



## Study of complementary feeding practices among mothers of children aged six months to two years – A study from coastal south India

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### RESEARCH

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### Abstract

#### Background

Infants and young children are at an increased risk of malnutrition from six months of age onwards, when breast milk alone is no longer sufficient to meet all their nutritional requirements and complementary feeding should be started. Hence this study was undertaken to assess the practices of complementary feeding.

#### Method

This hospital-based cross-sectional study was conducted at two private hospitals – Dr TMA Pai Hospital Udupi and Dr TMA Pai Hospital Karkala and a public hospital, Regional Advanced Paediatric Care Centre, Mangalore, of coastal south India for a two-month period from August 2010 to October 2010. Two-hundred mothers of children between six months and two years attending the paediatric outpatient departments of the above-mentioned hospitals for growth monitoring, immunisation and minor illnesses such as upper respiratory tract infections were selected for the study. The subjects were selected for the study by the order of their arrival to the outpatient department during the study period.

#### Results

In the present study 77.5% mothers had started complementary feeding at the recommended time of six months. Only 32% of mothers were giving an adequate

quantity of complementary feeds. The association of initiation of complementary feeding with socio-economic status, birth order, place of delivery and maternal education was found to be statistically significant. However the practice of giving an adequate quantity of complementary feeds was significantly associated only with the place of delivery.

#### Conclusion

In the present study, initiation of complementary feeding at the recommended time of six months was seen in the majority of children. However the quantity of complementary feeding was insufficient. Advice about breast feeding and complementary feeding during antenatal check-ups and postnatal visits might improve feeding practices.

#### Key Words

Complementary feeding, children, coastal south India

#### Background

An appropriate diet is critical in the growth and development of children especially in the first two years of life.<sup>1</sup> The World Health Organization (WHO) recommends exclusive breast feeding for the first six months of life, with the addition of complementary feeds at six months with continued breast feeds until at least the age of two.<sup>2,3</sup> Infants and young children are at an increased risk of malnutrition from six months of age onwards, when breast milk alone is no longer sufficient to meet all their nutritional requirements and complementary feeding should be started. Initiating complementary feeds too early or too late can lead to malnutrition.<sup>1</sup> The early introduction of complementary feeds before the age of six months can lead to displacement of breast milk and increased risk of infections such as diarrhoea, which further contributes to weight loss and malnutrition.<sup>4</sup> Besides this, it is thought that babies are also not physiologically ready to receive complementary feeds under six months due to immaturity of the gastrointestinal and neurodevelopmental systems and the kidneys. Studies have demonstrated that early introduction of complementary feeds does not result in improved growth velocities or food acceptance.<sup>5</sup>

Complementary feeding, if not done properly, can be followed by diarrhoea and months of growth retardation leading to kwashiorkor, marasmus and immunodeficiency



marked by recurrent and persistent infections which may be fatal.<sup>3</sup> Inadequate food/nutrient intake is the major factor for malnutrition. Poor nutrition leads to underweight infants and stunting.<sup>6</sup> Proper breast feeding and complementary feeding practices can prevent under five mortality by 19%.<sup>7</sup> Appropriate complementary feeding depends on accurate information and skilled support from the family, community and healthcare system. Inadequate knowledge about appropriate food and feeding practices is often a greater determinant of malnutrition than the lack of food. Knowledge of mothers about these factors will be of help in planning interventions to improve feeding practices. It has been shown in many studies that mothers in India are unable to start complementary feeding at the right time.<sup>1,8</sup> As there is a paucity of literature on the complementary feeding practices in this region, the present study was undertaken to find out the practices of complementary feeding among the children aged six months to two years. The result of this study would help in educating and counselling the prospective mothers about complementary feeding.

