Original Article

An epidemiological study of the determinants and patterns of complementary feeding practices among children of 6–24 months of age group

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ABSTRACT

Background: The introduction of complementary food is the most important factor determining the nutritional status of the children in the first 2 years of life. This study aimed to find out the determinants and patterns of complementary feeding practices and their impact on the growth and development of children of 6-24 months of age group. **Materials and Methods:** A descriptive cross-sectional study was done on immunization out patient department (OPD) in the field practice area of the Department of Community Medicine. The sample size taken was 250 using a systematic random sampling method. **Results:** One hundred and seven (42.8%) were given the optimum amount of complementary food for their age. One hundred and three (41.2%) were fed with an adequate frequency for their age. One hundred and ninety-five (78.0%) were given food that was appropriate in consistency for their age. Among 183 (73.2%) children who were not fed appropriately during and after their illness episodes, 119 (65.0%) were malnourished. On using logistic regression it was seen that the variables which had statistically significant association with the complementary feeding patterns (*P*<0.05) were maternal education, father's age, total members in the family, advice on complementary feeding from health care workers and use of bottle for feeding. Father's education, availability of ration card, antenatal counselling on childcare, birth order and history of repeated illness in the past did not show statistically significant association with complementary feeding practices (*P*>0.05). **Conclusion:** There was no statistically significant difference between the feeding patterns of normal and malnourished children. The association of complementary feeding practices and the anthropometric status of study children was not found statistically significant in the present study. Advice on complementary feeding from healthcare workers is seen to be having a positive impact on complementary feeding practices (*P* < 0.01).

Keywords: Anthropometric, children, complementary, mother, nutritional

Background

The nutritional status of young children is an important indicator of health and development, and it is not only a reflection of past health insults but also an important indicator of future health trajectories.[1] Globally, 161 million children under age five are too short for their age (stunted), and 51 million do not weigh enough for their height (wasted). Children are the most visible victims of undernutrition.[2] Globally, only 60% of children aged 6–8 months receive solid, semi-solid, or soft foods, highlighting deficiencies in the timely introduction of complementary foods.[3]

In India, an alarming 43% of children <3 years of age are stunted, 48% are underweight, and 17% are wasted, according to the National Family Health Survey-3 (NFHS; 2005–2006).[4] The transition from exclusive breastfeeding to family foods is referred to as complementary feeding and is a very vulnerable period. It is the time when malnutrition starts in many infants, contributing significantly to the high prevalence of malnutrition

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in children under 5 years of age worldwide. World Health Organization (WHO) estimates that 2 out of 5 children are stunted in low-income countries.[5]

Complementary feeding is defined as the process of adding complementary foods to the diet of an infant when breastmilk is no longer adequate to meet nutritional needs. This process should be initiated at 6 months of age and continued until the child is on the family diet, usually sometime between 18 and 24 months of age, although this varies by country and circumstances. It is necessary to generate data regarding the impact of healthcare services and health education on feeding practices, as well as to identify lacunae in the knowledge and patterns of the same for the better functioning of healthcare delivery systems in this aspect. Thus, this study is done to assess the socio-demographic, economic, and maternal determinants of complementary feeding practices and the anthropometric profile of the children in the age group of 6–24 months and to compare them with Indian growth standards and to assess the patterns of complementary feeding practices with reference to standard recommendations[6] in the study area and their association with anthropometric growth and development of study subjects.

