illness also has a role to play in

the development of severe acute malnutrition in children. Not gaining weight was the most common symptom with which the child presents to the NRC. Acute respiratory tract infection was the most common associated comorbid condition. More than half of the children had skin changes and one-third had hair changes. Majority of the severe acute malnutrition cases were referred by pediatrician.

### Recommendations

As the problem of severe acute malnutrition is multi-dimensional, there is an urgent need for improvement in all of these factors. There is a need to educate mothers about the proper spacing interval between two pregnancies by various IEC activities. Adequate nutrition of girl child needs to be ensured as they will be future women who will give birth to malnourished and small for gestation babies, early weaning from breastfeeding and the cycle continues in the society. Education to the parents about low-cost and nutritious food through various IEC activities would help in reducing the problem of severe acute malnutrition. Health education to the parents regarding receiving prompts treatment and immunization for the recurrent infections of the child and proper growth monitoring. As a significant number of cases were referred by pediatrician, there should be equal involvement of other health care workers which can be enhanced by organizing training sessions frequently and by organizing CME for the recent updates in nutrition.

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