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To Assess The Knowledge of Mothers on Hunger Cues in Infants Less Than 6months Under Different Feeding Methods

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ABSTRACT

Background Mothers' perception of infant hunger cues is a critical content of responsive feeding, which is central to the promotion of early childhood development. However, only a few studies have examined responsive feeding in India, especially lacking the studies on perceptions of infant hunger cues.the aim of this study was to describe the perceptions of infant hunger cues of mothers for infants aged 6 months, and explore the relationship between maternal perceptions of infant hunger cues and different feeding methods.

Methods A cross-sectional study was conducted with a sample of 200 mothers of healthy infants. The study involves mothers filling out a previously tested structured questionnaire, which is provided after getting consent in both English and Tamil. The questionnaire has been pre-validated by our expert team. This study does not involve any other interventions. The aim of this study is to observe the responses from the questionnaire and come to conclusions about mothers' understanding of hunger cues in infants under six months under various nutritional methods. Mothers are recruited from postnatal wards, regular OPD visits , and vaccination OPD visits. The inclusion criteria are as follows: (a) the child must be full-term (≥ 37 weeks); (b) the child's birth weight must be 2000 grams or more; (c) the child must have been exclusively breastfed in the past 24 hours and no other foods (except medications and vitamins) added (for children in the EBF group), or not exclusively breastfed in the past 24 hours (for children in the FF group). The above information was obtained through interviews, and mothers were given sufficient time to reflect on their responses. Exclusions include: (a) children with health problems that could affect feeding abilities (for example, swallowing); (b) mothers or children with severe health problems that could affect the child's growth and/or development and/or include the mother's prenatal and/or postnatal complications; (c) mothers without reading and writing skills.

Results sis revealed that EBF might support mothers to perceive infant hunger cues than FF mothers, with the number of infant hunger cues (OR = 1.70, 95% CI: 1.01–2.85), "hand sucking" (OR = 1.72, 95% CI: 1.04–2.87), "moving head frantically from side to side" (OR = 2.07, 95% CI: 1.19–3.62). The number of infant hunger cues perceived by mothers was also associated with their educational level and family structure.**Conclusion**EBF mothers of 6-month-old infants may be more likely to perceive infant hunger cues than FF mothers. It is necessary to increase the health education about infant hunger and satiety cues to caregivers, especially among mothers with lower education levels, mothers living in nuclear families, and FF mothers.

Keywords: *Infants, Hunger cues, Breastfeeding, Responsive feeding, Mothers*

1. INTRODUCTION

In recent years, responsive feeding has attracted considerable attention due to its significance in promoting infants health [1–6]. Responsive feeding is defined as "the interaction between the child and the caregiver" in a feeding context [1], and is related to on-demand feeding and baby-led feeding [7]. Its definition is similar to Mary Ainsworth's definition of parental sensitivity [8, 9] as a parent's ability to (1) notice child signals, (2) interpret these signals correctly, and (3) respond to these signals promptly and appropriately. Both responsive feeding and parental sensitivity involve the accurate perception of infant cues. Empirical research has confirmed the importance of maternal perceptions of infant hunger cues for promoting healthy child outcomes. Several studies have found that mothers who promptly perceive and respond apropriately to their infant hunger cues reduce the risk of overfeeding, rapid weight gain or malnutrition, and even stunting [4, 10–13].

Maternal perceptions of hunger cues in infancy also may influence whether the infant becomes over- or underweight during infancy and toddlerhood [14]. In addition, raising awareness of these cues with mothers may encourage more responsive and positive mealtime interactions [15, 16]. This facilitates emotional linkage and good attachment relationships between parents and infants, thereby promoting cognitive ability and psycho-behavioral development in infants [3]. Therefore, it is necessary to understand the parents' perception of infant hunger and satiety cues to lay the foundation for achieving responsive feeding. Mothers' perception of infant hunger cues is an essential aspect of achieving responsive feeding [7, 15].