## Method

This hospital-based cross-sectional study was conducted at two private hospitals – Dr TMA Pai Hospital Udupi and Dr TMA Pai Hospital Karkala and a public hospital, Regional Advanced Paediatric Care Centre, Mangalore. The hospitals are located in Udupi and Dakshina Kannada district, Karnataka State of coastal south India. The study was undertaken over a two-month period from August 2010 to October 2010. Inclusion criteria for the study were the mothers of children between six months and two years attending paediatric outpatient departments of the above-mentioned hospitals for growth monitoring, immunisation and minor illnesses such as upper respiratory tract infections. All the children with known reason for failure to thrive were excluded. The age group of study subjects was selected based on WHO recommendation on complementary feeding.<sup>3</sup> The subjects were selected for the study by the order of arrival to the outpatient department during the study period.

Data was collected using a semi-structured questionnaire administered by the authors to the mothers after getting written informed consent. The questionnaire consisted of 36 items. It elicited information about demographic profile, breast feeding, initiation and adequacy of complementary feeding. The questionnaire was pretested and was revised to enhance its clarity and comprehension. Socio-economic status was assessed using modified Kuppuswamy's scale.<sup>9</sup> The variables used in modified Kuppuswamy's socio-economic scale were education and occupation of the respondent and family income per month in rupees. Quantity of food was assessed by showing a standard 150ml katori to get the near exact dietary details of the child.<sup>1</sup> As per WHO recommendations,<sup>3</sup> the following operational definitions were used.

### *Complementary feeding:*

Complementary feeding is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk.

### *Recommended time of initiation of complementary feed:*

Introduce complementary food at six months of age (180 days) while continuing to breastfeed.

### *Amount of complementary food needed:*

Start at six months of age with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breastfeeding. The energy needed from complementary foods for infants of developing countries are approximately 200kcal per day at 6–8 months of age, 300kcal per day at 9–11 months of age, and 550kcal per day at 12–23 months of age.

### *Recommended meal frequency:*

The appropriate number of meals of complementary foods should be provided 2–3 times per day at 6–8 months of age and 3–4 times per day at 9–11 and 12–24 months of age.

Time of initiation of complementary feed by the mother was compared with the recommended time of six months to decide if the feed in the child was early, at recommended times or delayed. Adequacy of the feed was interpreted based on the amount of complementary feed the child received and the meal frequency.

The study protocol was approved by the Institutional Ethics Committee, Kasturba Medical College Mangalore. The data was analyzed using SPSS version 11.5. Statistical test chi square was used to find out the association of various demographic factors with initiation and adequacy of complementary feeding. P value < 0.05 was taken as statistically significant.

## Results

Among the selected 238 mothers, 200 consented to participate in the study giving a response rate of 84%. Some of the reasons provided by the mothers for not participating in the study were lack of time, not interested in revealing details to the interviewer and objections by the family members to participate in the study. Of the 200, the majority of children i.e. 82 (41%) belonged to the 6–12 months age group, 113 (56.5%) were male children and 104 (52%) belonged to a joint family. Most of the mothers i.e. 162 (81%) were homemakers. Table 1 shows the demographic profile of the study population.

**Table 1: Socio-demographic characteristics of study population N=200**

Socio-demographic factors	N (%)
Age of children	
6 months–12 months	82 (41)
12 months–18 months	51 (25.5)
18 months–24 months	67 (33.5)
Gender	
Males	113 (56.5)
Females	87 (43.5)
Family type	
Joint	104 (52)
Nuclear	96 (48)
Mother's education	
a) Illiterate	12(06)
b) Primary school	17(08.5)
c) Middle school	31(15.5)
d) High school	48(24)
e) PUC	42(21)
f) Graduate	48(24)
g) Professionals	2(01)
Mother's occupation	
Housewife	162 (81)
Working	38 (19)
Children in the family	
One	114 (57)
Two	64 (32)
More than two	22 (11)
Socio-economic status	
Upper lower	45 (22.5)
Lower middle	39 (19.5)
Upper middle	105 (52.5)
Upper	11 (5.5)
Institutional delivery	
Yes	197 (98.5)
No	3 (1.5)

In the study population 155 (77.5%) mothers had started complementary feeding at the recommended time and 24 (12%) children had delayed complementary feeding. The most common reason given for the delayed introduction of complementary feed was that mother felt their milk was enough for baby. Only 64 (32%) mothers practiced the adequate quantity of complementary feeds. The majority (82%) mothers had initiated weaning with home-made food. Around 44 (22%) of children were bottle-fed. Ragi, wheat and rice were the most common home-made complementary food used. In the study 162 (81%) mothers were breastfeeding their children at the time of interview. Table 2 shows the details of feeding practices.