Materials and Methods

Study design

A descriptive cross-sectional study: The study was carried out over a period of 24 months, that is, from December 2015 to November 2017. Immunization out patient department (OPD) of a tertiary healthcare center (Center I), urban health center (Center II), and a primary health center (Center III) which are field practice areas of the Department of Community Medicine of a tertiary healthcare center in a metropolitan city. The study participants were mothers whose children were 6–24 months old. Inclusion criteria: Beneficiaries of the services provided by the healthcare centers and children receiving complementary feeds. Exclusion criteria: Seriously ill (mother or the baby). According to the Comprehensive Nutrition Survey done in Maharashtra in 2012, the percentage of children 6–8 months who are fed solid, semi-solid, and soft foods was 59.9%.[7] The average yearly number of beneficiaries in each center from the past year's record:

Immunization OPD of a Tertiary Center (Center 1) = 360

Urban Health Center immunization OPD (Center 2) = 2400

Primary Health Center immunization sessions (Center 3) = 900

Total = 360 + 2400 + 900 = 3660 (reference population, N)

The sample size is calculated using the formula:

$$n = \frac{Z^2_{(1-\alpha)} * N * p * q}{(N-1)e^2 + \chi^2 * p * q}$$

where

n = Desired sample size

$Z_{(1-\alpha)}$ =1.96 ≈ 2 for a 95% confidence interval.

Therefore, n = 4pqN/(N-1) e^2 + 4pq

p = Proportion (59.9%)

q = (100 – p)

e = Precision (10% of p).

By this formula, the sample size calculated is 249.58 rounded off to 250 (error 10%).

The sample size was stratified in three centers by proportionate sampling as follows: Center I: n_1 = 360/3660 × 250 = 24.59 Rounded off to n = 25

Centre II: n_2 = 2400/3660 × 250 = 163.9 Rounded off to n = 164

Center III: n_3 = 900/3660 × 250 = 61.4 Rounded off to n = 61

Thus, the total sample size (n):

n = n1 + n2 + n3, n = 25 + 164 + 61, n = 250.

The beneficiaries fulfilling the inclusion criteria were enrolled in the study after the informed consent by using a systematic random sampling method prospectively till the desired sample size was achieved. A semi-structured questionnaire was prepared with reference to standard recommendations of Infant and young child feeding (IYCF) practices by WHO.[6]

Sampling interval $_{(study area)}$

$$= \frac{\text{Total number of beneficiaries in study area over a year}}{\text{Calculated sample size for the same study area}}$$

Thus, sampling interval for the Center 1 = 14, Center 2 = 15, Center 3 = 15

Thus, the first study subject was selected randomly and then every nth (sampling interval) subject was selected consecutively till the desired sample size was achieved. Data were collected using a structured questionnaire. Informed consent was taken from the mothers. The children were classified as stunted, wasted, underweight, or normal using the WHO standard Z score simplified field tables for length-for-age, weight-for-age, and weight-for-length. Separate charts were used for the boys and girls, as recommended by the WHO. Statistical analysis was performed using the Statistical package for social sciences (SPSS) software version 22. A test of significance (Pearson's Chi-square test) was applied to find out the association between the study variables. Logistic regression analysis was applied to find out the factors influencing complementary patterns.

Results

The majority of the mothers were in the age group of 20–25 years (*n* = 104; 41.6%) followed by 25–30 years (*n* = 87; 34.8%). One hundred and thirty-five (54%) study participants were Muslim and 114 (45.6%) were Hindu by religion. It was seen that the majority of the parents were educated till middle school certificate (mothers: *n* = 101, 40.4%; fathers: *n* = 95, 38%). The majority of mothers, that is, 237 (94.8%) were homemakers. 92 (36.8%) belonged to the middle class and 87 (34.8%) to the lower middle class. All the mothers had registered for antenatal care services when pregnant with the index child. One hundred and six (42.4%) were counseled for breastfeeding and complementary feeding of the child. The proportion of male children was 114 (45.6%) and female children were 136 (54.4%). The highest percentage of study subjects was in the age group of 9–12 months (24.8%) followed by 6–9 months (21.6%), whereas children between 21 and 24 months were the least (7.2%). The percentage of male and female children was equal in the 9–12 months age group (50.0% each). Ninety-eight (39.2%) children suffered from various morbidities (serious or non-serious) in the past. One hundred and seventy-eight (71.2%) children had received all vaccines appropriate for their age.

