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The effect of maternal anxiety levels on the transition period to complementary feeding

Ali Osman Koksal [1]*, Aysu Duyan Camurdan [2], Sebnem Soysal Acar [3], Nur Baran Aksakal [4], Bahar Cuhaci Cakir [2]

[1] Ambulatory Pediatric Clinic, Ankara, TÜRKİYE
[2] Department of Social Paediatrics, Faculty of Medicine, Gazi University, Ankara, TÜRKİYE
[3] Department of Paediatrics, Faculty of Medicine, Gazi University, Ankara, TÜRKİYE
[4] Department of Public Health, Faculty of Medicine, Gazi University, Ankara, TÜRKİYE
***Corresponding Author:** koksal6623@gmail.com

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ABSTRACT

Introduction: The aim of this study is to determine whether the anxiety levels of mothers before and after complementary feeding (CF) initiation negatively affect the transition period of infants to CF.

Materials and methods: The study was conducted with 150 mothers and their infants of five months of age who had not yet started CF. Beck's depression inventory, state-trait anxiety inventory, and a questionnaire were administered to mothers. The level of statistical significance was accepted as $p<0.05$ in this study.

Results: In this study, no statistically significant relationship was found between the transition period to CF and maternal anxiety levels ($p>0.05$). The relationship between eating snacks and inadequate weight gain was found significant ($p=0.020$).

Conclusions: In our study, the anxiety levels of the mothers did not increase in the CF period. Although there was no statistically significant, the presence of anxiety in mothers requires a unique approach and support for mothers and their infants.

Keywords: complementary feeding, anxiety, mother, infant

INTRODUCTION

Feeding practice during the first two years of life forms a very important basis for the establishment of a lifelong eating behavior development. In this period, growth and development are very fast, and feeding is the leading factor that affects this process [1]. Insufficient feeding in this period can lead to childhood diseases, emotional and cognitive disorders, irreversible growth retardations, and increase in mortality rates [2].

Breastfeeding is one of the most important factors that contribute to the healthy growth of children [3]. Breastfeeding is recommended for the first six months alone, then with complementary foods until the end of the second year [3, 4]. The complementary feeding (CF) period is considered to be between six-23 months [5]. CF is a significant transition period and the infant, and the mother can develop anxiety and stress in this time. Individuals with high levels of anxiety are easily hurt and become pessimistic. The probability of insufficient nutrition or obesity seems to be higher in the infants of mothers who experience stress and anxiety [6].

Various tests and scales have been developed in order to measure mothers' depression and anxiety levels. Beck's depression inventory (BDI) [7] for measuring depression and state-trait anxiety inventory (STAI) [8] for measuring anxiety are frequently used.

If a relationship is detected between the mother's anxiety level and the growth and development of the infant during the transition to CF, mothers with high anxiety levels can be identified before CF, and it can be a chance for intervention. In this study, we aimed to determine anxiety levels of mothers before and after the start of CF and whether maternal anxiety level had a negative effect on the infant's transition period to CF. In addition, we aimed to identify the factors affecting mothers who had anxiety related to feeding the infant and experienced feeding difficulties.

MATERIALS AND METHODS

The study was conducted prospectively in order to examine anxiety levels of mothers in the transition period to CF with the participation of 150 mothers and their infants who presented to the Well-Child Clinic at Gazi University School of Medicine, between June 2018 to January 2020. After obtaining "consent forms" from families, we started to collect data. Infants with gestational age between 37-41 weeks, without any disease and who had not started CF yet were included in the study. The infant-mother pairs were called in the 5th and 7th month for

follow-up. BDI was applied to the mothers when their infants were five months old to assess their depression status, and those who were determined to have severe depression were excluded from the study, while those with mild and moderate levels of depression were included in the study.

STAI was applied to the mothers two times. The first STAI was conducted when the infants were five months old before the start of CF. The second one was performed at the infant's seventh month following the transition to CF. In order to prevent bias, STAI was applied in another room by the same nurse. The results were evaluated by a pediatric psychologist. Standardized CF recommendations such as verbal and written brochures were given to all mothers included in the study.