**Table 2: Feeding practices adapted by mothers**

Practices	N (%)
Time of starting complementary feeding (n=200)	
< 6 months	21(10.5)
At 6 months	155 (77.5)
> 6 months	24 (12)
Reasons for delayed complementary feeding (n=24)	
Did not know exactly when to start	3 (13)
Mother feels that her milk is enough for baby	17(71)
Family elders tell not to give before one year	2(8)
Mother feels child may not be able to digest it	1 (4)
Mother did not try as child had no teeth	1 (4)
Giving marketed weaning food (n=200)	
Yes	36 (18)
No	164 (82)
Bottle feeding (n=200)	
Yes	44 (22)
No	156 (78)
Quantity of complementary feeds (n=200)	
Less for age	136 (68)
Appropriate for age	64 (32)
Method of feeding (n=200)	
By making the child sit on lap	151 (75.5)
By making the child sit on chair	24 (12)
Leaving the child to roam around	25 (12.5)
Using boiled water for drinking (n=200)	
Yes	180 (90)
No	20 (10)
Using a separate container for feeding child (n=200)	
Yes	164 (82)
No	36 (18)

Univariate analysis using chi square found that the practice of complementary feeding at the recommended time of six months was significantly associated with socio-economic



status ( $p=0.036$ ), birth order ( $p=0.013$ ), place of delivery (0.033), maternal education ( $p=0.038$ ) but not with gender of the child, maternal age, maternal employment status, type of family and advice about complementary feeding during immunisation (Table 3).

**Table 3: Factors associated with initiation of complementary feeding**

Factors	Initiation of complementary feeding N (%)			P value
	< 6 months	At 6 months	> 6 months	
Mothers age (in years)				0.218
a) $\leq 19$	00 (0)	06 (85.7)	01 (14.3)	
b) 20 – 24	05 (10.2)	37 (75.5)	07 (14.3)	
c) 25 – 29	06 (6.4)	74 (78.7)	14 (14.9)	
d) 30 – 34	08 (21.0)	28 (73.7)	02 (5.3)	
e) $\geq 35$	02 (16.7)	10 (83.3)	00 (0)	
Type of family				0.713
a) Joint	10 (9.6)	83 (79.8)	11 (10.6)	
b) Nuclear	11 (11.5)	72 (75.0)	13 (13.5)	
Education of the mother				0.038
a) Illiterate	02 (16.7)	06 (50)	04 (33.3)	
b) Primary school	04 (23.5)	11 (64.7)	02 (11.8)	
c) Middle school	02 (6.4)	23 (74.2)	06 (19.4)	
d) High school	03 (6.2)	37 (77.1)	08 (16.7)	
e) PUC	07 (16.7)	35 (83.3)	00 (0)	
f) Graduate	03 (6.3)	41 (85.4)	04 (8.3)	
g) Professionals	00 (0)	02 (100)	00 (0)	
Socio economic status				0.036
a) Upper lower	07 (15.6)	29 (64.4)	09 (20.0)	
b) Lower middle	06 (15.4)	27 (69.2)	06 (15.4)	
c) Upper middle	06 (5.7)	92 (87.6)	07 (6.7)	
d) Upper	02 (18.2)	07 (63.6)	02 (18.2)	
Number of children				0.013
a) One	08 (7.0)	93 (81.6)	13 (11.4)	
b) Two	06 (9.4)	50 (78.1)	08 (12.5)	
c) More than two	07 (31.8)	12 (54.6)	03 (13.6)	
Gender of the child				0.988
a) Male	12 (10.6)	87 (77.0)	14 (12.4)	
b) Female	09 (10.3)	68 (78.2)	10 (11.5)	
Place of delivery				0.033
a) Primary health centre	00 (0)	08 (100)	00 (0)	
b) Private hospital	12 (8.6)	115 (82.1)	13 (9.3)	
c) Public hospital	08 (16.3)	30 (61.2)	11 (22.5)	
d) Home	01 (33.3)	02 (66.7)	00 (0)	
Advice about complementary feeding during immunization				0.112
a) Given	10 (7.6)	107 (81.7)	14 (10.7)	
b) Not given	11 (15.9)	48 (69.6)	10 (14.5)	

