

REGULAR ARTICLE

How mothers interact with children with suspected cow's milk allergy symptoms

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ABSTRACT

Aim: To characterize mother-child interaction in children with suspected gastrointestinally manifested cow's milk allergy (GI-CMA) and to explore factors associated with the parentally perceived symptoms.

Methods: We invited a randomly selected group of children with suspected GI-CMA and their mothers to take part in a video recording of them playing together. The mother-child interaction was rated using the Emotional Availability Scales (EAS, 4th edition) and compared with national normative data.

Results: Video recordings were conducted with 24 patients (15 girls and nine boys) with a median age of 10.1 months (range 2.1–20.5 months) undergoing a double-blind, placebo-controlled food challenge for cow's milk allergy. The EAS profile in the challenge negative group (17/24) was significantly different from the normative data. The scores for maternal sensitivity ($p = 0.0049$) and nonintrusiveness ($p = 0.0192$), together with child responsiveness ($p = 0.0053$) and involvement of mother ($p = 0.0085$), were all significantly lower when compared to the normative data. The dimensions of maternal nonhostility and structuring, as well as the scores of the challenge positive group, did not differ from the normative data.

Conclusion: Dysfunctional mother-child emotional interaction was frequent in young children with suspected GI-CMA ruled out by the cow's milk challenge. Appropriate psychological support should be considered.

INTRODUCTION

Infants with excessive crying, fussing and feeding difficulties, as well as those experiencing sleep problems, may be diagnosed with cow's milk allergy (CMA). It may also be diagnosed in the absence of skin manifestations or cow's milk-specific-immunoglobulin E (IgE) (1). CMA usually affects the gastrointestinal tract, causing diarrhoea and/or vomiting. It may also cause colicky crying, but when this is the only symptom, it does not necessarily point to CMA (1, 2). There is evidence that parental suspicion of CMA is two to three times higher than the incidence confirmed by an oral food challenge (3,4), which is the only recommended diagnostic tool in non-IgE-mediated CMA (1). The gold standard is the double-blind, placebo-controlled food

challenge (DBPCFC), which may rule out as many as two-thirds of parental CMA suspicions (5). Thus, parental perceptions of the origin of the child's symptoms may in fact be unfounded, but we still need to identify other factors associated with the child's symptoms. For example, psychological distress is likely to occur in an infant with excessive crying and food-related symptoms, causing undue

Abbreviations

CMA, Cow's milk allergy; DBPCFC, Double-blind placebo-controlled food challenge; EAS, Emotional availability scales; FD, Feeding disorder; GERD, Gastro-oesophageal reflux disease; GI, Gastrointestinal; OFC, Oral food challenge; SPT, Skin prick testing.

Key notes

- Cow's milk allergy can manifest in the gastrointestinal tract with unspecific symptoms, and suspicions based on excessive crying and vomiting are often not confirmed by a food challenge.
- Mothers were filmed playing with 24 children (median age of 10.1 months) undergoing a double-blind, placebo-controlled food challenge for cow's milk.
- The study found that emotional interaction between mothers and challenge negative children was frequently dysfunctional and may require psychological support.

anxiety in parents. This, in turn, may affect the parent–child interaction.

Little is known about the psychology associated with the unspecific GI symptoms suspected of CMA. In general, intolerance of particular foods presenting with gastrointestinal symptoms tends to cause parents more emotional worry and concern than skin and respiratory symptoms. This is reflected in a reduced quality of life. This concern seems to stem from a fear of food allergies, rather than from a history of food reactions (6). One child development study found that 18-month-old infants with non-IgE food allergy had increased scores for internalizing behaviour problems. However, the diagnosis of non-IgE food allergy in that study was not based on a food challenge (7). In a report on feeding disorders, CMA was reported in 43% of organic onset paediatric feeding disorder patients (8). Increased feeding disorder rates have also been found in infants with eosinophilic gastrointestinal diseases and infant gastro-oesophageal reflux disease (GERD) (9,10). Infantile feeding disorder (FD) may be triggered by repetitive vomiting and traumatic feeding, as a result of bottle refusal (11), both of which may occur in GI-manifested CMA. The symptoms that suggest clinically significant infant FD include food refusal, head turning, gagging and vomiting. Vomiting may be present in up to 40% of cases and may be associated with both organic and nonorganic onset FD (8,11). An abnormal pattern of mother–child interaction is present in infant FD, with maternal anxiety as a mediating factor (12). Researchers also found an association with heightened maternal anxiety in feeding disorders related/triggered by GERD (10). When it comes to food allergies, mothers whose children were kept on exclusive elimination diets, despite negative food challenges, said that they did not change their child's diet because of heightened fear of losing control and a reluctance to face new challenges (13). Thus, addressing mother–child emotional interaction and related maternal anxiety may play a significant role in managing patients with GI symptoms suggestive of CMA.