STAI was developed by in 1970 [8] and is a 20-item scale consisting of state and trait anxiety questions. Trait and state anxiety levels are evaluated in normal and abnormal individuals. The inventory has two separate scales, each consisting of 20 items:

1. **STAI-I:** It determines how the person feels at a certain moment and under certain conditions. Depending on the severity of the thoughts or behaviors, one of the options 'not at all', 'somewhat', 'a lot' and 'totally' is chosen and answered.
2. **STAI-II:** It determines how the person feels, regardless of the current situation and conditions. According to the frequency of thoughts or behaviors, one of the options 'almost never', 'sometimes', 'very often' and 'almost always' is asked to be answered.

Anxiety levels are evaluated as low and high according to the score. The total value varies between 20-80 points. A high score indicates high anxiety, and a low score indicates low anxiety.

A questionnaire including sociodemographic characteristics was administered to the mothers when their infants were five months old, another questionnaire on measuring feeding time of the infant in detail was applied when their infants were seven months old.

The infants' weight, height and head circumference were measured during monthly follow-up visits. Infants' weights were measured while they were fully naked and with the same infant scales (calibrated).

Cut-off value for anxiety level was determined to be 40, and thus monthly STAI was evaluated [9, 10]. Mothers with STAI-I and STAI-II scores of ≥40 were accepted as significant in terms of anxiety [11, 12].

Analysis

Statistical package for the social sciences (SPSS) for Windows version 22.0 (SPSS Inc. Chicago, IL, USA) software was used. Categorical variables were expressed as number and percentage, while continuous variables were presented as mean (M)±standard deviation (SD) and median (min, max). Consistency of the continuous variables with normal distribution was checked. If the data did not meet normality assumptions, Mann-Whitney U test was used in the comparison between two independent groups, and t test was employed between two independent groups, if the data showed normal distribution. In the comparison of the categorical variables between independent groups, Chi-square test was used. McNemar test was used in the comparison of the categorical variables between dependent groups. In the comparison of two dependent groups, which did not show normal distribution, Wilcoxon signed-rank test was employed.

The factors that were determined to have a significant effect on deficiency in weight gain in the transition period to CF were evaluated through multivariate logistic regression analysis. The adjusted OR values of the effective factors of deficiency in weight gain in the transition period to complementary food were presented with multivariate logistic regression analysis with 95% confidence interval. Statistical significance level was set at $p<0.05$.

Table 1. Anxiety level of mothers (n=150) when infant was five & seven months old

	5th month	7th month	p-value
STAI-I*	34.65±9.2	35.01±8.6	0.567[1]
STAI-II*	39.90±10.7	38.80±8.3	0.149[1]

Note. *M±SD & [1]Wilcoxon signed rank test

RESULTS

Of the 150 infants included in the study, 49.3% (n=74) were girls, and 50.7% (n=76) were boys. According to the results of the BDI applied to the mothers during their presentations in the 5th month in order to evaluate their depression status, 38.7% (n=58) of the mothers included in the study had depressive symptoms. 28.7% (n=43) of the symptoms were mild, and 10.0% were classified as moderate depressive symptoms. Three mothers who were detected to have severe depression were referred to psychiatry for consultation and excluded from the study, while those with mild and moderate levels of depression were included in the study.

While STAI-I total scale mean score of the mothers was 34.65±9.2 and 35.01±8.6 when their infants were five and seven months old, respectively. The increase in the mean STAI-I total score between the two months was not statistically significant (p=0.567). On the other hand, STAI-II total scale mean score of the mothers was 39.90±10.0 and 38.80±8.3 when their infants were five and seven months old, respectively. The difference between the two STAI-II scale mean scores was not statistically significant (p=0.149) (**Table 1**). 33 mothers (22.0%) expressed that they had anxiety about feeding their infants when their infants are five months old.

Among these 33 mothers who had anxiety about feeding their infants in the 5th month, it was found statistically significant that the mothers who had depressive symptoms (n=20) had more anxiety of feeding their infants compared to the mothers who did not have depressive symptoms(n=13) (34.5% vs. 14.1%, p=0.006). No statistically significant relationship was found between the presence of anxiety at the 5th month and the variables of gender, pregnancy planning status, fertilization method, delivery method, first breastfeeding time, the educational level of mother, the mother's employment status, family income, or age of starting CF (p>0.05).

