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Original Research Article

Risk factors for severe acute malnutrition in under-five children attending nutritional rehabilitation centre of tertiary teaching hospital in Karnataka: a case control study

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ABSTRACT

Background: To determine and analyse the risk factors leading to severe acute malnutrition (SAM) in children under 5 years of age attending nutritional rehabilitation centre of our hospital.
Methods: This questionnaire based case control study was conducted from January 2016 to December 2016 on SAM children. For comparison children attending outpatient department without any evidence of malnutrition were included. These SAM children were admitted to the nutritional rehabilitation centre of Cheluvamba Hospital attached to Mysore Medical College and Research Institute, Mysore, Karnataka.
Results: A total of 103 SAM cases were compared with 100 controls. The sociodemographic risk factors were age less than 2 yrs, more family members (55.3% had 5 to 8 members), Birth spacing less than 2 years (39.8%), open air defecation (37.9%) and living in kucha house (32%). The dietary risk factors which were statistically significant were poor appetite (33%), prelacteal feed (19.4%), lack of exclusive breast feeding (42.7%), discontinuing breast feed before 2 years (74.8%), receiving complementary feed before 6 months (67%), bottle feeding (32%), calorie deficit (79.6%), protein deficit (66%) and feeding difficulty (17.5%).
Conclusions: The social risk factors identified in this study were large family size, low income, more number of siblings and living standards like type of house, open air defecation. The nutritional risk factors were giving prelacteal feed, not giving exclusive breast feeding until 6 months, starting complementary feed before 6 months and giving food low in calories and protein.

Keywords: Risk factors, Severe acute malnutrition

INTRODUCTION

Nutrition is essential for human development. Malnutrition not only enhances morbidity and mortality amongst children, it also leads to reduced work capacity and poor productivity when these children grow up as adults, hampering the development of a country. SAM was defined as per WHO and same norm is used mostly everywhere.[1] India is being recognized as having, perhaps, the worst malnutrition problem in the world which is much more than Sub-Saharan Africa or Latin America. The findings of the National Family Health Survey (NFHS-4) reveal.[2]

- Under the age of five years 38.4% are stunted (Ht for age)
- Under the age of five years 35.7% are under weight (Wt for age)
- Under the age of five years 21% are wasted (Wt for Ht)

- Under the age of five years 7.5% are severely wasted (Wt for Ht).

Compared to the national standards Scenario of malnutrition amongst children in Karnataka according to National Family Health Survey (NFHS-4) data are.[2]

- Under the age of five years 36.2% are stunted (Ht for age)
- Under the age of five years 35.2% are under weight (Wt for age)
- Under the age of five years 26.1% are wasted (Wt for Ht)
- Under the age of five years 10.5% are severely wasted (Wt for Ht).

Malnutrition in children is a consequence of multiple risk factors acting on a particular child. Previous studies have shown distinct maternal and socio-economic risk factors and factors related to the child. A few of these include large family size, lack of exclusive breast feeding in first 6 months, bottle feeding, administration of pre-lacteals, deprivation of colostrum, prolonged breastfeeding, low socioeconomic status of the family, poor education of the mother etc.[3-6] There are not many studies done on risk factors for malnutrition in South Indian children. As there are significant differences in diet and social factors between north India and south India, the present study was undertaken, so that steps can be taken to eliminate these risk factors as much as possible.

METHODS

The present study was a case control study which was conducted from January 2016 to December 2016 in patients admitted to Cheluvamba hospital nutritional rehabilitation centre attached to Mysore Medical College and Research Institute, Mysore, Karnataka, South India. This is a tertiary care referral hospital. Consent was obtained from the parents of all children included for the study and the study was approved by the institutional ethical committee. A minimum sample size of 81 cases was calculated with the prevalence of SAM amongst admitted patients in cheluvamba Hospital being 5.6% at 0.05 significance level using the formula Sample size $n = z^2pq / d^2$. Where Z=1.96, p=prevalence of the disease, q=1-p and d=95% confidence interval. Hence 103 children with SAM and 100 children without SAM as comparison group were taken up for the study. Non-probability purposive sampling technique was used to select the under five children.

