

Dietary determinant of severe acute malnutrition among infants: Evidence from a case controlled study at a Central Indian district

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Abstract

Breast feeding and complementary feeding practices ultimately determine the nutritional status of newborn at the end of infancy. The objective of the present study was to find the possible causes of malnutrition in context of breastfeeding and complementary feeding practices adopted by families of infants aged 6-12 month old. A community-based, unmatched, case-controlled study was conducted involving 78 cases and 156 controls in the Raisen district of Madhya Pradesh, India. The study included infants aged 6- 12 months who were enrolled in the Integrated Child Development Scheme. Cases and controls were selected through a multi-staged sampling strategy. Cases were those with severe acute malnutrition and controls were those with no malnutrition as per the World Health Organization criteria. Data related to the breastfeeding, pre-lacteal feeding and complementary feeding practices were collected using a pre-tested questionnaire. Descriptive and bivariate analyses were carried out. *P*-value and Odds ratios were calculated. The proportion of exclusive breastfeeding among cases and control was 10.3% and 24.4% respectively. The high odds of malnutrition were related to lack of exclusively breastfeeding [COR(95% CI) = 4.69(2.50- 6.53)], lack of feeding semisolid food, less frequent complementary feedings [COR(95% CI) = 5.69(3.01- 8.93)], lack of hand washing by caregivers [COR(95% CI) =2.44 (1.10-3.19)], and lack of use of disinfected drinking water for infants. Proper health education should be imparted not only to mothers but also other family members involved in the child's care.

Keywords: Severe acute malnutrition, infant, breastfeeding, complementary feeding, India.

Introduction

The period from birth to two years of age has been recognized as a critical window for proper physical and mental development of children, in order for them to reach their full potential.¹ The achievement of these developmental goals may be hindered during the first two years of life due to increased incidence of growth faltering, deficiencies of certain micronutrients, and common childhood illnesses such as diarrhea.¹⁻³ It has been scientifically proven that, it is very difficult to reverse the stunting that has occurred during the first two years of life.¹

Breast milk by itself is sufficient for complete physical and mental development of infant up to 6 months of life.⁴ Therefore UNICEF, WHO and the government of India, all recommends that each mother practice Exclusive Breast Feeding (EBF) for the first six months of life.^{5,6} The risk of mortality and morbidity due to diarrhea and other infections is higher among infants who are not exclusively breastfed.^{7,8} Complementary feeding is defined as the process of giving external food to infant from 6 months onwards when breast milk alone is no longer sufficient to meet the nutritional requirements of the infant.^{9,10} The quality, consistency and content of the food introduced as part of the complementary feeding are very crucial to the child's development.⁹ If the complementary food is contaminated, has low energy density or low nutritive value, then it can result in poor nutritional status and sub-normal development of the infant.¹⁰

The method/manner in which a child is fed also plays a

Practice Points

- Proper breastfeeding and appropriate complementary feeding practices significantly influences the nutritional status of an infant and his/her future potential.
- Most common type of pre-lacteal feed given was honey (34.%) followed by animal milk (32.1%).
- Only 10.3% of cases were exclusively breastfed compared to 24.4% controls. The most common reason for non-exclusive breastfeeding was that mothers were not available all the time/they were at work (41.4%).
- The decision on the age of starting and content of complementary feeding was most commonly taken by infant's mother. Factors which increased the odds of severe malnourishment were lack of diet diversity, less frequent feeding, no hand washing before feeding, lack of separate vessel for infant and feeding non-semisolid food.
- Proper health education should be given not only to mothers but also the family members and should start from the antenatal period and must be continued up to the end of infancy period.