While 26.7% (n=40) of the infants in the 7th month were found to be fed with infant formula, 88.7% (n=133) still continued to be breastfed. 26.7% (n=40) of the infants had started to receive CF before the 6th month. There was no relationship between feeding with infant formula and timing of introduction of CF (p>0.05). When STAI-I was evaluated by months, it was seen that there was anxiety in 52.7% (n=79) of

Table 2. Assessment of anxiety level by months

	Fifth month: n (%) (n=150)	Seventh month: n (%) n=150)	p-value
State anxiety (STAI-I)			
Anxiety	79 (52.7)	80 (53.7)	1.000[1]
No anxiety	71 (47.3)	70 (46.3)	
Trait anxiety (STAI-II)			
Anxiety	76 (50.7)	84 (56.4)	0.185[1]
No anxiety	74 (49.3)	66 (43.6)	

Note. [1]McNemar test

Table 3. The factors that were found to be significant in infants who had feeding difficulties

	Mothers who have feeding difficulties: n=27 (18.0%)	Mothers who have not feeding difficulties: n=123 (82.0%)	p-value
Is s/he willingness to play?			
Yes	19 (27.9)	49 (72.1)	0.008[1]
No	8 (9.8)	74 (90.2)	
Does s/he cry during meal?			
Yes	8 (53.3)	7 (46.7)	0.001[2]
No	19 (14.1)	116 (85.9)	
State of expressing emotions			
Yes	6 (37.5)	10 (62.5)	0.044[2]
No	21 (15.7)	113 (84.3)	

Note. *The column percentage is presented; [1]Continuity correction Chi-square test; & [2]Fisher Exact Test

the mothers in the 5th month and in 53.7%(n:80) of the mothers in the 7th month. According to STAI-II, 50.7% of mothers (n=76) in the 5th month and 56.4%(n=84) of the mothers in the 7th month were found to have anxiety. No statistically significant relationship was found between the transition time to CF and the presence of anxiety in the 5th and 7th months (**Table 2**).

When daily weight gain rates of the infants in the transition period to CF were examined, it was found that 28.7% (n=43) gained weight less than <15 g/day.

It was found statistically significant that mothers of 13.9% (n=16) of infants with a mealtime of <30 minutes had difficulty feeding their infants, while 31.4% (n=11) of those with a mealtime of >30 minutes (p=0.037).

27.9% (n=19) of the infants who were willing to play had difficulty in feeding, and the likelihood of the infants who were willing to play to have feeding difficulty was found to be statistically significant (p=0.008). 53.3% (n=8) of babies crying while eating had difficulty in feeding was found statistically significant (p=0.001). 37.5% (n=6) of the mothers who expressed their feelings about feeding such as worry, anger, rebellion while feeding their infants had difficulty in feeding their infants, 15.8% (n=21) of the mothers who did not express their feelings had difficulties was found statistically significant (p=0.044). Factors that were found to be significant related to the feeding of the infants who had difficulty in feeding (7th month) are presented in **Table 3**.

Factors that were effective on weight gain in the infants between 5-7 months were also evaluated (**Table 4**). It was determined that 36.5% (n=27) of the girls and 21.1% (n=16) of the boys gained insufficient weight (less than 15 g/day). No statistically significant relationship was found between gender, being breastfed, formula feeding with breast milk, time of CF start and insufficient weight gain(p=0.056, 1.000, 0.064, and 0.470, respectively).

Table 4. Factors affecting weight gain between 5-7 months

	Adequate weight gain (15 gr/day & more): n=107 (71.3%)	Inadequate weight gain (less than 15 gr/day): n=43 (28.7%)	p-value
Gender: n (%)*			
Male	60 (78.9)	16 (21.1)	0.056[1]
Female	47 (63.5)	27 (36.5)	
Mother's education level			
Primary-secondary school	12 (54.5)	10 (45.5)	0.103[1]
High school-university	95 (74.2)	33 (25.8)	
Continue breastfeeding			
Yes	94 (70.7)	39 (29.3)	1.000[2]
No	12 (75.0)	4 (25.0)	
Formula intake status			
Yes	32 (84.2)	6 (15.8)	0.064[1]
No	74 (66.7)	37 (33.3)	
Complementary feeding initiation time			
<Six months	30 (76.9)	9 (23.1)	0.470[1]
≥Six months	76 (69.1)	34 (30.9)	
Estimated meal duration			
<30 minutes	86 (75.4)	28 (24.6)	0.061[1]
≥30 minutes	20 (57.1)	15 (42.9)	
Any signs of hunger?			
Yes	97 (70.8)	40 (29.2)	1.000[2]
No	9 (75.0)	3 (25.0)	
Willingness to play?			
Yes	43 (63.2)	25 (36.8)	0.077[1]
No	63 (77.8)	18 (22.8)	
Does she/he cry during meal?			
Yes	6 (42.9)	8 (57.1)	0.026[2]
No	100 (74.1)	35 (25.9)	
Does she/he sit at table with family?			
Yes	97 (74.0)	34 (26.0)	0.067[1]
No	9 (50.0)	9 (50.0)	
State of expressing emotions			
Yes	14 (87.5)	2 (12.5)	0.154[2]
No	92 (69.2)	41 (30.8)	
Giving snacks between meals			
Yes	45 (61.6)	28 (38.4)	0.020[1]
No	61 (80.3)	15 (19.7)	

