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Original Research Article

Inappropriate feeding practices as a risk factor for severe acute malnutrition in children aged between one month to five years: a case control study

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ABSTRACT

Background: In developing country like India, inappropriate feeding practices like lack of exclusive breastfeeding, early or late introduction of complimentary diet, lack of direct breastfeeding, prelacteal feed, bottle feeding are the major risk factors for development of severe acute malnutrition in children aged between one month to five years.
Methods: It was a case control study, 109 children aged between one month to five years with severe acute malnutrition (SAM) who fulfilled the WHO criteria for SAM admitted to KIMS Hubli were taken as cases and 109 children aged between one month to five years without SAM admitted to KIMS Hubli were taken as control, the data gathering tool was questionnaire of children and mother. Data were entered and analysed using SPSS software version 11. Proportions were compared using Chi square (χ^2) test of significance, categorical variables were assessed using χ^2. Odds ratio (OR) and 95% confidence interval (CI) were calculated. To estimate the independent effect of the factors that were significantly associated with SAM and to control the confounding effect they may have on each other, logistic regression analysis was done. In all the above test the p value of less than 0.05 was accepted as indicating statistical significance.
Results: In the study lack of EBF (exclusive breastfeeding), DBF (direct breastfeeding), h/o prelacteal feeds, h/o bottle feed and late initiation of complimentary diet >6 months were significantly associated with SAM (p value less than 0.05).
Conclusions: The findings of this study clearly establishes the association of SAM with inappropriate infant feeding practices prevailing in our country.

Keywords: SAM, EBF, DBF, Complementary diet, Prelacteal feed

INTRODUCTION

Malnutrition in children is widely prevalent in developing countries like India. Malnutrition has been in the news owing to a number of reports depicting shocking statistics from India. India is home to 46.6 million stunted children, a third of world's total as per Global nutrition report 2018. Nearly half of all under-5 child mortality in India is attributable to undernutrition.[1] The country ranked 102 out of 117 on the Global hunger index in 2019, which reported that around 90 per cent of children between the ages of six and 23 months in the country don't even get the minimum food required.[2] According to the National family health survey 2015-16 (NFHS-4), stunting (low height for age) is prevalent among 38 per cent of children under the age of five, and the rate of wasting (low weight for height) of 20.8 per cent in the same age bracket is the highest in the world.[3]

With 9.3 million children under the age of five affected by SAM, India has the largest burden of SAM in the world, increasing the case fatality rate in children with SAM from common illnesses such as diarrhea and pneumonia.

Acute malnutrition is an unstable condition and results from a relatively short duration of nutrition deficit and is often complicated by concurrent infection. Important risk factors for malnutrition are poverty, parental illiteracy, inadequate feeding practices and large family size.[4-6]

SAM is associated with inappropriate feeding practices, which occur during the first two years of life like lack of EBF till the age of 6 months and lack of breastfeeding till the age of two years. SAM is an important public health problem in India.[7,8] There is a phenomenon called Asian enigma, which is related to persistent and unusually high prevalence of child undernutrition in South Asia as compared to countries at similar levels of income or economic growth. In-depth analysis shows its complex aetiological factors.[1] The immediate cause of undernutrition mirrors a negative interaction between inadequate food intake and repeated infectious diseases. Underlying these causes is an array of factors particularly salient to India.[9] Also there is a paucity of literature concerning the estimates of inappropriate feeding practices and its importance as a risk factor in SAM specially in South Indian states. Hence the present study was done to study the association of inappropriate feeding practices in SAM children.

Objective of the study was to know the association between inappropriate feeding practices and SAM in children aged between one month to five years

METHODS

A case control study was conducted in the department of pediatrics, KIMS, Hubli between July 2019 to June 2020. Institutional Ethics committee clearance was obtained for the study protocol. The study included 109 cases of SAM admitted in department of pediatrics, KIMS, Hubli, belonging to age group one month to 5 years, who fulfilled the inclusion criteria, WHO criteria of SAM definition was used in the study (weight for height less than 3 SD and/or visible severe wasting and/or edema of both feet and/or mid arm circumference less than 11.5 cm) (only in infant more than 6 months of age), 109 children (aged between 1 month to 5 years, without SAM) were taken as controls.[10] Other causes of edema (nephrotic syndrome, congestive cardiac failure), associated systemic diseases (congenital heart disease, malabsorption, cerebral palsy) were excluded.

Sample size was calculated based on the prevalence of suboptimal infant feeding practice among the controls, based on 95% CI and 80% power with case to control ratio of 1:1. The sample size was calculated to be 109 children each in cases and control groups. Structured questionnaire was used for data collection and information was collected about knowledge, practice of nutrition including the feeding practices were obtained from mothers and immediate care givers.