Inclusion Criteria used to recruit children for the study are-Children under 5 years admitted with a diagnosis of severe acute malnutrition. For the purpose of the study, SAM was defined as per WHO which regards it as any of the following:[1]

- Weight-for-height below -3 standard deviation (SD or Z score)
- Presence of bipedal oedema
- Mid upper arm circumference (MUAC) below 11.5cm

Severe acute malnutrition in children showing clinical features of chronic diseases like congenital heart disease, malabsorption syndromes, HIV, cysticfibrosis etc were excluded from the study.

Malnutrition was measured by using the standard tools. Electronic weighing machine with digital reading to the precision of 10g with minimal clothing. The weigh time was about one hour before or after food. For the weight measurement in children who were not able to stand alone, mother was made to stand on the scale and weighed and then scale is tared to zero, mother was given her child to hold, this gives child's weight alone on the scale. In older children, who can stand alone individually are made to stand individually and weight taken. If child is less than 2 years old recumbent length measured using infantometer and in more than 2 years children standing height was taken using stadiometer. MUAC was measured on upper left arm, midpoint between shoulder (Acromion) and the tip of the elbow (Olecranon), and measuring tape placed snugly around the arm at the midpoint marked (the tape should not be pulled too tight). MUAC was measured two times to ensure an accurate interpretation. Data were analysed using WHO growth charts. The method used for collecting data regarding risk factors was a structured interview schedule after obtaining written informed consent from the parent/guardian. After the diagnosis of SAM has been established, a predesigned proforma that will assess the possible risk factors was administered to the caregiver of the patient. The areas covered by the proforma included:

- Ante-natal care of the mother,
- Natal history,
- Post-natal history,
- Medical history of the child,
- Development history
- Detailed diet history including infant and young child feeding practices
- Data about socio-economic status, family history and social history etc

General physical examination and systemic examination of the child was conducted as per the predesigned proforma. These children were compared with under-five children without any evidence of malnutrition according to WHO growth charts. The comparison group children were selected from children attending outpatient department of the same hospital. The same predesigned proforma was used for the comparison group to determine and analyse the risk factors. Institutional ethical committee clearance was obtained. For the data analysis, numerical (continuous variable) data obtained from the sample were organized and 'summarized with the help of descriptive statistics like percentage, mean, median, and standard deviation. The two groups were

compared with respect to various risk factors with the help of Chi- square test. "P" value <0.05 at (95% Confidence Interval) was taken as statistically significant. The factors influencing SAM were analysed using bivariate and multivariate analysis.

RESULTS

In the present study, a total of 103 SAM cases were compared with 100 controls as shown in Table 1 and Table 2.

Table 1: Comparison of sociodemographic risk factors for SAM among the cases and controls.

Sociodemographic risk factors	Cases number (%)	Controls number (%)	P value
Child's age			
<2years	85 (82.5%)	64 (65.9%)	0.019
>2years	18 (17.5%)	33 (34%)	
Mother age			
<20yrs	34 (33%)	11 (11%)	0.0001
21 to30yrs	61 (59.2%)	74 (74%)	
>31yrs	8 (7.8%)	15 (15%)	
Number of family members			
<4	37 (35.9%)	83 (85.6%)	0.0001
5 to 8	57 (55.3%)	9 (9.3%)	
>9	9 (8.8%)	5 (5.2%)	
Monthly income			
<5000	38 (36.9%)	4 (4.1%)	0.0001
5001 to 10000	45 (43.7%)	53 (54.6%)	
>10001	20 (19.4%)	40 (41.2%)	
Number of siblings			
<2	57 (55.3%)	83 (85.6%)	0.0001
3 to 5	30 (29.1%)	10 (10.3%)	
>6	16 (15.5%)	4 (4.1%)	
Birth spacing			
<2yrs	41 (39.8%)	8 (8%)	0.0002
2.1to 5yrs	45 (43.7%)	72 (74.2%)	
>5.1yrs	17 (16.5%)	20 (20.60%)	
Birth order			
1	30 (29.1%)	8 (8%)	0.0001
2	43 (41.7%)	57 (57%)	
3	15 (14.6%)	32 (32%)	
4	10 (9.7%)	3 (3%)	
5	5 (4.9%)	0 (0%)	
Toilet			
Yes	64 (62%)	92 (92%)	0.0001
No	39 (37.9%)	8 (8%)	
Housing			
Kucha	33 (32%)	4 (4%)	0.0001
Pucca	39 (37.9%)	34 (34%)	
Semi pucca	31 (30.1%)	59 (59%)	