Note. *The column percentage is presented; [1]Continuity correction Chi-square test; & [2]Fisher Exact Test

It was determined that 38.4% (n=28) of the infants who were given snacks between meals gained insufficient weight, while 19.7% (n=15) of the infants who were not given snacks between meals gained insufficient weight. The correlation between snacking between meals and insufficient weight gain was found statistically significant (p=0.020).

Factors potentially related with insufficient weight gain in the transition period to CF (p<0.20) were evaluated in terms of model fit for multivariate logistic regression analysis.

As a result of the model created with backward LR method, the variables "gender, mother's educational status, infant formula intake, meal duration, willing to play, crying while eating, sitting at the table, and feeding snacks between meals" were included in the model. Multivariate logistic regression analysis results and adjusted OR values of the factors effective on insufficient weight gain in the transition period to CF are presented in **Table 5**.

As a result of the multivariate logistic regression analysis, it was seen that the gender of girl (p=0.039) and giving snacks

Table 5. Factors associated with low weight gain during the transition to CF

	Multivariate logistic regression model	
	Adjusted OR (95% confidence interval)	**p-value**
Gender (ref: Boy)	2.5 (1.0-5.7)	0.039
Mother's education level (ref: High school/university)	2.0 (0.7-5.8)	0.192
Formula (ref: Not use)	0.2 (0.1-0.7)	0.010
Mealtime (ref: <30 minutes)	2.4 (0.9-5.9)	0.061
Willing to play	1.3 (0.5-3.1)	0.593
Crying during mealtime (ref: Not crying)	3.0 (0.7-11.7)	0.122
Sitting to dinner table (ref: Sitting)	3.1 (0.9-10.1)	0.056
Giving snacks between meals (ref: Not giving)	2.8 (1.2-6.7)	0.015

Note. *The logistic regression model was created with the backward LR method & Adjusted OR: Adjusted relative risk

between meals (p=0.015) were risk factors effective on insufficient weight gain in the transition period to CF. Intake formula was found to be statistically significant (p=0.010).

DISCUSSION

In this study in which the effect of maternal anxiety levels on the transition period to CF who had five-month-old infants and who did not start CF yet were evaluated and no statistically significant relationship was found between the transition period to CF and maternal anxiety levels. However, 22.0% of the mothers expressed that they had feeding related anxiety before and after the start of CF and had difficulty in feeding their infants (resistance to supplementary food, lack of appetite, difficulty with different tastes, nausea-vomiting, feeder preference, etc.). It was also found statistically significant that the mothers who were anxious about feeding their infants also experienced difficulties in feeding their infants. It was determined that the mothers who prolonged mealtime duration, whose infants were willing to play, whose infants cried while eating, and who expressed emotions about feeding while feeding their infants such as worry, anger, and rebellion had more difficulties.

In studies conducted, it has been stated that feeding anxiety can decrease the mother's breastfeeding confidence as well as decreasing the duration of breastfeeding [12, 13]. In a study conducted in Norway [14], similarly to our study, no relationship was found between the mother's anxiety and depression symptoms and the transition period to CF. However, there are studies in the literature, which state that there exists a strong relationship between anxiety and depressive symptom presence [15, 16].