Infant hunger cues include putting their hand in their mouth, increasing physical activity, mouth opening or closing, moving their head frantically from side to side, crying and so on [10, 22–25]. Infants signal hunger through their body movements, facial expressions, and vocalizations [26]. These hunger cues are typically subtle (e.g., putting hand in mouth) in the early stages of hunger and gradually escalate until the cues are perceived and responded to by the mother [25, 27].

Research suggests parental responsiveness to children's hunger and satiety cues is critical for developing healthy eating habits [4, 14].Exploring mothers' perception of early infant hunger cues may provide insight into responsive feeding practices during lactation. The literature has identified various factors that may influence infant hunger cues and parental perception of these hunger cues, including social demography, feeding methods and parenting behavior. Some studies have pointed out maternal perceptions associated with income [31], maternal education level, mother's country of origin, maternal BMI [23], infant age, infant gender [32] and minority ethnicity [33, 34], history of breastfeeding [23], breast milk intake, sleep pattern and feeding.

Parenting experience is associated with maternal age and the number of children [37, 38]. The family structure [39] and daily nursing may also influence parenting practices. Therefore, these factors may be related to the mothers' perception of these hunger cues. Shloim et al. (2015) has shown that breastfeeding mothers of the 2 to 6-month-old infants, compared to FF mothers, can better understand infant hunger cues and provide a more positive feeding experience [36].

Unfortunately, there is still a lack of research in the current Indian literature on maternal perception of infant hunger cues. Few studies have examined mothers' perception of infant hunger cues. It is necessary to investigate the Indian mothers' perception of infant hunger cues, which can encourage mothers to better understand how to perceive infant hunger cues and respond promptly, and may have reference value for other Southeast Asian countries. This study is part of the study of mother-infant interaction under different feeding methods [42, 43]

However, we focused on analyzing perceptions of infant hunger cues by mothers of less than 6-month-old infants in this study. The main goals were as follows: (1) to understand maternal perceptions of hunger cues of infants less than 6months (2) to evaluate the association between feeding methods and maternal perceptions of infant hunger cues. Therefore, we hypothesized that feeding methods and other factors may be related to maternal perceptions of infant hunger cues. This is helpful for child health providers to guide the development of responsive feeding for parents.

2. METHODS*Design and sampling*

A cross-sectional survey approach was used. The study involves mothers filling out a previously tested structured questionnaire, which is provided after getting consent in both English and Tamil.The questionnaire has been pre-validated by our expert team. This study does not involve any other interventions. The aim of this study is to observe the responses from the questionnaire and come to conclusions about mothers' understanding of hunger cues in infants under six months under various nutritional methods. 200 Mothers are recruited from postnatal wards, regular opd visits , and vaccination OPD visits. The inclusion criteria are as follows: (a) the child must be full-term (≥ 37 weeks); (b) the child's birth weight must be 2000 grams or more; (c) the child must have been exclusively breastfed in the past 24 hours and no other foods (except medications and vitamins) added (for children in the EBF group), or not exclusively breastfed in the past 24 hours (for children in the FF group). The above information was obtained through interviews, and mothers were given sufficient time to reflect on their responses. Exclusions include: (a) children with health problems that could affect feeding abilities (for example, swallowing); (b) mothers or children with severe health problems that could affect the child's growth and/or development and/or include the mother's prenatal and/or postnatal complications; (c) mothers without reading and writing

skills.

PLACE OF STUDY: Chettinad Hospital and Research Institute

Period of study:April to July 2024

STUDY OUTCOME:

To assess the mothers perception on feeding cues under different nutritional methods.