The study participants were classified into two groups, that is, normal and malnourished as per their anthropometric measurements; it was found that 91 (36.4%) children were normal, and 159 (63.6%) were malnourished. The study subjects with stunted and underweight status were 54 (21.6%). Only stunted children were 39 (15.6%) and children with stunting, underweight, and wasting were 25 (10.0%). The majority of the children in the study, that is, 121 (48.4%) were given complementary feeding appropriately at 6 months of age, while 78 (31.2%) were given between 6 and 12 months of their age and 46 (18.4%) were given before 6 months of their age. Only 5 (2.0%) children were given complementary foods after 12 months of their age.

The majority of mothers (*n* = 122; 48.8%) started giving complementary foods to their children as they were advised by healthcare workers and 17 (6.8%) were advised by elders in the family, while 69 (27.6%) mothers started as they considered their breastmilk was insufficient. Four (4.82%) were not aware of the age of initiation of complementary feeding. Out of 250 study participants, 107 (42.8%) were given the optimum amount of complementary food for their age. One hundred and three (41.2%) were fed with an adequate frequency for their age. One hundred and ninety-five (78.0%) were given food, which was appropriate in consistency for their age. Two hundred and twenty-nine (91.6%) study participants practiced handwashing before preparation of food and before feeding the child as well. Appropriately cooked or stored food was given to 236 (94.4%) children. Stored food rewarming before eating was practiced by 237 (94.8%) mothers. Two hundred and thirty-nine (95.6%) mothers responded that they used clean utensils for food preparation and feeding the

child. One hundred and sixty-three (65.2%) mothers were using treated or boiled water for complementary food preparation and drinking purposes of their children. It was seen that 246 (98.4%) children were fed directly or assisted, and 244 (97.6%) were fed slowly with patience. Two hundred and forty-six (98.4%) children were encouraged to eat without any force. One hundred and fifty-eight (63.2%) mothers responded that they avoid common distractions like TV, mobile phone, or toys while feeding their children. Two hundred and forty-five (98.0%) mothers said that they interacted with their children by looking at them and talking to them while feeding.

It was also revealed that only 90 (36.0%) children were given more fluids during illness. Eighty-nine (35.6%) children were encouraged to eat soft, varied foods during illness. Eighty (32.0%) children included in the study were offered more food than usual after an illness episode. Ninety (36.0%) children were encouraged to eat more during their recovery from illness. The proportion of children who were fed appropriately for each principle of feeding during and after illness was less compared to the children who were not fed appropriately.

Apple was the most commonly given fruit (frequency = 27) to the study children, followed by banana (frequency = 21). Tea was a commonly given form of sugary drink. Formula milk, chocolates, wafers, and cold drinks were also given to a few study children. It was seen that 60 (24.0%) children were given fortified products or vitamin-mineral supplements, as shown in Figure 1.
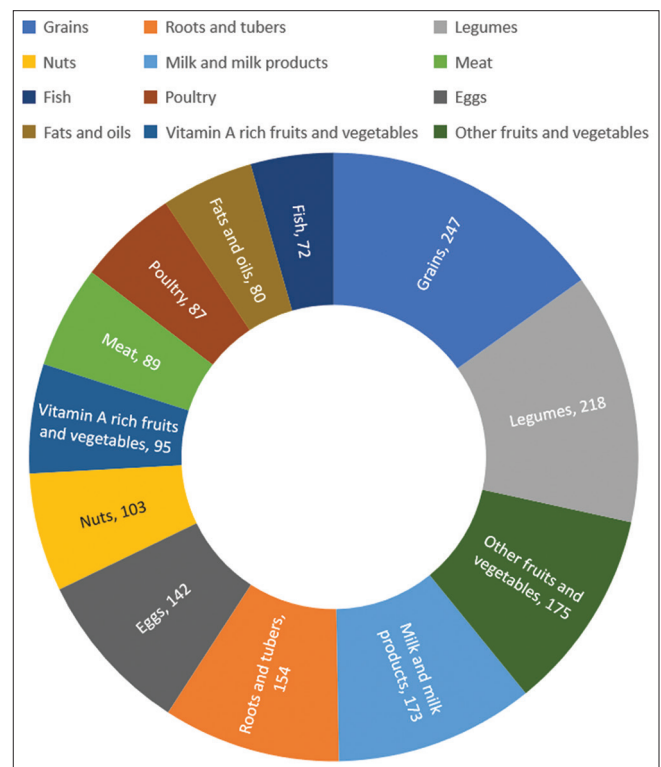
Figure 1: Distribution of study participants as per food types of their complementary feeding