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role in the development of the infant. It is recommended that parents/caretakers practice 'responsive feeding', i.e., by applying the principles of psycho-social care while feeding children.⁹

According to the National Family Health Survey-3 (NFHS), the prevalence of Severe Acute Malnutrition (SAM) in infants aged 6-11 months was 15.3% and 20.2% in India and Madhya Pradesh, respectively.^{11,12} The prevalence of exclusive breastfeeding in Madhya Pradesh increased from 14.9 % in 2005 to 34.5 % in 2015.¹³ Overall in India, only 21% of children age 6-23 months are fed according to all three practices of Infant and Young Child Feeding (IYCF) guidelines.¹¹ In Madhya Pradesh, the proportion of infants who are fed correctly based on the three recommendations of IYCF is merely 8.1% and 13.1% in the age groups 6-8 and 9-11 months, respectively.¹²

The nutritional status of infants aged 6-12 month is mainly determined by the breastfeeding and complementary feeding practices that are prevalent in a particular community/society.^{14,15} These practices in turn are influenced by the nature of the family, urban/rural locality, knowledge on breastfeeding and complementary feeding, education status of the parents, place of delivery, antenatal care (ANC) visits, customs (such as giving pre-lacteal feed), and beliefs.¹⁶⁻¹⁹ In today's world, new factors are increasingly becoming important such as increasing numbers of women being employed outside the home, increasing advertisement of baby food etc.^{16,20} High rates of severe acute malnutrition among infants are definitely linked to the poor breastfeeding and complementary feeding practices followed in a given community.²¹ Many previous studies have explored breastfeeding and complementary feeding practices prevailing in communities, but only a very few have studied these practices exclusively in relation to severe acute malnutrition in infants. In the present study, the risk factors for severe acute malnutrition among infants were examined in the context of breastfeeding and complementary feeding practices which are followed by families in Raisen district of India.

Materials and methods

Study design: This was a community-based, unmatched case-controlled study.

Setting: The present study is a part of a larger study to assess the overall demographic, social, dietary, living conditions and economic characteristics of families with one or more children with severe acute malnutrition.

Study location: The present study was conducted in the rural and urban areas of district Raisen, Madhya Pradesh, Central India.

Study Duration: The study was conducted over five months (July-November 2015). The duration of data collection was three months (August-October 2015).

Study Participants: All the children between 6-12 months of age that were enrolled in the Integrated Child Development Scheme (ICDS) of the district Raisen.

Source of participants: Under the ICDS scheme, there is

an Aganwadi Centre (AWC-courtyard) located appropriately to cover a population of 800-1000, which is managed by an Aganwadi worker (AWW- grass root worker of ICDS scheme).²² Each AWW worker records anthropometric measurements of all children enrolled in her center and sends it to the Child Development Project Officer (CDPO) posted at each block of the district on a monthly basis, who in turn sends it to higher authorities.

Case definition: Severe acute malnutrition among infants of 6-12 months of age was defined as per the WHO guidelines i.e., infants with mid upper arm circumference <11.5 cm or infants who weigh <(-)3 standard deviations (SD) for height as per WHO anthropometric guidelines, or both.²³

Inclusion Criteria for cases: (i) Infants with severe acute malnutrition whose parents gave valid informed consent for the study.

Exclusion criteria: (i) Infants with severe acute malnutrition whose parent did not give consent for the study. (ii) Infants diagnosed with chronic illnesses including tuberculosis, HIV, renal disease, cardiac diseases and congenital abnormalities. (iii) Infants whose mother died any time after giving birth. (iv) Infants with mothers who had contraindications for breastfeeding.

Control definition: infant with > (-)2 SD weight for height and belonging to same gender and having same age in months as case. **Inclusion criteria for controls:** (i) Infant belonging to a different family from the case. (ii) Infant enrolled in the ICDS scheme. (iii) Infants whose parents gave valid informed consent for study.

Sampling: The study employed a multistage sampling strategy. The ICDS scheme has divided the Raisen districts into 7 developmental blocks, each headed by a CDPO.²⁴ In the first stage, three blocks were chosen by simple random sampling. In the second stage, all the children with severe acute malnutrition in the age group 6-12 months belonging to all AWCs of the selected blocks were enrolled. In the third and final stage, all the children from every AWC in a selected block who fulfilled our inclusion criteria were enrolled in our study. The controls were taken from the same AWCs as cases. If we could not find the control from an AWC to match a case, then controls from the nearest AWC were selected.

