

# Breastfeeding pattern and its relationship with weight gain in children older than 6 months

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## ABSTRACT

**Introduction:** According to the World Health Organization (WHO), breastfeeding is the best way to feed infants. Adoption of some inappropriate nutritional patterns along with breast milk, especially in infants older than 6 months, may lead to a delay in the child's growth. Therefore, the present study was conducted to investigate the relationship between breastfeeding and weight gain in children aged 6-24 months. **Materials and Methods:** This case-control study was conducted on 120 infants aged 6-24 months and their mothers recruited from health centers of Ahvaz, southwest of Iran. The data collection tool in the present study included a questionnaire to record demographic information and information in the child's medical records in health centers. Statistical analysis of the data was done by SPSS 23 using the Chi-square test and *t*-test. **Results:** No significant difference was observed between the control and case groups in terms of the infant's age ( $P = 0.741$ ) and gender ( $P = 0.564$ ) and the mothers' age ( $P = 0.614$ ), her educational attainment ( $P = 0.389$ ), and socioeconomic status of the infant's family ( $P = 0.563$ ). The type of delivery ( $P = 0.650$ ), mothers' opinion ( $P = 0.133$ ), and the interval between breastfeeding and complementary feeding ( $P = 0.144$ ) had no significant relationship with the infant's growth disorder. On the other hand, duration of breastfeeding per meal ( $P = 0.007$ ) and frequent breastfeeding (dependency on the mother's breast) ( $P = 0.049$ ) had a significant relationship with children's developmental disorders. **Conclusion:** According to the results of the present study, growth disorders in infants in the case group could be attributed to their mothers' inappropriate breastfeeding patterns.

**Keywords:** Breastfeeding, breastfeeding pattern, frequent breastfeeding, infants aged 6-24 months

## Introduction

During the first 6 months of an infant's life, breast milk is the first and only food source that meets all the infant's nutritional needs.<sup>[1]</sup> Breast milk contains a variety of bioactive agents that not only improve the function of the digestive and immune systems but are also involved in brain development and reducing infant

infections. The World Health Organization (WHO) recommends that infants should be fed exclusively with breast milk in the first 6 months of life since it is the best nutrition to promote optimal growth in early infancy.<sup>[2-6]</sup> Also, the American Academy of Pediatrics (AAP) recommends that after the first 6 months of an infant's life, breastfeeding along with complementary feeding should continue for 2 years or more.<sup>[3,7]</sup> The results of previous studies have shown that infants older than 6 months who are fed with breast milk but who do not receive enough supplementary nutrition, are more exposed to the risk of malnutrition due to the increased nutritional needs of the child. This problem is associated with a negative impact on the growth of the infant.<sup>[3]</sup> The reasons for children not receiving supplementary nutrition

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include clinical problems in infants, economic problems, insufficient knowledge of parents, traditional norms, and the child's lack of appetite due to the adoption of improper nutritional patterns.<sup>[3,8]</sup>

Nutritional patterns and breastfeeding behaviors depend largely on the complex interaction between the mother and infant, and on a number of other influencing factors. Currently, there is no prescriptive pattern for infant feeding, and the current feeding recommendations for infants older than 6 months are based on demand.<sup>[9]</sup> Breastfeeding mothers should be aware of the changes in the volume of milk in each feeding session, the frequency of feeding, and the distribution of milk received during the day and night by infants.<sup>[10]</sup> Various factors have been proposed in the literature as obstacles to breastfeeding. These include not having enough milk, mother's employment, stress, isolation, fatigue, concern about the child's growth disorder, and time commitment to breastfeeding.<sup>[11]</sup>