For the purpose of analysis, a complementary feeding score was developed as given in Table 1.

The total number of subjects with a complementary feeding score of 5 or < five was 138 (55.2%). One hundred and twelve (44.8%) subjects had a score of more than 5. It was common for all the variables. Hence, it is not mentioned for further variables.

Children with length for age, weight for age, and weight for length below 2 standard deviation (S.D). for age were classified as stunted, underweight, and wasted, respectively. From above Table 2, it is evident that there was no statistically significant difference between the feeding patterns of normal and malnourished children. Availability of maternal and child health cards with growth chart and under five clinic registrations was not found associated with complementary feeding indicator scores statistically. However, advice on complementary feeding from a healthcare worker is seen to have a positive impact on complementary feeding

practices ($P < 0.01$). Sixty-eight (55.7%) subjects who were counseled for complementary feeding had a score of more than five, while only 44 (34.4%) subjects who did not receive complementary feeding counseling had having score of more than five.

Discussion

In the present study, the mean age in years and standard deviation for maternal and paternal age was 25.98 ± 4.30 and 30.24 ± 4.59, respectively. Study findings show that 100% of mothers were registered for antenatal care of the index child, while 98.0% regularly visited ante natal care (ANC) clinic. 42.4% of mothers were counseled for breastfeeding as well as complementary feeding. Results of the study by Wu *et al.*[8] show that 26.3% of mothers received information on breastfeeding and 23.7% on complementary feeding during pregnancy. The present study findings suggest better coverage of antenatal services compared to NFHS-4[9] and district level household and facility survey (DLHS)-4[10] findings. However, addressing issues like breastfeeding and complementary feeding during the antenatal period was found to be more compared to the findings of Wu *et al.*[8] and slightly less when compared to the findings of Malhotra[4] and Catherin *et al.*[11] There is a possibility that the information collected from study subjects regarding antenatal care, birth details of index children, breastfeeding practices and complementary feeding practices may not be accurate due to recall bias of study subjects.

In the present study, the highest percentage of study subjects was in the age group of 9–12 months (24.8%) followed by 6–9 months (21.6%). The percentage of male and female children was equal in the 9–12 months age group (50.0% each). The proportion of female children was higher (54.4%) compared

Table 1: Complementary feeding indicator score

Indicator	Score
Introduction of solid, semi-solid, or soft foods at 6 months of age	1
Continued breastfeeding to 2 years of age or beyond	1
Amount of complementary feeding needed as per age	1
Age appropriate minimum meal frequency	1
Food consistency	1
Safe preparation and storage	1
Responsive feeding	1
Feeding during and after illness	1
Minimum dietary diversity	1
Fortified products or vitamin mineral supplements	1
Total	10

Table 2: Socio-demographic and maternal determinants of complementary feeding practices