Method of statistical analysis

Data were entered and analysed using SPSS software version 11. The results for each parameter (numbers and percentages) for discrete data and averaged (mean±standard deviation) for continuous data are presented in table. Proportions were compared using Chi square (χ^2) test of significance, categorical variables were assessed using χ^2. OR and 95% CI were calculated. To estimate the independent effect of the factors that were significantly associated with SAM and to control the confounding effect they may have on each other, logistic regression analysis was done. In all the above test the p value of less than 0.05 was accepted as indicating statistical significance.

RESULTS

Demographic profile of cases and controls is depicted in Table 1. A total of 218 subjects in the age group of 1 month-5 years (109 cases with severe malnutrition and 109 normal healthy controls) were studied. Mean age of cases and controls were 1.43 years and 1.67 years respectively. Male children were affected more than female children, 60.55% and 39.45% respectively.

Table 2 shows inappropriate nutritional/feeding practices among cases and controls depicting univariate analysis of risk factors for SAM. In the study lack of EBF, DBF, h/o prelacteal feeds, h/o bottle feed and late initiation of complimentary diet after 6 months of age were significantly associated with SAM. In the present study all the children were breastfed and breastfeeding was initiated within the first hour of birth. However h/o prelacteal feed was observed in more number of SAM cases (40.4%) compared to controls (8.3%) (OR was 7.52 95% CI 3.4-16.4). Lack of EBF for the first six months of age was more common in cases 70 (64.2%) compared to controls 14 (12.8%) (OR 12.17; 95% CI 6.14-24.14). Lack of DBF was seen in 75.2% cases (OR 3.17; 95% CI 2.09-6.61) while h/o bottle feeding was observed among 65.1% of SAM cases (OR 20.7; 95% CI 9.4-45.6). Late initiation of complementary diet was also observed among SAM cases (65.1%) compared to controls (11%) (OR 15.1; 95% CI 7.36-30.9) .

Table 3 depicts further analysis with logistic regression model for Independent risk factors for SAM after calculating the adjusted OR. In the present study lack of EBF had 8.395 times higher risk for SAM, lack of DBF had 2.443 times higher risk for severe acute malnutrition, h/o bottle feed had 18.81 times higher risk for SAM and late initiation of complimentary diet >6 months had 6.645 times higher risk for SAM. Hence they were the independent risk factors for SAM.

Table 1: Demographic profile of cases and controls.

Profiles	Cases	%	Controls	%	Total	%	χ^2	P value
Age groups								
≤0.06 months	16	14.68	28	25.69	44	20.18		
0.07 months to 1 year	46	42.20	35	32.11	81	37.16		
1.01-2.0 year	28	25.69	8	7.34	36	16.51		
2.01-3.00 year	8	7.34	15	13.76	23	10.55	19.8871	0.0001*
≥3.01 year	11	10.09	23	21.10	34	15.60		
Mean age	1.43		1.67		1.55			
SD age	1.24		1.71		1.49			
Gender								
Male	66	60.55	61	55.96	127	58.26	0.4720	
Female	43	39.45	48	44.04	91	41.74		0.4920
Total	109	100.00	109	100.00	218	100.00		

*significant.

Table 2: Univariate analysis for risk factors for SAM.

Analysis		Group				P value	OR	95% CI
		Cases		Controls				
		Count	%	Count	%			
Lack of EBF	Yes	70	64.2	14	12.8	<0.001*	12.17	6.14 to 24.14
	No	39	35.8	95	87.2			
Lack of DBF	Yes	82	75.2	49	45.0	<0.001*	3.71	2.09 to 6.61
	No	27	24.8	60	55.0			
H/o prelacteal feed	Yes	44	40.4	9	8.3	<0.001*	7.52	3.4 to 16.4
	No	65	59.6	100	91.7			
H/o bottle feed	Yes	71	65.1	9	8.3	<0.001*	20.7	9.4 to 45.6
	No	38	34.9	100	91.7			
Late initiation of complimentary diet >6 months	Yes	71	65.1	12	11.0	<0.001*	15.1	7.36 to 30.9
	No	38	34.9	97	89.0			

*significant associations.

Table 3: Independent risk factors and adjusted OR for SAM.

Groups	B	P value	Exp (B) adjusted OR	95% CI for exp (B)	
				Lower bound	Upper bound
Lack of EBF-yes	2.128	<0.001*	8.395	3.231	21.810
Lack of DBF-yes	0.893	0.043*	2.443	1.029	5.799
H/o pre lacteal feed-yes	0.700	0.219	2.015	0.659	6.154
H/o bottle feed-yes	2.934	<0.001*	18.812	6.872	51.496
Late initiation of complimentary diet >6 months	1.894	<0.001*	6.645	2.580	17.114

* significant associations.