The practice of giving the adequate quantity of complementary feeds was significantly associated with only the place of delivery ( $p=0.045$ ) and not with any of the above mentioned parameters (Table 4).

**Table 4: Factors associated with adequacy of complementary feeding**

Parameters	Adequate feeds n (%)	P value
Mothers age (in years)		0.782
a) $\leq 19$	01 (14.3)	
b) 20–24	17 (34.7)	
c) 25–29	29 (30.9)	
d) 30–34	12 (31.6)	
e) $\geq 35$	05 (41.7)	
Type of family		0.932
a) Joint	33 (31.7)	
b) Nuclear	31 (32.3)	
Education of the mother		0.706
a) Illiterate	03 (4.7)	
b) Primary school	05 (29.4)	
c) Middle school	10 (32.3)	
d) High school	12 (25.0)	
e) PUC	13 (31.0)	
f) Graduate	20 (41.7)	
g) Professionals	01 (50.0)	
Socio economic status		0.351
a) Upper lower	11 (24.4)	
b) Lower middle	10 (25.6)	
c) Upper middle	39 (37.1)	
d) Upper	04 (36.4)	
Number of children		0.138
a) One	38 (33.3)	
b) Two	23 (35.9)	
c) More than two	03 (13.6)	
Gender of the child		0.785
a) Male	36 (31.9)	
b) Female	28 (32.2)	
Place of delivery		0.045
a) Primary health centre	01 (12.5)	
b) Private hospital	53 (37.9)	
c) Public hospital	10 (20.4)	
d) Home	00 (0)	
Advice about complementary feeding during immunisation		0.326
a) Given	45 (34.4)	
b) Not given	19 (27.5)	

**Discussion**

In the present study 77.5% of mothers had started complementary feeding at the recommended time i.e., at six months. In an interventional study of 35 parents in Delhi only 16.5% of mothers had started complementary feeding at the recommended time, which is less when compared to



the present study.<sup>8</sup> A prospective interview study of 200 parents by Aggarwal et al. showed that only 17.5% of mothers had started complementary feeding at the recommended time.<sup>1</sup> A National Family Health Survey (NFHS 3) for Karnataka State, India showed that 72.5% of children aged 6–9 months were receiving complementary feeds and breast milk.<sup>10</sup>

High rates of initiation of complementary feeds at the recommended time of six months in our study could be related to high female literacy rates and high institutional deliveries in the study population. As this was a hospital-based study a component of selection bias might exist.

In our study, approximately 96% of mothers were literate. The association of literacy and initiation of complementary feeds at the recommended time was statistically significant ( $p=0.038$ ). Literate mothers were starting the complementary feeds at the recommended time compared to illiterate mothers. However the association of the practice of an giving adequate quantity of complementary feeds and literacy was not statistically significant. A prospective interview study of 200 parents from Delhi also showed that knowledge about the correct timing of complementary feeding significantly correlated to maternal education and father's education but knowledge about quantity of complementary feeds was not affected by the educational status of parents.<sup>1</sup>