The results of different studies have shown that the frequency and duration of feeding, as well as the level of prolactin, affect the production of breast milk.<sup>[12]</sup> Milk production is controlled by the endogenous hormones, prolactin and oxytocin.<sup>[13]</sup> In the first 6 months of breastfeeding, due to the small stature of the infant and the high level of prolactin in the mother's blood, feeding on demand meets the nutritional needs of the infant. However, after the first 6 months of breastfeeding, due to the significant reduction of prolactin in the mother's blood (decrease in the baseline level of prolactin concentration from 119 to 59 g/ $\mu$ L) and the increased infant's nutritional needs, there may be a mismatch between the amount of milk production and the infant's appetite.<sup>[9]</sup> Therefore, it is necessary to pay attention to the frequency of breastfeeding, the time intervals between breastfeeding sessions, and appropriate complementary feeding in infants older than 6 months to ensure the full potential of growth, development, and health of infants.<sup>[7]</sup> In children older than 6 months of age, many factors may lead to growth disorders. However, the relationship between the child's breastfeeding style and the growth disorder of infants older than 6 months has not yet been determined. Therefore, the present study aims to investigate the relationship between breastfeeding and weight gain in children aged 6–24 months.

## Materials and Methods

This case-control study was approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences. It was conducted on 120 infants older than 6 months and their mothers recruited from health centers in Ahvaz, southwest of Iran. The inclusion criteria included: (1) mother's willingness to participate in the study, (2) children aged between 6 and 24 months of age, and (3) children having no underlying diseases. Exclusion criteria were failure to complete the questionnaire and unwillingness to continue participation. The convenience sampling method was used to select the participants. After sampling was done, infants with normal growth were included in the control group ( $N = 60$ ),

whereas infants having delayed growth were included in the case group ( $N = 60$ ). The infants' parents were briefed on the objectives of the study and were assured that their information would remain confidential and that they could withdraw from the study at any time. Informed consent was obtained from the parents to participate in the study.

The data collection tools in the present study included a questionnaire to record demographic information and the medical records available in health centers. The demographic questionnaire included variables such as the infant's age, the number of hours the child sleeps, the mother's opinion regarding breastfeeding cessation for the better development of the child, the number of times the child wakes up to feed at night, the duration of breastfeeding per meal, and frequent breastfeeding. Also, information such as the child's delayed weight growth and the type of delivery were extracted from the child's medical record. Quantitative variables were reported as mean and standard deviation (SD), and qualitative variables were represented in number (percentage). The Chi-square test was used to check the relationship between qualitative variables, and to compare the mean of quantitative variables between the two groups *t*-test was used. A logistic regression test was used to investigate the relationship between factors related to growth failure. Statistical analysis of data was done by SPSS version 23. The significance level was set at 0.05.

## Results

The samples in this research included 120 infants in the age range of 6–24 months. The average age of the infants in the control and case groups was  $12.98 \pm 5.16$  and  $12.59 \pm 4.89$  months, respectively. No statistically significant difference ( $P = 0.741$ ) was observed between the case and control groups in terms of the children's age. Nor was there any statistically significant difference between the two groups in terms of the child's gender ( $P = 0.564$ ), mother's age ( $P = 0.614$ ), mother's educational attainment ( $P = 0.389$ ), and the *socioeconomic* status of the child's family ( $P = 0.563$ ) [Table 1].

Based on the results, 45 and 48.33% of the children in the control and case groups had been born through cesarean section, respectively. The results showed that there was no significant relationship between growth disorder (case group) and type of delivery ( $P = 0.650$ ). Also, 85 and 94% of the mothers of the children in the growth disorder (case) and normal growth (control) groups, respectively, disagreed with the opinion that breastfeeding cessation improves the infant's growth status. According to the results, there was no significant relationship between mothers' opinions and growth disorder ( $P = 0.133$ ). The duration of breastfeeding in each meal was less than 5 min (short duration) in 51.67% of the children in the case group. Also, 28.33 and 13.33% of children in the control and case groups, respectively, had adequate breastfeeding duration (more than 20 min) in each meal. The results of the Chi-square test showed that there was a significant relationship at 1% confidence