Selection of participants: Monthly progress reports (MPR) for every month from every block is generated by CDPO, and it includes the number, age group and gender of all children with SAM in a given block. From the CDPO's office, a list of names and address of AWC to which all children with SAM (cases) belongs, and name and phone number of the AWW was noted. After reaching a particular AWC, the identity of a case was verified and thereafter anthropometric measurements of the case were measured after obtaining permission from the AWW. Anthropometric measurements of the infant were taken according to the WHO standardized techniques.²³ Anthropometric measurements were taken by the researchers themselves. Children were also assessed for the presence or absence of edema of the feet. Anthropometric measurements of children were taken at the aganwadi centre. After confirming that the child is severely malnourished as per the WHO's

classification, parents of cases were informed about the purpose and nature of the study. Thereafter, valid informed consent was obtained from the parents of each case. The same procedure was adopted for selecting controls. Two controls were selected per case.

Sample size: All the infants enrolled in ICDS from the selected three blocks of district Raisen fulfilling the inclusion criteria during the period of data collection were enrolled in the study. Following this we approached a total of 87 cases and 169 controls.

Data collection: A questionnaire was designed after a literature search on breastfeeding and complementary feeding guidelines as advised by WHO, UNICEF and the government of India.^{5,9,10,25} The questionnaire was translated from English to the local language by a translator, and the responses were translated back to English. The questionnaire was pretested on mothers of 15 children with severe malnutrition admitted to the nutritional rehabilitation center at community health centre *Mandeep*, district *Raisen*; after that necessary modifications were done. Results of pre-testing were excluded from final analysis. The final version of the questionnaire had a reliability of $\alpha=0.92$ on field testing.

Diet Survey: the data about complementary feeding practices was obtained using a 24-hour recall method.²⁶

Variables: A questionnaire was used to collect data on all aspects of breastfeeding (frequency, duration, pre-lacteal feeding) and complementary feeding (age of starting, frequency, the variety of foods, mode of feeding). Minimum dietary diversity was defined as the proportion of children who were fed foods from 4 or more food items out of the seven major foods items within 24 hours preceding the survey.²⁵ The questionnaire was administered to mothers of cases and controls at their respective house. Hand washing: For the purpose of study we defined 'hand washing' as washing hands with soap or detergents using any methodology for any duration of time. Hand washing with just plain water without using soap or detergents was not considered as hand washing.

Outcome variable: The outcome variable was the duration of feeding only breast milk to infant, practices of exclusive breastfeeding and adoption of standard complementary feeding practices by families of cases and controls.

Potential confounding variable: An important confounder was the per-capita income of families of cases and controls, as there are chances that those families of controls which have higher per-capita income are likely to spend more on the child's nutrition and diet. We minimized the effect of this confounder variable by selecting controls from such families who had the same type of ration card as families of cases. Wherever possible, the facts stated by the respondent in the interview were cross-checked by the data collector such consistency of complementary food, vessel/container of feeding, the variety of food served to cases and controls.

Data Analysis: Data were checked for completeness, and then were finally entered into SPSS version 20.0 software. Anthropometric data were calculated by using WHO anthro2010 software and WHZ-scores were also

being generated based on the WHO child growth standards. Descriptive statistics were used to describe the sample. The results of the descriptive statistics were expressed as a percentage and frequency, as well as discordant and concordant pairs were described. A *p*-value below 0.05 was considered statistically significant. A bivariate analysis was performed on the independent variables and their proportions and crude odds ratio were computed against the outcome variable to identify the factors that are associated with severe acute child malnutrition. This study, involving infant and mother enrolled in the ICDS scheme was conducted after receiving ethical clearance from institute ethical board. Written informed consent was obtained from parents of cases and controls. Confidentiality of the information given by the respondents was maintained throughout the study. During data collection, if any infant whether cases or controls needed any medical attention, they were referred to the health facilities for proper treatment.