In our study, mostly mild depressive symptoms were determined in one third of mothers. There was no significant relationship was found between depressive symptoms and the mothers' feeding anxiety levels. However, the presence of depressive symptoms in most of the mothers with feeding anxiety supports the positive relationship between anxiety and depressive symptoms. In the present study, almost 1/3 of the infants gained insufficient weight in the transition period to CF (<15 g/day). Insufficient weight gain was 2.5 times higher in girls and 2.8 times higher in the infants fed with snacks between meals. It was also determined that use of infant formula was associated with weight gain. There are studies stating that girl gender had higher risks related to nutritional problems in infancy, early childhood and adolescents and that it adversely affects weight gain [17, 18]. In another study, it was reported that gender had no effect on weight gain [19]. Growth and development process may follow different courses in girls and boys. It is important to restrict snack intake between meals so that the infant becomes hungry enough at the mealtime. Families give snacks to their children who are choosy about food and display loss of appetite for foods for fear that they will suffer from hunger. This situation, which turns into a vicious cycle, can create a risk for insufficient weight gain. In a study conducted, it was shown that 37% of the 6-8-month-old infants and 72.0% of 9-11-month-old infants consumed unhealthy snacks at least once a day [20].

In studies conducted, no relationship was found between gender, mode of delivery, planned pregnancy and weight gain [19], while it was determined that the mother's educational status and income level affected weight gain [19, 21]. In this study, although no correlation was found between the mother's educational status and the infant's weight gain, the educational levels of most of the mothers whose infants gained sufficient weight were high.

Significantly higher frequency of insufficient weight gain in children whose mothers had high levels of anxiety [22] and the increase in feeding problems in children in relation to this situation suggested that the mother's anxiety level is associated with the duration and severity of the child's refusing to eat. In the study [23], a relationship was found between the insufficient weight gain in the first two years of the infants and the mothers' depressive symptoms. In another study [24], a correlation was found between the decrease in the infant's weight gain and the mother's depressive symptoms, but it was stated that this correlation was temporary. In similar studies to the present study in which 929 mothers were included in Germany and 595 mothers were included in Brazil, no significant relationship was found between the presence of the mother's depressive symptoms and the infant's weight gain [25, 26].

In our study, insufficient weight gain in the infants who cried during the mealtime was found statistically significant. The fact that most of the infants who had feeding problems also had crying problems determined in another study supports the results of our study [17]. The crying of the infants during the meal who also have feeding problems can disrupt the communication between the mother and the infant, and as it leads to earlier termination of feeding by the mother, it can negatively affect weight gain.

In a study in which STAI was used, the mothers' anxiety levels were found to be higher in the first pregnancy and after cesarean section(C/S) [10]. In our study, no significant relationship was found between the method of delivery vaginal delivery and C/S and number of pregnancies and the mothers' anxiety levels. The fact that the preliminary evaluations were made in the 5th month may have led to the determination of normal anxiety levels in the present study, as it was a long time

since the mothers' experience related to childbirth. The level of anxiety in first pregnancies may be related to the society, where the mothers live. Considering the high rate of assistance and guidance provided to the mothers who give birth by the family members in our society, the level of anxiety can be found to be low, even in the first pregnancy. Besides, the mothers and the infants included in the present study were regularly followed up in well-child clinic, and they were provided with guidance related to their anxieties. Continuous follow-up may have been effective on lower levels of anxiety in the mothers.

Although no significant relationship was determined in our study between the mothers' feeding anxiety and their educational levels, most of the mothers with feeding anxiety had a high level of education. It can be thought that the different commentaries obtained from different sources especially virtual environment that mothers with higher education levels may increase their anxiety levels. There are different studies in the literature with different results. While similar results to our study were found in some of these studies [10, 27], it was found that the mothers with severe levels of feeding anxiety had higher educational levels [28]. In addition, there are studies, which determined that as the mother's level of education decreased, her anxiety level increased [29].

Starting time of CF has been determined in various studies. In a study conducted in Italy [30], 34% of the infants started to get CF in the 4th month and before and were found to be 13.4% in a study conducted in Ethiopia [31] and 10.8% in a study conducted in Turkey [32], while in other studies, 25.6% [33] and 36.3% [34] of the infants started to get CF before six months. In the present study, it was found that 26.7% of the mothers started CF before the 6th month. The results of our study are similar to those in the literature. It should also be noted that the time of starting CF in infants is affected by various factors such as the mother's educational level, the mother's age, how many children she has, employment status, and socioeconomic level of the family.