About 98.5% deliveries were institutional in the present study. This was comparable with the District Level Household and Facility Survey (DLHS3) of Dakshina Kannada and Udupi district where institutional births accounted for 96% and 94.3% respectively but higher than the institutional delivery rate of 66.9% in Karnataka State, India (NFHS 3).<sup>10</sup>

The association of place of delivery and initiation of complementary feeds at the recommended time was statistically significant ( $p=0.033$ ). Higher deliveries in the institution, may lead to better feeding practices. A prospective study of infant feeding practices carried out among children attending the under five clinic at KEM hospital Mumbai, where all were hospital born, showed that initiation of complementary feeds at the recommended time was seen in 95 % children.<sup>13</sup>

About 52.5% of our study population was in the upper middle socio-economic class followed by 22.5% in the upper lower and 19.5% in the lower middle socio-economic class. The association of socio-economic status and initiation of complementary feeds at the recommended time was statistically significant ( $p=0.036$ ). In the upper middle class, 87.5% mothers had started complementary feeding at the recommended time.

In the present study 10% of children were weaned prematurely. Premature weaning is also reported in other studies.<sup>1,14,15</sup> A study from Delhi<sup>1</sup> reported premature weaning in only 5.5% children which is lesser than the

present study. A prospective observational study from Ireland showed that 22.6% of infants were prematurely weaned onto solids at  $\leq 12$  weeks with mothers reporting the maternal grandmother as the principal source of advice on infant feeding.<sup>14</sup> A study from Brazil showed that the median age for the introduction of complementary feeds was four months.<sup>15</sup> In the present study even though the majority had initiated complementary feeding at the recommended time, only 32% of mothers were giving an adequate quantity of complementary feeds which is comparable to a study from Allahabad where 38.7% of children received proper complementary feeding.<sup>16</sup> This necessitates the need to impart proper information on the quantity of complementary feed required by the child. Only the place of delivery had statistically significant association with the practice of giving an adequate quantity of complementary feeds ( $p=0.045$ ).

The majority of children (86%) were breastfed within four hours in the present study whereas in the study done at Allahabad only 55.8% of mothers initiated breastfeeding within six hours of delivery.<sup>16</sup> A study from Mumbai<sup>13</sup> showed that 82.3% of infants were breast-fed within four hours of birth which is comparable to our study. The secondary data analysis of the National Family Health Survey 2005–06, which consisted of a sample size of 20,108 children showed that only 23.5% of mothers had initiated breastfeeding within the first hour after birth and 56.7% of infants aged six to nine months received complementary feeds.<sup>17</sup> The early initiation of breastfeeding in our study could be attributed to a high institutional delivery rate of 98.5% as well as to a higher literacy rate among the mothers. In our study the mothers with a lesser number of children were starting the complementary feed at the recommended time of six months and the association of number of children and the practice of initiation of complementary feeding at the recommended time was statistically significant ( $p=0.013$ ). In the present study 65.5% of children were fully immunised for age as per schedule; 34.5% partially immunised. In our study 66.5% of mothers received advice regarding complementary feeding during immunisation. Six mothers had stopped breastfeeding their children before the age of 12 months. The earliest was at five months and reason was the mother had to go to work. Common reasons for stopping breastfeeding were not enough milk and next pregnancy. Bottle feeding was practiced in 22% children in our study which is more than the 11% seen in the study by Bhonsle et al.<sup>18</sup>

## Conclusion

In the present study, initiation of complementary feeding at the recommended time of six months was seen in the majority of children. However the quantity of complementary feeding was insufficient. Advice about breastfeeding and complementary feeding during antenatal checkups and postnatal visits might improve feeding practices.



## Limitations

The study was hospital-based. Community-based studies are required to represent the values in the general population. The study data was collected on a recall basis hence the study has a component of recall bias. Some of the questions used were not open-ended. With respect to complementary feeding practices the feed consistency was not taken in to consideration which is again a limitation. One more limitation of this study was the timescale over which this study was undertaken.

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## PEER REVIEW

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## CONFLICTS OF INTEREST

None

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