Results

For the present study we approached a total of 87 cases and 169 controls. Of the 87 cases, mothers of 5 cases refused to participate in study and 4 were excluded using inclusion/exclusion criteria. Of the 169 controls we approached, mothers of 9 controls refused to constant for study and mothers of 4 controls were not available for interview. Thus final analysis was done on a total of 78 cases and 156 controls.

The demographic characteristic of families of cases and controls are presented in Table 1. Most of the mothers of both cases and controls were 20-25 years old. Most of the cases were 8-9 months of age. Birth order of most of the cases was third or higher. The proportion of males and females among cases was 44.9% and 55.1 %, respectively. The breastfeeding practices followed by the mothers of both cases and controls are presented in Table 2. The delay in initiating breastfeeding beyond the stipulated time was more common after caesarean sections as compared to vaginal deliveries. The prevalence of pre-lacteal feed was higher (close to 70 %) among those children who were born by caesarean sections (data not shown). Among cases, the most common reason for pre-lacteal feedings was pressure from relatives (45.3%) followed by traditional customs (34.0%). On being asked the type of pre-lacteal feed given, the most common answer was honey (34.0 %) followed by animal milk (32.1 %). Only 10.3% of cases were exclusively breastfed compared to 24.4% controls. A considerable proportion of cases (23.1%) were given breast milk only until 3 months of age, against the recommended 6 months. This was also reflected by the poor knowledge of mothers regarding exclusively breastfeeding.

Among mothers of cases, a large proportion (39.7%) believed that the right age for starting giving water to infants was 4 months. The most common reason cited by mothers or starting external food before 6 months of age was that they were not available all the time/they had to work (41.4%). On being probed about the type of first external food given to the infant, the most common reply was animal milk (35.7%) followed by the mixture of pulses and rice (17.1%).

Table 1: Distribution of study participants by socio-demographic profile

Demographic Characteristics	Cases (n=78) n (%)	Controls (n=156) n (%)
<i>Age of mother (in years)</i>		
< 20	19 (24.4%)	12 (7.7%)
20- < 25	33 (42.3%)	79 (50.6%)
25 - < 30	19 (24.4%)	45 (28.8%)
30 and above	7 (9%)	20 (12.8%)
<i>Educational qualification of mother</i>		
Illiterate	28 (35.9%)	38 (24.4%)
Up to Primary	19 (24.4%)	47 (30.1%)
Up to High School	18 (23.1%)	34 (21.8%)
Intermediate and above	13 (16.7%)	37 (23.7%)
<i>Occupation of mother</i>		
House wife	23 (29.5%)	23 (14.7%)
Labourer	25 (32.1%)	57 (36.5%)
Business	20 (25.6%)	42 (26.9%)
Service	10 (12.8%)	34 (21.8%)
<i>Religion</i>		
Hindu	59 (75.6%)	109 (69.9%)
Muslim	19 (24.4%)	47 (30.1%)
<i>Caste (social group)</i>		
General	17 (21.8%)	39 (25%)
Other Backward Class	20 (25.6%)	49 (31.4%)
Schedule Caste	19 (24.4%)	30 (19.2%)
Schedule Tribes	22 (28.2%)	38 (24.4%)
<i>Type of family</i>		
Nuclear	55 (70.5%)	103 (66%)
Joint	23 (29.5%)	53 (34%)
<i>Birth order</i>		
1	17 (21.8%)	48 (30.8%)
2	16 (20.5%)	38 (24.4%)
3 or more	45 (57.7%)	70 (44.9%)
<i>Place of delivery</i>		
Hospital	59 (75.6%)	141 (90.4%)
On the way to hospital	12 (15.4%)	4 (2.6%)
Home	7 (9%)	11 (7.1%)
<i>Per capita income per month (in INR*)</i>		
<1000	39 (50%)	39 (25%)
1000-2000	27 (34.6%)	51 (32.7%)
2001-5000	10 (12.8%)	31 (19.9%)
5001 and more	2 (2.6%)	35 (22.4%)
<i>Age of infant</i>		
6-< 7	4 (5.1%)	8 (5.1%)
7-<8	4 (5.1%)	8 (5.1%)
8-<9	11 (14.1%)	22 (14.1%)
9-<10	17 (21.8%)	34 (21.8%)
10-<11	22 (28.2%)	44 (28.2%)
11-<12	20 (25.6%)	40 (25.6%)
<i>Gender</i>		
Male	35 (44.9%)	70 (44.9%)
Female	43 (55.1%)	86 (55.1%)