Table 1 depicts the comparison of sociodemographic risk factors for SAM among cases and controls. This table shows that SAM was more common in the age group of less than 2 yrs, about a total of 85 cases (82.5%) which was statistically significant (p=0.019). Taking mother's age for comparison, significant number 34 (33%) of mothers were below 20 years which was statistically highly significant (p=0.0001). More number of SAM children had family members in the 5 to 8 members group i.e. 57 members (55.3%) which was statistically highly significant (p=0.0001). Considering average monthly income, around 38 children were from less than 5000 Rupees group which was statistically highly significant (p= 0.0001). More number of SAM children 57 (55.3%) were having siblings more than two, 30 (29.1%) children were having 3 to 5 siblings and 16 (15.5%) belonged to group of having more than 6 siblings

which was statistically highly significant (p=0.0001). 41 (39.8%) SAM children belonged to the group of parents who maintained birth spacing of less than two years as compared to 8% in control group which was statistically highly significant (p=0.0002). Around 39 (37.9%) of SAM children families didn't had toilets and they had practiced open air defecation as compared to 8% controls, which was statistically highly significant (p=0.0001). More number of SAM children lived in kucha house than controls i.e. 32% as compared to 7% controls which was statistically highly significant (p=0.0001).

Table 2: Comparison of nutritional risk factors for SAM among the cases and controls.

Nutritional risk factors	Cases number (%)	Controls number (%)	P value
Appetite			
Good	69 (67%)	88 (90.7%)	0.0001
Poor	34 (33%)	9 (9.3%)	
Prelacteal feed			
Yes	20 (19.4%)	1 (1%)	0.0001
No	83 (80.6%)	96 (99%)	
Exclusive breast feeding upto 6 months			
Yes	59 (57.3%)	85 (87.6%)	0.0001
No	44 (42.7%)	12 (12.4%)	
Breast Feeding continued upto 2 years			
Yes	26 (25.2%)	74 (76.3%)	0.0002
No	77 (74.8%)	23 (23.70%)	
Initiation of Complementary feed			
Less than 6 months	69 (67%)	16 (16.5%)	0.0001
More than 6 months	34 (33%)	81 (83.5%)	
Bottle feed			
Yes	33 (32%)	16 (16.5%)	0.011
No	70 (68%)	81 (83.5%)	
Calorie deficit			
Yes	82 (79.6%)	5 (5.2%)	0.0001
No	21 (20.4%)	92 (94.8%)	
Protein deficit			
Yes	68 (66%)	5 (5.2%)	0.0001
No	35 (34%)	92 (94.8%)	
Intake of fruits and vegetables			
Yes	59 (57.3%)	74 (76.3%)	0.004
No	44 (42.7%)	23 (23.7%)	
Feeding difficulty			
Yes	18 (17.5%)	4 (4%)	0.0001
No	85 (82.5%)	96 (96%)	