The aim of this study was to evaluate how mothers interacted with infants whose GI symptoms were thought to be caused by (non-IgE) CMA. We hypothesized that this interaction would be affected in the symptomatic infants, possibly displaying similar patterns to those seen in FD (12). This information would help the management of parentally perceived GI symptoms, especially when the cow's milk challenge was negative. We conducted the interaction evaluation using the Emotional Availability Scales (EAS, 4th edition) (14), which has been previously used in infant FD and sleep disturbances (12,15).

SUBJECTS AND METHODS

Study participants

This single-centre, prospective study evaluated 57 infants and children from 0 to 4-years-of-age, who were referred to the Helsinki University Central Hospital Pediatric or Allergy clinics with GI symptoms suggesting CMA between January 2010 and January 2011. Eligible patients were

children who mainly exhibited GI symptoms, including minor rashes or respiratory symptoms, who had no known metabolic or other systemic disease. They had either never been diagnosed with CMA or had been referred for the double-blind, placebo-controlled food challenge (DBPCFC), following previous indecisive oral food challenge (OFC) results. Patients who had positive results for IgE or for skin prick testing (SPT) were not excluded if they exhibited GI-dominant symptoms. All the infants and children were on a cow's milk-free diet for a minimum of 2 weeks before the first appointment. The study participants were all examined and interviewed by one paediatrician (LM-S), who also supervised the DBPCFCs. The patients underwent laboratory testing, including cow's milk-specific IgE (Phadia ImmunoCAP) tests for cow's milk. Parents kept a detailed daily diary of their child's symptoms both before and during the DBPCFC. The DBPCFC protocol and results have already been published (5).

The mothers of 28 (49%) patients were randomly selected and asked to participate in a video recording session where they played freely with their child. The recording was carried out at the outpatient clinic before the DBPCFC was concluded. The random selection was based on predetermined alternate days when the video equipment was available, thus minimizing selection bias. Children were only included in the study if their caregivers signed an informed consent form stating their willingness to participate. This study was approved by the Helsinki University Hospital Ethics Committee (No.317/13/03/03/2009).

Emotional availability assessment

Mother–child dyads were assessed from the video-taped observations of the free play sessions, which lasted 15 to 20 min. The mothers were told to play with their children as they normally would with the following toys: mirror, ball, book, building blocks, doll (with milk bottle) and a wooden baby puzzle. We used the EAS (4th edition, original US version) for this assessment (14). The EAS includes four maternal dimensions (sensitivity, structuring, nonintrusiveness and nonhostility) and two child dimensions (responsiveness to mother and involvement of mother) that are evaluated using a seven-point scale. The same original version was used in the present study patients and in the normative sample.

A trained rater (SS) coded the videotapes. The inter-rater reliability (r) of 10% of the videotapes was checked by two trained raters and ranged from .87 to .90.

Normative sample

The normative sample was derived from a study project aimed at developing psychological methodology for examining the emotional and cognitive growth of young children (16). The children were randomly recruited by nurses working at six, randomly selected well-baby clinics in Helsinki and Turku, two cities in Southern Finland. They invited every third family to participate until they had recruited the required number of families and approximately 90% of the families agreed. Participants were

considered eligible if the infants were born full-term and healthy, and the mothers (mean age 29 years) spoke Finnish and did not abuse substances. A trained clinical psychologist in a study clinic tested the children and conducted the video recordings at the ages of 8 or 12 months (mean age 9.96 months, SD 2.01).

Statistical methods

Ordinal or score variables, such as scores for the EA scales, were compared using the Kruskal–Wallis test between three groups (normative, allergy positive and allergy negative). We used the Mann–Whitney's U test for comparisons between two groups. Categorical variables (demographic data, symptoms) were compared using the Chi-square or Fisher's exact test. The data were analysed using GraphPad Prism Software (San Diego, CA, USA) version 5. All of the tests were two-sided, and the level of significance at $p < 0.05$ was considered significant.

RESULTS

Twenty-four (85%) of the 28 mothers that we initially recruited agreed to participate in the study. The median age of the 19 girls and nine boys was 10.1 months (range 2.1–20.5 months, boys) (Table 1). The symptoms that led to suspicion of CMA are outlined in Table 2. The most common symptoms were excessive crying (79%), loose stools or diarrhoea (58%) and vomiting (29%). Parents reported some form of problematic feeding, such as bottle/

Table 1 Characteristics of children with gastrointestinal symptoms suspected of cow's milk allergy (CMA) undergoing assessment of Emotional Availability and general Finnish population

	All (n = 24)	CMA negative (n = 17)	CMA positive* (n = 7)	Finland in 2010 ⁽²⁶⁾
Age, months (median, range)	10.1 (2.1–20.5)	9.2 (2.6–20.5)	16.4 (5.5–19.8)	
Gender				
Male, n (%)	9 (38)	7 (41)	2 (28)	
Female, n (%)	15 (62)	10 (59)	5 (72)	
Maternal education				
University/ college	12 (50%)	9 (52%)**	3 (43%)	30%**
Maternal age (years) median (range)	32.5 (21–40)	33 (21–40)	32 (29–39)	28.3
Siblings				
Firstborns, n (%)	13 (54)	10 (59)	3 (43)	43.7%

CMA, Cow's milk allergy.