ETHICAL CONSIDERATION:

Mothers will be enrolled after getting consent. Questionaire given will be in an simple and understandable language

Statistical analysis Sociodemographic characteristics, daily nursing variables, and maternal perceptions of infant hunger cues in EBF and FF groups were described by frequencies and percentages. In univariate analysis, bivariate associations between the feeding methods and the maternal perceptions of infant hunger cues, including maternal perceptions of the number of infant hunger cues, and early, active, late hunger cues, were evaluated using the chi-square test. Logistic regression was used to examine the association between maternal perceptions to infant hunger cues and the sociodemographic variables, daily nursing variables, feeding methods measures in multivariate analysis. This regression employed four models, in which the dependent variables included the number of perceived hunger cues (Model A), hand sucking (Model B), moving head frantically from side to side (Model C), and crying (Model D), respectively. And nine multi-categorical variables, including infant's birth weight, maternal age, father's age, maternal education level, father's education level, family structure, location, feeding interval, and feeding duration, were transformed into dummy variables in logistic analysis. Odds ratios (ORs) were presented as results for both bivariate associations and logistic regression model. All of the data preparation and statistical analyses were performed using the SPSS for Windows software program (version 25.0).

3. RESULTS

Demographic characteristics & daily nursing related to infant hunger cues perceptionsThe sample included a total of 200 mother-infants, including 120 in EBF group and 80 in FF group. About the number of hunger cues, 77 (38.34%) perceived 1 hunger cue, 63 (31.60%) perceived 2 hunger cues, 40 (19.94%) perceived 3 hunger cues, 18.4 (9.20%) perceived 4 hunger cues, and 2 (0.92%) perceived 5 hunger cues. Three participants marked the "other" option (0.92%, including "Waving hands, reaching tongue, not sleeping"), and zero chose the "not clear" option (0.00%). However, the mothers who selected "other" also all perceived at least one hunger cues that this study involved. The demographic characteristics of the participants were shown in Table 1. The analysis indicated that there were no statistically significant differences in gender, ethnicity, mother's age, mother's education level, family structure, and one-child status between EBF group and FF group (all $p > 0.05$). When the demographic variables of the two groups were compared as stratified by region, only the study subjects in Qingdao had statistical differences in infant's gender and infant's ethnicity.**Table 1 Demographic Characteristics and daily nursing variables of the Participants**

Variable	**Exclusive Breastfeeding (EBF) N (%)**	**Formula Feeding (FF) N (%)**	χ^2	*p*
Demographic Characteristics	120	80		
Infant's Gender			0.51	0.48
Boy	(51.1)102	(55.1) 110		
Girl	(48.9) 98	(44.9) 90		
Mother's Age			1.82	0.40
≤ 24	(8.0) 16	(10.1) 20		
25–35	152(80.9)	(74.6)		
≥36	(11.2) 22	(15.2) 30		