Socio-demographic and maternal and paternal determinants*along with anthropometric variables	Complementary feeding indicator score (%)		Total (%)	Statistical test
	≤5	>5		
Maternal age				
≤25 years	82 (56.9)	62 (43.1)	144 (57.6)	χ^2=0.418 df=1,
>25 years	56 (52.8)	50 (47.2)	106 (42.4)	P=0.518
Total**	138 (55.2)	112 (44.8)	250 (100)	
Mother's education				
Illiterate/Primary	58 (76.3)	18 (23.7)	76 (30.4)	χ^2=19.688, df=1,
Middle school and above	80 (46.0)	94 (54.0)	174 (69.6)	P=0.000
Father's education				
Illiterate/Primary	23 (74.2)	8 (25.8)	31 (12.4)	χ^2=5.162, df=1,
Middle school and above	115 (52.5)	104 (47.5)	219 (87.6)	P=0.033
Length for age				
Normal	70 (53.0)	62 (47.0)	132 (52.8)	χ^2=0.532, df=1,
Stunted***	68 (57.6)	50 (42.4)	118 (47.2)	P=0.274
Weight for age				
Normal	72 (52.2)	66 (47.8)	138 (55.2)	χ^2=1.141, df=1,
Underweight***	66 (58.9)	46 (41.1)	112 (44.8)	P=0.174
Weight for length				
Normal	109 (56.2)	85 (43.8)	194 (77.6)	χ^2=0.340, df=1,
Wasted***	29 (51.8)	27 (48.2)	56 (22.4)	P=0.648

*For the purpose of analysis, study variables were clubbed together to make two groups

to male children (45.6%). However, in a study conducted by Anurag *et al.*,[12] the proportion of male children was 51.8% and female children were 48.2%. The difference in the findings could be due to different study methodologies. Study results show that 71.2% of children had received all vaccines appropriate for their age. 28.8% were partially immunized. However, NFHS-4[9] shows that 56.3% of children of 12–23 months were fully immunized. There was no much difference between the proportion of male and female children completely or partially immunized. The number of partially immunized female children was slightly more (39) compared to several partially immunized male children (33).

At the end of 6 months of age, 48.4% of children were introduced to complementary foods. Similarly, at the time of NFHS-4, 43.3% of children of 6–8 months were receiving solid or semi-solid food. In a study by Basnet *et al.*,[13] 50% of mothers had started complementary feeding at 6 months of age. In our study, 18.4% of children were given complementary foods before 6 months of age. Similarly in a study by Basnet *et al.*,[13] 40.3% of the mothers started complementary feeds before the recommended time. The study findings discern that study children whose mothers were illiterate or studied up to the primary level had poor complementary feeding score [Table 2].

However, in a study conducted by Chowdhury MR *et al.*[14] it was seen that poor complementary feeding practices were observed among the children with illiterate mothers, illiterate fathers, children of currently unemployed fathers, children belonging to the poorest socio-economic group, and children from rural areas.

In the present study, advice from healthcare workers was found to have a desirable effect on complementary feeding practices. Similarly, an analysis of socio-economic factors that contribute to infant and young children feeding practices done by Malhotra[4] using NFHS-3, data suggested that nutritional information from health professionals was a significant and important determinant of sound complementary feeding practices. The present study results show that major determinants of poor complementary feeding practices that emerged after regression analysis [Table 3] are lower education

of mothers, younger age of fathers, children from nuclear families, and no advice on complementary feeding practices by healthcare workers. No use of bottle feeding was found to be associated with a lower risk of poor complementary feeding practices. Another form of malnutrition, that is, micronutrient deficiency, was not assessed in the study.

In the present study, the association between complementary feeding patterns and the anthropometric status of children was not found statistically significant [Table 4]. Similarly, the results of study by Srivastava *et al.*[15] in India and Ntab *et al.*[16] in Africa suggest that complementary feeding score was not found to be significantly associated with the nutritional status of children. However, the results of a study by Mukhopadhyay DK *et al.*[17] in West Bengal and by Garg *et al.*[18] in Uttar Pradesh, India showed that complementary feeding practices have an association with the anthropometry of children.