*INR-Indian National Rupee

The complementary feeding practices followed by families/mothers of cases and controls are detailed in Table 3. The data for complementary feeding was obtained using a 24-hour recall method. The decision on the starting age, and content of complementary feeding was most commonly taken by the infant's mother. 26.9% of cases were given the semisolid food as compared to 55.7 % of controls. Among study participants, only 24.4

% of cases and 58.3% controls were given disinfected water for drinking. Hand washing before feeding infants was followed in families of 29.5% cases and 57.1% controls. The diet diversity score was higher among controls as compared to cases.

The bivariate analysis of important factors related to breastfeeding and complementary feeding are

Table 2: Distribution of study participants as per breast feeding practices by mother

Variables	Cases (n = 78)	Controls (n=156)
	n (%)	n(%)
<i>Pre-lacteal feeding</i>		
Yes	53 (67.9%)	75 (48.1%)
No	25 (32.1%)	81 (51.9%)
<i>Reason for Pre-lacteal feed (Cases=53, controls=75)</i>		
Customs and Belief	18 (34%)	27 (36%)
Pressure from relatives	24 (45.3%)	30 (40%)
Mother was not well	8 (15.1%)	13 (17.3%)
Other	3 (5.7%)	5 (6.7%)
<i>Type of Pre-lacteal feeds (Cases=53, controls=75)</i>		
Animal Milk	17 (32.1%)	19 (25.3%)
Holy water	16 (30.2%)	25 (33.3%)
Honey	18 (34%)	30 (40%)
Others	2 (3.8%)	1 (1.3%)
<i>Colostrum given</i>		
Yes	64 (82.1%)	108 (69.2%)
No	14 (17.9%)	48 (30.8%)
<i>Time of starting breast feeding after birth</i>		
<i>After Vaginal Delivery (Cases=62,controls=127)</i>		
<one hour	41 (66.1%)	97 (76.4%)
>one hour	21 (33.9%)	30 (23.6%)
<i>After caesarean section (Cases=16, controls=29)</i>		
< 4 hours	3 (18.8%)	9 (31%)
>4 hours	13 (81.2%)	20 (69%)
<i>Duration till which only breast milk was fed</i>		
< 3 months	18 (23.1%)	9 (5.8%)
3- < 4 months	20 (25.6%)	27 (17.3%)
4 -< 5 months	20 (25.6%)	43 (27.6%)
5- < 6 month	12 (15.4%)	39 (25%)
Till 6 completed months	8 (10.3%)	38 (24.4%)
<i>Reason for external feeding before 6 months of age (Cases=70, controls=118)</i>		
Had to work/Unavailable all the time	29 (41.4%)	47 (39.8%)
Child was crying/hungry after breastfeeding	22 (31.4%)	34 (28.8%)
External food is more nutritious	11 (15.7%)	25 (21.2%)
Others	08 (11.4%)	12 (10.2)%
<i>Type of external feeding before six months of age (Cases=70, controls=118)</i>		
Animal milk	25 (35.7%)	22 (18.6%)
Pulses-rice	12 (17.1%)	17 (14.4%)
Fruits/juices	8 (11.4%)	23 (19.5%)
Baby food	7 (10%)	28 (23.7%)
Ghutti (traditional medicine)	10 (14.3%)	21 (17.8%)
Water	8 (11.4%)	7 (5.9%)
<i>Till what age mother thinks breast milk is sufficient for baby</i>		
4 months	38 (48.7%)	29 (18.6%)
5 months	17 (21.8%)	63 (53.4%)
6 months	18 (23.1%)	54 (45.8%)
7 months and more	5 (6.4%)	10 (6.4%)
<i>By what age onwards baby should be given water</i>		
3 rd month	5 (6.4%)	10 (6.4%)
4 th month	31 (39.7%)	49 (31.4%)
5 th month	27 (34.6%)	87 (55.8%)
6 th month and beyond	15 (19.2%)	10 (6.4%)