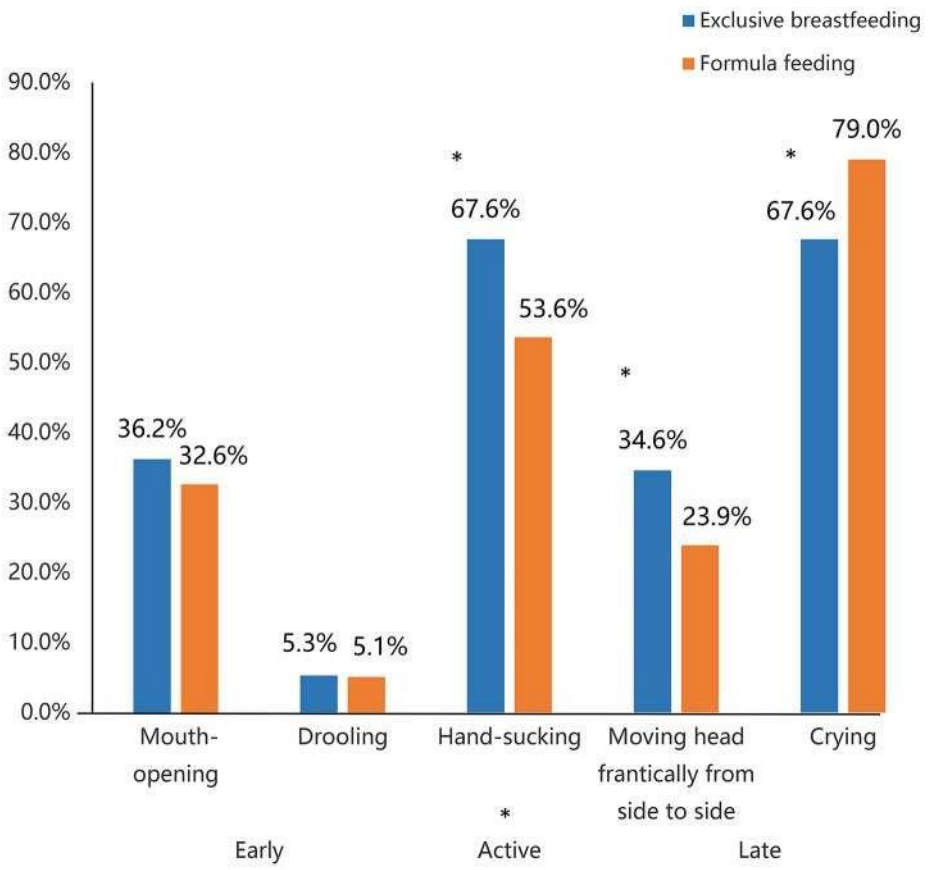
Variable	**Exclusive Breastfeeding (EBF) N (%)**	**Formula Feeding (FF) N (%)**	χ^2	*p*
Mother's Education Level			4.90	0.18
Completed Junior High School or Less	(11.2) 22	(18.8) 38		
Completed Senior High School or Technical Certificate	(17.0) 34	(18.8) 38		
Family Structure			0.59	0.74
Nuclear Family	(38.8) 76	(36.2) 76		
Linear Family	(54.8) 110	(58.7) 116		
One-child Status			0.03	0.87
Yes	(65.1) 130	(65.9) 131		
No	(34.9) 70	(34.1) 69		
Daily Nursing				
Sleeping with Mother			15.15	< 0.01
Yes	(96.8) 194	(84.8) 170		
No	(3.2) 6	(15.2) 30		
Feeding Interval (hour)			17.64	< 0.01
≤ 2	(38.8) 78	(17.4) 35		
3	(49.5) 99	(65.2) 130		
≥ 4	(11.7) 23.4	(17.4) 35		
Feeding Durations (min)			1.65	0.44
≤ 10	(38.8) 78	(40.6) 82		
11–20	(40.4) 81	(44.2) 88		
> 20	(20.7) 41	(15.2) 30		

Table 1 also compared the differences in daily parenting factors that may be related to perceptions of infant hunger cues in the two groups. The proportions of EBF mothers who fed their infants at intervals of no more than 2 h (96.8%, 96.8% & 38.8%, respectively) were higher than that in FF group (86.2%, 84.8% & 17.4%, respectively), and these differences were statistically significant ($p < 0.05$).

Comparison of self-reported maternal perceptions of infant hunger cues between the two feeding method

groups

Overall, mothers in this study chose at least one infant hunger cue, and 61.7% chose two or more infant hunger cues. The percentage of mothers who perceived two or more infant hunger cues in EBF group (66.5%) was higher than in FF group (55.1%), with statistically significant ($p < 0.05$). Figure 1 showed the percentages of mothers who self-reported perceiving five infant hunger cues in the early, active, and late cues in EBF and FF groups. The percentages of mothers who perceived infant hand sucking and moving their head frantically from side to side as hunger cues were higher in the EBF group (67.6% & 34.6%, respectively) than that in FF group (53.6% & 23.9%%, respectively). However, the percentage of mothers in EBF group who perceived infants' crying as a hunger cue (67.6%), was lower than that in FF group (79.0%). The above three differences were statistically significant ($p < 0.05$).



In terms of perceiving hunger cues in different periods, the percentage of mothers in EBF group who could perceive the active hunger cue (67.6%) was higher than in FF group (53.6%; $p < 0.05$). However, the differences in the percentage of EBF and FF mothers who could perceive early hunger cues (37.2% vs. 35.5%) and late hunger cues (79.3% vs. 82.6%) were not statistically significant ($p > 0.05$).