Differences between CMA-negative and CMA-positive groups were not statistically significant.

*Diagnosed with the double-blind, placebo-controlled food challenge.

** $p = 0.0390$ for the χ^2 test between observed and expected proportions.

Table 2 Symptoms and clinical findings associated with the suspicion of cow's milk allergy (CMA) in CMA-negative children and CMA-positive children. (The differences between groups were not statistically significant, $p > 0.05$)

	CMA negative n = 17 (71%)	CMA positive* n = 7 (29%)**
Symptoms		
Excessive crying	14 (83)	5 (71)
Loose stools/diarrhoea	8 (47)	6 (85)
Problematic feeding	8 (47)	3 (42)
Skin rashes	6 (35)	3 (43)
Vomiting/Gastroesophageal reflux	6 (35)	1 (14)
symptoms		
Constipation	3 (17)	1 (14)
Other (e.g. flatulence)	4 (17)	0
Cow's Milk-specific IgE > 0.35 kU/L	0	0
Cow's Milk totally eliminated at 6 month follow-up	0	4 (57)

CMA, cow's milk allergy; DBPCFC double-blind, placebo-controlled food challenge.

*Diagnosed using the DBPCFC.

**95% Confidence Interval for DBPCFC positivity is 14–49%.

breast refusal, age-inappropriate nocturnal feedings, stimulation-demanding feeding, in 11 patients (45%). All the parents reported improvements in their child's symptoms when they were on a cow's milk-free diet. None of the children had detectable levels of cow's milk-specific IgE. Other characteristics are shown in Table 1. The DBPCFC confirmed a CMA-positive diagnosis in seven patients (29%, boys $n = 2$), with a median age of 16.4 months (range 5.5–19.8 months) and a negative diagnosis in 16 patients. During the DBPCFC, six of the CMA-positive patients presented with loose stools and one with vomiting. In one patient, accidental ingestion of dairy products did not cause a recurrence of symptoms, so the DBPCFC was withheld, and the child was classified as CMA negative.

There was a significant difference in the EAS profiles between the study patients and the normative data. CMA status (based on the DBPCFC as discussed above) was significantly associated with the EAS profile. The difference between the 17 CMA-negative patients and the normative data was remarkable, whereas the EAS profiles of the seven CMA-positive patients did not differ from the normative data (Fig. 1). The EAS dimensions for maternal sensitivity (median 4.5 [range 3.5–7] versus the normative median 5.5 points [4.0–7.0], $p = 0.0049$) and nonintrusiveness (6 [4–7] versus .5 [3–7], $p = 0.0192$) were significantly lower in the CMA-negative group compared with the normative values. Also, child responsiveness to the mother (5 [3–6] versus 5 [3–6], $p = 0.0053$) and involvement of the mother (4 [2–6] versus 5 [3–6], $p = 0.0085$) were significantly lower than normal. In all of these categories, the range of EAS points was relatively wide within the DBPCFC-negative group. The total EAS score was not significantly lower than normal. The dimensions for maternal structuring and nonhostility were similar in the study patients to the normative data.