Training is an effective and low-cost method for correcting mothers' wrong information and applications related to CF [35]. Studies show a significant increase in the knowledge levels of mothers following training [36]. A comprehensive CF training to be provided to families in order to reduce or eliminate anxiety, wrong attitudes and thoughts that may be formed before starting CF may contribute to increasing mothers' knowledge levels and reducing their anxiety. In the pediatrics clinic, where the study was conducted, a printed guide for CF is provided to all infants followed up and the family is verbally informed about CF at the 6th month follow-up. Most follow-up protocols include a 9th month follow-up after the 6th month follow-up. However, as it was observed that giving a long break after the CF recommendations made at the 6th month would increase mothers' anxiety and there may be some mistakes due to the influence of social media use instead of evidence-based recommendations, an additional follow-up was placed between the 6th and 9th month follow-ups. The main purpose of this additional follow-up is to determine how CF process is progressing and to alleviate mothers' anxiety. One reason for relatively low anxiety levels of mothers in CF period in the present study could be this close follow-up and support provided.

In our study, the prolonging of meal durations by mothers who had difficulty in feeding their infants was found to be significant. Mothers' prolonging the meal duration for the fear that their infant would not be full due to their current feeding anxiety can be a psychological self-relief method for them. However, prolonged meal duration could also increase tension both for the infant and the mother [37]. There are no studies conducted in the literature, which examined the relationship between meal duration and feeding difficulty.

Half of the infants included in the study who cried while eating were forced by their mothers to eat. Mothers' adopting a coercive attitude thinking that their infant who kept crying was not satiated can create a vicious cycle and increase crying more. This situation may lead to disorders in both the infant's and the mother's psychological conditions. Moreover, mothers who cannot interpret their infant's emotions and do not perceive the responses (hunger-satiety) from the infant correctly can feed their infants excessively or less than required.

In the present study, difficulty in feeding the infants who were willing to play was found to be significant. In studies conducted, it was stated that some mothers used feeding while playing as a method when their children did not want to eat [21]. Infants may prefer playing overeating as playing attracts them more. Infants who do not respond to their parents, who cannot get any response from their parents, or who do not respond to their parents' efforts can experience problems in feeding or play times. Thus, they may not be able to distinguish between feeding time and play time. As a result, feeding can turn into a torture for the infant at times, and it can become a kind of play at some other times.

37.5% of the mothers included in the present study who expressed their emotions of worry, anger and rebellion while feeding their infants experienced difficulty with feeding their infants. It was found statistically significant that the mothers who expressed their emotions while feeding their infants experienced more difficulties in feeding their infants. The mother's character is one of the influential factors in the development of feeding problems in the infant in early infancy period. In studies conducted, it was reported that the mother's negative mood was associated with the selective eating behavior in the child [38]. The threats perceived by the infant and physical and emotional abuse during feeding can lead to anxiety and fear. Struggles and conflicts experienced while feeding can cause problems in the communication between the infant and the mother. An inverse correlation was found between the conflict between mother-infant and the infant's weight gain [39]. In the present study, it was determined that 25.0% of the mothers who insisted on their infants' eating experienced difficulty in feeding their infants, while 15.7% who did not insist experienced difficulties. In a study [28], it was found that mothers with severe anxiety of feeding had difficulties in feeding their infants and they tried to get their infants to eat more than required.

The limitations of the study are that the study was conducted in a single center and that the feeding problem in infants was questioned only based on the opinion of the mother.

CONCLUSIONS

The contribution of CF period is important in laying the ground for the infant's healthy growth and development. Nevertheless, there are very few prospective studies in the literature on the problems experienced by mothers in CF period, and to the best of our knowledge, the present study is

the first prospective study in which mothers' anxiety levels in the transition period to CF were examined. The transition period to CF is a new process for both the mother and the infant and therefore, mothers are expected to be anxious, but in the present study, the mothers' anxiety levels were not elevated. This may have stemmed from the standard printed feeding guide provided along with frequent follow-ups and regular child health follow-up visits, which allowed the opportunity to intervene at every step, where difficulty was experienced. Although it was not statistically significant, the presence of anxious mothers requires a special approach to mother-infant pairs and support. It is believed that the results of the present study will contribute to practical applications in CF.

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Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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