detailed in Table 4. Factors related to breastfeeding which increased the odds of severe malnourishment among infants were lack of exclusive breastfeeding [COR (95% CI) = 4.69(2.50-6.53)], feeding breast milk only for less than 4 months of age [COR(95% CI) = 8.86(3.13-13.64)], and pre-lacteal feeding [COR(95% CI) = 2.25 (1.11-4.67)]. Factors related to complementary feeding which increased the odds of severe malnourishment were lack of diet diversity [COR(95% CI) = 6.92(3.32-9.48)], less frequent feeding [COR(95% CI) = 5.69(3.01-8.93)], no hand-washing before feeding [COR(95% CI)=2.44

(1.10-3.19)], lack of a separate vessel for the infant [COR(95% CI) = 1.59(1.06-2.43)] and feeding non-semisolid food (liquid + solid).

Discussion

Based on the review of the literature, the uniqueness of our study was to assess who has a say in deciding at what age complementary feeding should be started and what should be the contents of complementary feeding. In our study, the odds of

Table 3: Distribution of study participants by complementary feeding practices

Complementary Feeding	Cases	Controls
	n (%)	n (%)
<i>By what age (in months) as per mother should external food be started for baby</i>		
4	28 (35.9%)	19 (12.2%)
5	24 (30.8%)	86 (55.1%)
6	14 (17.9%)	32 (20.5%)
7	12 (15.4%)	19 (12.2%)
<i>Decision on timing of starting external food/ complementary feeding was taken by</i>		
Mother	23 (29.5%)	73 (46.8%)
Father	3 (3.8%)	5 (3.2%)
Jointly by mother and father	8 (10.3%)	15 (9.6%)
Grand parents	18 (23.1%)	34 (21.8%)
Relatives/neighbours	19 (24.4%)	5 (3.2%)
Advice from health personnel	7 (9%)	24 (15.4%)
<i>Content of complementary feeding is decided by</i>		
Mother	29 (37.2%)	85 (54.5%)
Father	1 (1.3%)	1 (0.64%)
Jointly by mother and father	4 (5.1%)	2 (1.28%)
Grand parents	20 (25.6%)	41 (26.3%)
Relatives	12 (15.4%)	8 (5.1%)
Advice from health personnel	10 (12.8%)	19 (12.2%)
<i>Frequency of complementary feeding per day</i>		
0-3	39 (50%)	20 (12.8%)
4-6	33 (42.3%)	118 (75.6%)
7 and more	6 (7.7%)	18 (11.5%)
<i>Nature of complementary feeding</i>		
Vegetarian	52 (66.7%)	110 (70.5%)
Eggs	17 (21.8%)	39 (25%)
Non vegetarian	9 (11.5%)	7 (4.5%)
<i>Consistency of complimentary food</i>		
Liquid	38 (48.7%)	39 (25%)
Semi solid	21 (26.9%)	87 (55.8%)
Solid	19 (24.4%)	30 (19.2%)
<i>Diet diversity (past 24 hours)</i>		
Yes	24 (30.8%)	129 (82.7%)
No	54 (69.2%)	27 (17.3%)
<i>Do mother/care provider washes his/her hand before feeding cases/control</i>		
Yes	23 (29.5%)	89 (57.1%)
No	55 (70.5%)	67 (42.9%)
<i>Separate Vessel/Container for feeding baby</i>		
Yes	29 (37.2%)	103 (66%)
No	49 (62.8%)	53 (34%)
<i>Disinfection of drinking water for infant</i>		
Yes	19 (24.4%)	91 (58.3%)
No	59 (75.6%)	65 (41.7%)

being severely malnourished were related to lack of exclusive breastfeeding, starting external food earlier than 4 months of age, less frequent complementary feeding, not washing hands before feeding the infant and not using disinfected drinking water for the infant.