4. DISCUSSION

This study mainly explored the differences in perception of infant hunger cues in Indian mothers with infants less than 6months under different feeding methods. The results of this study provided preliminary evidence for understanding mothers' perceptions of infant hunger cues in the Indian population, which will provide a support to promoting early childhood responsive feeding.We found that the breastfeeding might support mothers to perceive infant hunger cues. This result is consisted with the previous researches [16, 36].

This study further explored the maternal perceptions of infant hunger cues under different feeding methods. As presented in the results, mothers in EBF group and mothers in FF group differed in their perceptions of the number of hunger cues, infant "sucking hands", and "moving their heads frantically from side to side", which supports the notion that mothers' perception of infant hunger cues differs across feeding methods. Mothers in the EBF group perceived more infant hunger cues than mothers in the FF group, proved that breastfeeding may establish mothers' higher levels of sensitivity to infants' needs, especially in the first three months of life [44, 45].

Interestingly, mothers in the breastfeeding group had lower perceptions of infant crying than mothers in FF group as a hunger cue. This may be due to crying is a late hunger cue, and breastfeeding mothers were more in tune with their baby's cues during feeding [36]. It also might be the differences in the locus of control in the feeding [49], that satiating FF is due to volume compared to the frequency of breastfeeding. Breastfed infants may be more satisfied and they may not cry as often because they are in charge of when the meal is initiated [16]. It should be noted that crying is not a specific feeding cue [25], when the infant is abnormally crying, non-starvation should consider treatment.

This study also explored maternal perceptions of infant hunger cues for different stages of feeding. There were high or low perceptions of different hunger cues, and there was still room for improvement in the mothers' perceptions of infant early hunger cues. Hodges et al.(2016) found that, from 3 to 18 months, mouth opening was frequent and predominated at each time point [25]. However, the results of this study showed that the perceptions of infant hunger cues were mainly concentrated in the active and late stages in mothers in the EBF and FF groups, and the perceptions of early hunger cues ("mouth opening" and "drooling") were lower in both groups. It may be because early hunger cues are less intense than in the active and late stages.

we found that maternal education level and family structure were associated with the mother's perception of infant hunger cues, a point that deserves further attention. Gross et al.(2010) similarly found that maternal education level and feeding methods were associated with infant hunger cues perceptions [23]. In our study, mothers with higher education levels and those in multigenerational families were more likely to perceive infant hunger cues, likely because more educated mothers tend to have higher cognitive and health management abilities. They also enjoy more socio-economic advantages, which can help them to obtain health knowledge and services [50–52],

For these reasons, maternal education level may be an especially important factor impacting feeding methods, particularly since most primary caregivers of infants in this study were mothers (92.33%). The direct and indirect roles played by maternal education level should be further explored in future studies. In terms of the impact of family structure (i.e., with grandparents, parents, and children living together) can allow parents to receive childrearing help from grandparents, thereby reducing the stress they face [42].

Parents living in linear family structures may also be able to benefit from the parenting advice and lived experiences of grandparents. For these reasons, linear family structures can allow mothers to focus more time and energy on their children. These factors suggest that child healthcare providers need to provide more targeted and specific guidance to mothers with lower education level, living in nuclear families, and FF to improve their perceptions of infant hunger cues and to promote responsive feeding.

Limitations

This study is the first to explore maternal perceptions of infant hunger cues under different feeding methods in an Indian population, however, there are still some potential limitations. First, this study used self-reported data reflecting maternal perceptions of infant hunger cues, which may be affected by selective reporting or recall bias.

5. CONCLUSION

Mothers who use different feeding methods in India also display different levels of perceptiveness toward infant hunger cues. Exclusively breastfeeding mothers of 6-month-old infants are more likely to perceive infant hunger cues than FF mothers in India, and impacts from the mother's educational level and family structure are also observed. It is necessary to increase the health education of infant hunger and satiety cues to caregivers in Indian population, especially among less educated mothers, mothers living in nuclear families, and FF mothers. Targeted education interventions can improve the perception of infant hunger cues by these caregivers and may contribute to the promotion of responsive feeding practices.

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