Table 2 depicts the comparison of nutritional risk factors between cases and controls. 34 cases were having poor appetite compared to only 9 controls which is very significant (p=0.0001). 20 cases i.e. 19.4% of SAM children had received prelacteal feed against only 4 children in control group who received prelacteal feed which was statistically highly significant (p=0.0001). In case group 42.7% of children were not breastfed exclusively compared to only 12% in control which was statistically highly significant (p=0.0001). More number of SAM children 77 (74.8%) discontinued breast feed before 2 years on the other hand only 23 children discontinued breastfeeding in controls which was statistically highly significant (p=0.0002). Among the SAM group large number of children 69 67%) had received complementary feed before 6 months which is very high when compared to controls where only 16 children received complementary feed before 6 months which was statistically highly significant (p=0.0001). More number of SAM children 33 (32%) were given bottle feed than only 16 children in the control group which was statistically significant (p= 0.011). Strikingly more number of SAM children 82 (79.6%) were having calories deficit when compared to controls which were only 8 (8%) which was statistically highly significant (p=0.0001). Among SAM group 68 children (66%) were having protein deficit which was very significant compared to controls. 42.7% of cases did not consume fruits and vegetables against 23% of controls which was statistically significant (p=0.001). Feeding difficulty is

seen in 17.5% of SAM children which is more against only 4% of controls which was statistically highly significant (p=0.0001).

DISCUSSION

Nutrition is essential for human development and the focal point of health and well-being. Pre-school children are one of the most nutritionally vulnerable segments of the population. Nutrition during the first five years has an impact not only on growth and morbidity during childhood, but also acts as a determinant of nutritional status in adolescent and adult life. Malnutrition is the underlying cause of at least 50 per cent of deaths of children under five. The study population was predominantly rural and the factors identified corroborate this setting. The incidence of SAM is more in the younger children. In the present study 82.5% children were less than 2 years of age. This may be due to the growth and the nutritional requirement is maximum during younger age group.[7]

Our study shows SAM is more common in the children of mothers who are below 20 years of age. Very young age mother is an important risk factor for low birth weight babies in turn which may be a cause for malnutrition.[8] A larger family size is associated with an increased risk of SAM. The effect of a large family size with overcrowding and inadequate spacing has been implicated as a risk factor for severe malnutrition in different studies as well.[9,10] This supports the notion that non-nutritional factors should be essential components in the effort to reduce severe acute malnutrition. The risk of SAM is increased when the monthly income is lower than 5000 Rupees. Similarly, poor family income has been found as a risk factor for severe acute malnutrition in studies done in India.[11] So, our study done showed that children with malnutrition lived in a household with low monthly income.

Table 2; Breastfeeding is a norm in our country, our study shows 42.7% children were not given exclusive breast feeding until six months. The severely malnourished children are more likely to receive prelacteal feeds than the controls. The use of prelacteal feeds is not recommended as it can make the infant ill and interferes with breastfeeding.[12] Introduction of other diet before six months of age in our study is 67% with cases as compared to 16% amongst controls, indicating that children with severe acute malnutrition are started with complementary diet either too early or too late. A study done in China by Wang X, Wang Y, Kang C et al showed that the introduction of other diet before the age of six months increased the prevalence of pneumonia and diarrhoeal disease.[13] Similarly a study in Kenya by Bloss E, Wainaina F, Bailey RC et al showed an increased risk of being underweight when complementary food was started early.[14] As a global public health recommendation, infants should be exclusively breastfed for the first 6 months of life to achieve optimal growth, development and health. Thereafter to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond.[15] Bottle-feeding is more commonly observed in the severely malnourished group than the controls. Bottle-feeding is discouraged at any age. It is usually associated with increased risk of illness, and especially diarrhoeal disease, because of the difficulty in sterilizing the nipples properly. Bottle-feeding also shortens the period of postpartum amenorrhea and increases the risk of pregnancy.[16]

CONCLUSION

In conclusion, the findings of this study confirmed that the risk factors of severe acute malnutrition were large family size, low income, more number of siblings and living standards like type of house, open air defecation etc. Inappropriate infant and young child feeding practices, like giving prelacteal feed, not giving exclusive breast feeding until 6 months, starting complimentary feed before 6 months and giving food low in calories and protein. To reduce childhood malnutrition due emphasis should be given in improving the knowledge and practice on appropriate infant and young child feeding practices.

The implication of the findings of this study will enable the assessment of risk factors responsible for severe acute malnutrition in children below the age of 5 years in and around Mysore district in Karnataka, and therefore help policy makers for prevention and early intervention in SAM. It will also help in educating mothers and families in general about ways to minimise those risk factors.

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