level between the duration of breastfeeding in each meal and the children's growth disorder ( $P = 0.007$ ). Also, 33.33 and 38.33% of children in the control and case groups had a short interval (less than one hour) between complementary feeding and breast milk, respectively. Breastfeeding intervals had no significant relationship with complementary feeding and growth disorder ( $P = 0.144$ ). The amount of night sleep in both case and control groups was completely equal. In both groups, 15% of the mothers reported less than 5 h of sleep, 58% between 6 and 8 h, and 27% more than 9 h ( $P = 1.00$ ). Also, 70 and 85% of the infants in the control and case groups, respectively,

woke up more than twice at night to feed, and no significant relationship was observed between the number of waking ups to feed and growth disorder ( $P = 0.407$ ). Frequent breastfeeding was observed in 63.33 and 38.33% of children in the case and control groups, respectively. The results of the Chi-square test showed a significant relationship between growth disorder and frequent breastfeeding in short intervals ( $P = 0.049$ ) [Table 2].

## Discussion

The present study was conducted to investigate the relationship between breastfeeding and developmental disorders in children older than 6 months. The results showed that there is no significant relationship between the case and control groups in terms of the demographic characteristics of the infant, namely gender and age, and the mother's demographic characteristics, namely age, educational attainment, and socioeconomic status. This confirms the homogeneity of the control and case groups and the lack of influence of these characteristics on the research results. These results are in line with those of Lestari *et al.* study<sup>[14]</sup>. In contrast, a study in Indonesia reported a significant relationship between severe growth disorders and low socioeconomic status in children.<sup>[15]</sup> Low-income families are less likely to afford the necessary supplementary nutrition, so it seems that the risk of malnutrition in these children is higher. These conflicting results may be due to different methods of determining the socioeconomic status. Low educational attainment of parents, both the father and mother, may increase the risk of a child's growth disorders, but in our study, there was no relationship between the mother's educational attainment and the infant's growth disorder. Similarly, Nasikhah and Margawati<sup>[16]</sup>

**Table 1: The demographic characteristics of the mothers and their infants**

Characteristics	Control group (n=60)	Case group (n=60)	P
Child's gender, n (%)			
Male	28 (46.7)	26 (43.3)	0.564
Female	32 (53.3)	34 (56.7)	
Child's age (mean±SD)	12.98±5.16	12.59±4.89	0.741
Mother's age (mean±SD)	32.3±6.12	31.2±5.22	0.614
Mother's educational attainment, n (%)			
Illiterate	6 (10)	9 (15)	0.389
Primary	20 (33.3)	18 (30)	
High school	19 (31.7)	22 (36.7)	
Diploma	9 (15)	6 (10)	
University	6 (10)	5 (8.3)	
Socioeconomic status, n (%)			
Poor	19 (31.7)	23 (38.3)	0.563
Moderate	27 (45)	28 (46.7)	
Good	14 (23.3)	9 (15)	

SD=Standard deviation

**Table 2: Comparison of children's nutritional characteristics in case and control groups**

Characteristics	Control group (n=60)	Case group (n=60)	P
Type of delivery, n (%)			
Cesarean Delivery	27 (45.00)	29 (48.33)	0.650
Natural childbirth	33 (55.0)	31 (51.67)	
Mother's opinion, n (%)			
Agree	4 (6.67)	9 (15.00)	0.133
Disagree	56 (93.33)	51 (85.00)	
Breastfeeding duration, n (%)			
5 min	13 (21.67)	25 (51.67)	0.007
15 min	30 (50.00)	24 (35.00)	
20 min	17 (28.33)	14 (13.33)	
Interval between complementary feeding and breastfeeding, n (%)			
<1 h	20 (33.33)	23 (38.33)	0.144
>1 h	40 (66.67)	37 (61.67)	
Sleeping hours per night, n (%)			
<5 h	9 (15.00)	9 (15.00)	1.00
6–8 h	35 (58.33)	35 (58.33)	
>9 h	16 (26.67)	16 (26.67)	
Number of night waking ups for breastfeeding			
Less than twice	42 (70.00)	51 (85.00)	0.407
More than twice	18 (30.00)	9 (15.00)	
Frequent breastfeeding			
Yes	23 (38.33)	38 (63.33)	0.049
No	37 (61.67)	22 (36.67)	

reported that bivariate and multivariate analyses did not show any statistically significant relationship between growth disorders and the mother's educational attainment.