Infants belonging to families of lower socioeconomic statuses were more likely to be undernourished than their richer counterparts. This finding is comparable to findings of similar studies conducted in many low and middle-income countries and reflects the fact that malnourishment disproportionately affects the poor households.²⁷⁻²⁹ A higher birth order was strongly associated with infant's undernourishment. The prevalence of severe acute under nutrition was higher among infants with higher (3rd or more) birth order. The higher birth order gives less opportunity for exclusive breastfeeding and less attention than an infant normally deserves, thus increasing the risk of malnutrition.²⁸ Higher birth order is associated with an

increased risk of communicable disease such as diarrhea and pneumonia among infants.²⁹

The lack of exclusive breastfeeding and inappropriate complementary feeding practices deprives an infant of essential nutrients during the first year of life.³⁰ These practices, if used properly, are known to prevent infective disease by reducing exposure to an infective agent and improving infant's immunity status, thus interrupting the vicious infection-malnutrition cycle.^{31,32} Improving these practices can lead to an improved nutritional status thus improving child survival, growth, and development. This also prevents further episodes of undernutrition in later life.^{33,34}

Limitations

The study's findings could be affected by recall bias due to the retrospective collection of data. These problems are inherent in case-control studies.

Table 4: Bivariate analysis of selected characteristics of the study participants

Variable	Cases	Controls	COR (95% CI)	p-value
	n (%)	n (%)		
<i>Breast Milk</i>				
<i>Exclusive breastfeeding for Six months</i>				
No	70 (89.7%)	118 (75.6%)	4.69 (2.50- 6.53)	0.003
Yes	8 (10.3%)	38 (24.4%)	1	
<i>Pre lacteal feed</i>				
Yes	53 (67.9%)	75 (48.1%)	2.25 (1.11-4.67)	0.06
No	25 (32.1%)	81 (51.9%)	1	
<i>Only breast milk feeding till 4 month of age</i>				
No	32 (41%)	36 (23.1%)	8.86 (3.13-13.64)	<0.001
Yes	46 (59%)	120 (76.9%)	1	
<i>Complementary feeding</i>				
<i>Dietary diversity</i>				
No	54 (69.2%)	27 (17.3%)	6.92(3.32-9.48)	0.023
Yes	24 (30.8%)	129 (82.7%)	1	
<i>Separate Vessel/Container for feeding Infant</i>				
No	49 (62.8%)	53 (34%)	1.59 (1.06, 2.43)	0.041
Yes	29 (37.2%)	103 (66%)	1	
<i>Frequency of feeding</i>				
<4	39 (50%)	20 (12.8%)	5.69 (3.01- 8.93)	0.01
4 and more Closed	39 (50%)	136 (87.2%)	1	
<i>Hand Washing before feeding Infant</i>				
No	55 (70.5%)	67 (42.9%)	2.44 (1.10- 3.19)	0.02
Yes	23 (29.9%)	89 (57.1%)	1	
<i>Consistency of complementary feeding</i>				
Liquid	38 (48.7%)	39 (25%)	1.27(0.88, 1.77)	0.05
Solid	19 (24.4%)	30 (19.2%)	1.21(0.90, 1.73)	
Semi solid	21 (26.9%)	87 (55.8%)	1	
<i>Disinfection of drinking water</i>				
No	59 (75.6)	65 (41.7%)	1.69(1.10, 2.09)	0.027
Yes	19 (24.4)	91 (58.3%)	1	

Conclusion

Period from birth to two years of age is a 'critical window' for proper physical and mental development of children. Proper breastfeeding and appropriate complementary feeding practices significantly influences the nutritional status of an infant and his/her future potential. Factors such as duration of exclusively breastfeeding and avoidance of pre-lacteal feeding can be improved by reinforcing health education at every step from the antenatal period onwards. Based on our findings, we recommend health education about right practices of breastfeeding and complementary feeding should be imparted not only for mothers but also to other care givers such as father, grandparents and other household members.

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Conflict of Interest

None declared.

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