Conclusions

All mothers included in the study had registered for antenatal care of the index child. More than one-third of mothers (42.4%) had received information on both breastfeeding and complementary feeding during the antenatal period. More than one-third (36.4%) of study children were normal, while the rest of them suffered from some form of malnutrition, viz., stunting, underweight, wasting, or possible combinations of these forms. Complementary feeding of the majority of study children was taken care of by their mothers. Less than half (48.4%) of children were given complementary foods at 6 months of age. Common reasons for initiation of complementary feeding given by mothers were advice from healthcare workers followed by insufficient breastmilk and advice from elders. Responsive feeding was practiced by the majority of mothers (more than 90%). The determinants of poor complementary feeding practices found statistically significant in the study were illiteracy or primary education of mothers, younger age of fathers, nuclear families, no advice on complementary feeding from healthcare workers, and use of bottles for feeding. The association of complementary feeding practices and the anthropometric status of study children was not found statistically significant in the present study.

Table 3: Results of logistic regression analysis (Dependent variable—Complementary feeding score; Reference category: Score >5)

CF score (≤5)	*B*	Std. error	Wald	df	Sig.	Exp (*B*)	95% Confidence interval for exp (*B*)	
							Lower bound	Upper bound
Intercept	0.074	0.575	0.017	1	0.897			
Maternal education*	1.126	0.434	6.717	1	0.010	3.083	1.316	7.222
Father's age**	1.157	0.522	4.916	1	0.027	3.181	1.144	8.847
Father's education*	0.447	0.614	0.531	1	0.466	1.564	0.470	5.208
No antenatal counselling on childcare	0.374	0.389	0.923	1	0.337	1.453	0.678	3.114
Birth order ≤2	-0.272	0.448	0.368	1	0.544	0.762	0.316	1.834
No history of repeated illness	-0.390	0.366	1.131	1	0.287	0.677	0.330	1.389
No advice on complementary feeding	0.829	0.393	4.457	1	0.035	2.292	1.061	4.951

*Illiterate/Primary education; **Father's

Table 4: Distribution of complementary feeding indicators and anthropometry of study children

Complementary feeding indicator	Anthropometry		Total (%)	Odd's ratio (Confidence interval) *P*
	Malnourished* (%)	Normal** (%)		
Initiation of complementary feeding at 6 months				
Early/Delayed[#]	85 (65.9)	44 (34.1)	129 (51.6)	1.226 (0.730–2.06)
Timely[##]	74 (61.2)	47 (38.8)	121 (48.4)	(*P*=0.511)
Continued breastfeeding till date				
No[#]	27 (61.4)	17 (38.6)	44 (17.6)	0.891 (0.456–1.77)
Yes[##]	132 (64.1)	74 (35.9)	206 (82.4)	*P*=0.734
Age appropriate amount				
Less[#]	94 (65.7)	49 (34.3)	143 (57.2)	1.238 (0.735–2.087)
Optimum[##]	65 (60.7)	42 (39.3)	107 (42.8)	*P*=0.429
Age appropriate minimum meal frequency				
Less[#]	96 (65.3)	51 (34.7)	147 (58.8)	1.194 (0.706–2.017)
Adequate[##]	63 (61.2)	40 (38.8)	103 (41.2)	*P*=0.508
Food consistency				
Inappropriate[#]	38 (69.1)	17 (30.9)	55 (22.0)	1.365 (0.724–2.642)
Appropriate[##]	121 (62.1)	74 (37.9)	195 (78.0)	*P*=0.348
Continuation of breastfeeding and timely initiation of CF				
No[#]	110 (65.1)	59 (34.9)	169 (67.6)	1.217 (0.700–2.103)
Yes[##]	49 (60.5)	32 (39.5)	81 (32.4)	*P*=0.482

[#]Exposure (+); [##] Exposure (-); *Disease (+); **Disease (-)

Conflicts of interest

There are no conflicts of interest.

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