Choosing the right feeding method as soon as the baby is born plays an important role in the early stages of the child's growth and development and later years of life. An inadequate nutritional approach provides the ground for not gaining proper weight or getting overweight in childhood or later periods of the child's life.<sup>[17]</sup> The main risk period of growth is between the ages of 4 months and 2 years, which can be accompanied by a delay or disturbance in the child's growth phase. Based on this, it is very important that nutritional needs and deficiencies in this period be quickly identified and taken into serious consideration because this can leave irreversible effects on the growth and development of the child.<sup>[18]</sup> Therefore, it is imperative to investigate the effect of breastfeeding on children's growth disorders, especially when children (those older than 6 months) need supplemental nutrition to prevent adverse effects on child growth. In the present study, the results showed that there is a significant relationship between the duration of breastfeeding in each meal and growth disorder. The duration of breastfeeding in each meal was less than 5 min in a high percentage (51.67%) of the children in the case group. In other words, the children in the case group received a much smaller amount of breast milk in each meal than did the children in the control group. On the other hand, 63.33% of the infants in the case group were breastfed frequently in short intervals. The increased frequent breastfeeding in children of the case group may have led to false satiety in these children, which subsequently led to a delay in the introduction of complementary foods into the child's diet.<sup>[19]</sup> In other words, the results of our study show that with the increase of the infants' dependence on the mother's breast, not only do they not receive a large amount of milk, but they also refuse to consume complementary foods, leading to a significant decrease in weight gain.<sup>[3]</sup> The delay in the introduction of supplementary nutrition into the child's diet causes the child never to have a natural appetite for supplementary nutrition. This will lead the child to depend too much on the mother's breast and may also cause chewing problems, both of which may result in developmental disorders in the child. The results of our study are consistent with those of Syeda *et al.*<sup>[19]</sup> and Przyrembel.<sup>[20]</sup>

Although breast milk is high in nutritional value, after the age of 6 months onward, it is not sufficient as an independent meal, and the child should be given supplementary nutrition along with breast milk.<sup>[19]</sup> According to the literature, there are significant differences in the nutritional composition of breast milk and infant formula. In particular, infant formula generally has a higher protein content than breast milk, and protein intake in excess of metabolic needs early in life may stimulate insulin and insulin-like growth factor-1 (IGF-1) secretion, which in turn promotes weight gain.<sup>[21,22]</sup> In the present study, it seems that the short duration of breastfeeding in each meal and the high dependence on the mother's breast in the children of the case group led to not only receiving a low volume of breast milk but also refusing to receive complementary feeding. As a result,

the milk received from the mother by the children of the case group did not have enough calories and nutritional value for their growth, and for this reason, growth disorders were seen in these children compared to the control group.

## Conclusion

Although breastfeeding plays an important role in food security and infant growth, an inappropriate breastfeeding pattern can have the opposite effect by reducing the child's appetite for complementary feeding. In general, the results of the present study revealed that among the variables related to the breastfeeding of children aged 6–24 months, the duration of breastfeeding in each meal and frequent breastfeeding in short intervals (dependence on the mother's breast) are associated with children's growth disorders. According to these results, due to using an improper breastfeeding pattern, mothers who breastfeed their infant in short intervals duration do not let the nutritional needs of the child be met. Frequent breastfeeding in short intervals, on the other hand, can reduce the child's appetite for complementary feeding and make the child reject it. This can have a negative impact on children's development. It seems that keeping a 3-hour gap between breastfeeding meals will be associated with a better acceptance of complementary feeding by the infant. The findings of this research can be used as a practical guide for the health staff to educate mothers to raise these mothers' awareness of the importance of a suitable nutritional pattern and how to use it.

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## Conflicts of interest

There are no conflicts of interest.

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