DISCUSSION

Malnutrition is responsible directly or indirectly for 60% of the 10.9 million deaths annually among children under five years. Majority of deaths occurring within 1st year were often associated with inappropriate feeding practices.[11] SAM was both a medical and social disorder. The medical problem was due to social problem at home. SAM was due to a constellation of risk factors ranging from socio demographic factors like poverty, parental illiteracy, family size and also nutritional factors like inappropriate feeding practices like lack of EBF, lack of

DBF, prelacteal feeds, bottle feeding and delayed weaning. The aim of the present study was to assess the association of nutritional determinants and inappropriate feeding practices among one month to five years of age children with SAM.

A study by Ramachandran et al found that there was a progressive increase in under-weight and stunting rates between 3 and 23 months of age.[12] Present study also showed concordant findings with maximum number of SAM cases were found (68%) in the age group of 7 months to 2 years. The findings thus suggested that the service component should be strengthened, especially for under-two children with respect to EBF, supplementary feeding practices, regular growth monitoring, prevention of infections, immunization, health and nutrition education of mothers with necessary follow up and corrective actions.[13]

In the present study all the children from both the groups were breastfed as breastfeeding practice was a norm in India, however history of prelacteal feeds were substantially seen among 44 SAM cases (40.4%) compared to controls 9 (8.3%) (p<0.001). The first breast fluid, colostrum is high in protein, fat-soluble vitamins like vitamin A and growth factors and immunologic components. Hence, colostrum was often called the infant's first immunization.[14] High protein content gave creamy and yellowish consistency and appearance to colostrum which unfortunately was widely believed to be dirty and usually discarded and replaced by prelacteal feedings.[14] Lack of EBF in the first six months of age was observed in 70 cases (64.22%), when compared to controls 14 (12.8%) (OR 12.17; 95% CI 6.14-24.14), DBF stopped before the age of 24 months of age in 82 cases (75.23%) when compared to controls 49 (45%). Findings of our study were concordant with the studies from Ethiopia by Solomon et al Indonesia and China.[15-17] Exclusively breastfed neonates had a significantly reduced risk of sepsis, diarrhea and respiratory infections when compared with partially breastfed infants.[14] Furthermore, surveys in India and Haiti have also showed an association between initiation of breastfeeding within the first hour of life and a reduced risk of stunting in children <5 years of age.[18,19]

Solomon et al observed that discontinuation of breastfeeding before 24 months of age was seen in 12/39 (30.8%) of the cases, which was similar to our study findings.[15]

Studies have clearly shown that EBF for the first 6 months and continued for the first 2 years was critical to reduce the burden of pneumonia, the leading cause of child mortality, which resulted in 1.4 million child deaths less than 5 years of age in 2010, with the majority of morbidity and mortality in developing countries.[20,21]

H/o bottle feeding was observed significantly in cases 71 (65.1%) compared to controls 9 (8.3%) p<0.001; OR 20.7; 95% CI 9.4 to 45.6). Similar findings were observed by Solomon et al and Oddy et al.[15,22] When compared to formula fed infants, breastfed children showed less growth acceleration, less upward centile crossing with a decreased risk for overweight-obesity, even as early as two years of age.[22] Also, bottle fed infants showed more tendency to be overfed as they were shown to consume up to 30% more milk than breastfed infants.[23] Bottle feeding also decreased the period of postpartum amenorrhea and increased the risk of pregnancy, worsening the socio economic burden.[15]

Present study showed late initiation of complementary feeds in 71 (65.1%) SAM cases compared to controls 12 (11.0%) (p<0.001; OR 15.1; 95% CI 7.36 to 30.9) which was concordant with studies from Ethiopia.[15] However a study in Kenya showed an increased risk of being underweight when complementary food was started early 24, which proved the importance of the time of introduction of complementary feeds and its nutritional quality. Therefore, global public health recommendation, clearly mentioned that infants should be exclusively breastfed for the first 6 months of life to achieve optimal growth and development and later to meet their increasing nutritional requirements, infants should receive nutritionally balanced and safe complementary foods while continuing breastfeeding for up to two years of age beyond.[25]

Limitations

This was an observational study which was prone to several potential biases. Socio demographic factors like parental illiteracy and specifically maternal illiteracy, poor family income, large family size also contributed significantly as a risk factor to SAM which needed further study. Further community based studies were recommended to study and correlate socio demographic factors with severe malnutrition in children.

CONCLUSION

The findings of this study clearly establishes the association of SAM with inappropriate infant feeding practices prevailing in our country. This suggests the need to improve the knowledge and attitude of parents on appropriate feeding practices and nutritional behaviours. Therefore, nutrition educators must understand cultural practices and family factors to effectively improve breastfeeding promotion and encourage parents to inculcate the best feeding practices for their young ones.

Recommendations

To prevent development of SAM in children aged between one month to five years, not to give any pre-lacteal feed, EBF for first 6 months of age, continuation

of DBF for 24 months of age, promoting early initiation of breastfeeding irrespective of the type of delivery, avoiding bottle feeding practices, timely initiation of nutritionally adequate and safe complementary diet at completion of six months of age were recommended.

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