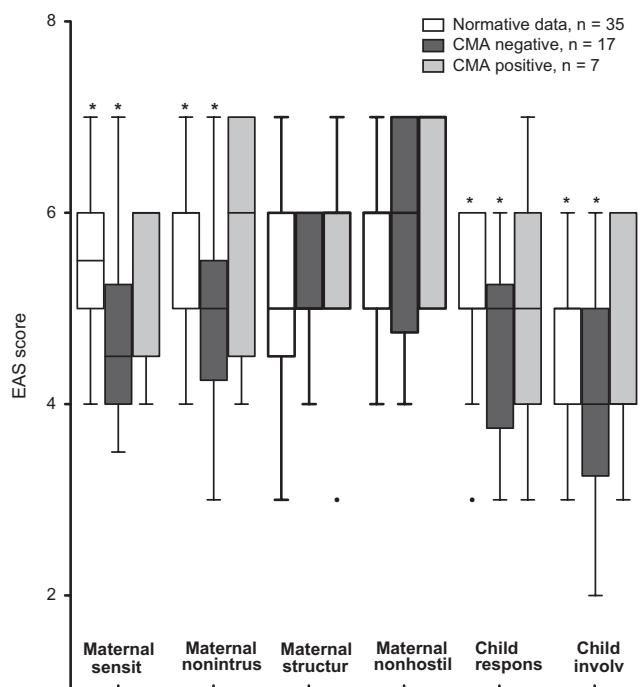


Figure 1 The Emotional Availability Scale (EAS) scores in children with gastrointestinal symptoms suspected of cow's milk allergy (CMA). The figure shows Tukey's whiskers (with bars on medians) in three groups: normative sample, CMA-negative patients and CMA-positive patients. The scores between the three groups were analysed using nonparametric ANOVA (Kruskal–Wallis test), with statistically significant differences in four dimensions: maternal sensitivity ($p = 0.0175$) and nonintrusiveness ($p = 0.0349$), child responsiveness ($p = 0.0265$) and involvement ($p = 0.0390$). Scores for maternal structuring and nonhostility were similar between the groups. * $p < 0.05$ (Mann–Whitney's U-test comparing the normative and CMA-negative results only).

DISCUSSION

This study shows that there may be associated dysfunctional mother–child emotional interactions in some children with unspecific gastrointestinal symptoms that are suspected to be non-IgE CMA. To the best of our knowledge, this has not been demonstrated before. The dysfunctional interactions, which were studied by analysing emotional availability within the mother–child relationship, were more frequent in the DBPCFC-negative patients. In contrast, the small number of DBPCFC-positive children demonstrated EAS results within the range of normative data.

Emotional availability of mothers in mother–child interactions is systematically linked to positive child outcomes in terms of self-regulation, sleeping patterns, secure attachment and socialization skills (15,17–19). Low levels of dyadic emotional availability were found in children suffering from FD in early childhood (12,20) and mother–child interactions and maternal anxiety play a major role in the development of FD (21). The direction of effects, however, is not easy to delineate. According to transactional developmental theory, parent–child interaction involves a dynamic reciprocal system (22). Maternal worry may lead to difficulties in reading the child's interactional cues, for example, offering food when the child is not ready

for feeding. This intrusiveness may, in turn, lead to the child withdrawing from interaction as well as refusing food and cause increased levels of maternal anxiety.

The Emotional Availability Scale (EAS) is a tool developed to describe the quality of parent–child interaction, which consists of six dimensions that address different areas of emotional interaction between the child and mother (14). Maternal sensitivity consists primarily of maternal positive affect and responsiveness to the child. Nonintrusiveness, on the other hand, consists of the ability of the mother to follow the child's lead when interacting with him or her, rather than taking charge herself. These maternal characteristics returned lower scores more frequently in the subgroup of patients with nonconfirmed CMA when compared to normative data. This group also showed less responsiveness from the children to maternal cues and lower maternal involvement when compared to normative data. Interestingly, a similar pattern of Emotional Availability is found in infant FD (12). In contrast to patients with clinical FD (20), the total EAS scores in our study were within the normal range. None of our patients had clinically significant FD, even though almost 50% of both CMA-positive and CMA-negative groups did report signs of problematic feeding. These problems included refusing bottle, breast and spoon feeding, needing to be distracted during feeding, age-inappropriate nocturnal feedings and feeding-related gagging. Although the problems in emotional availability did not fall within a pathological range for most patients, the dysfunctions we observed in the mother–child interaction warrant attention.

The observed profile of emotional availability may refer to an interactive approach, where the mother is trying too hard to involve the child, with inadequate positive affective framing and support. This, in turn, may cause the child to actually become less responsive, as we observed. In studies on FD, such corollaries were mediated by maternal anxiety (12). We did not study maternal psychological characteristics and future studies on the possible mediating factors are warranted. With regard to our EAS results, the scores for maternal structuring (the ability to support age-appropriate development) and non-hostility (the ability to suppress aggression and negative emotions) did not differ from normal. Thus, it seems that, despite the child's relative unresponsiveness, the mothers were able to guide them appropriately and handle their own negative feelings. We did not observe dysfunctional mother–child interactions in CMA-positive children. Our results, therefore, suggest that when the DBPCFC is negative, the clinician should also address psychological factors, such as the mother–child emotional interactions that may be involved in the parental reporting of child symptoms. When it comes to possible psychological intervention, increasing maternal awareness of the need to focus on the cues the child provides in mother–child interactions may help the mothers to express their affection without trying too hard to involve the child (23). Interventions should emphasize the aspects of emotional availability within mother–child relations rather

than focus solely on structuring the child or on the educational aspects of parenting.

The strengths of this study add to the credibility of the findings. These include the use of the DBPCFC, to confirm or reject the suspicion of CMA, and the prospective design of the study, with detailed food challenge information and follow-up. We systematically perform DBPCFC for cow's milk in our daily clinical practice, so we knew that the protocol would be feasible and reliable. The same team of one nurse and one paediatrician supervised all the DBPCFCs included in this study (5). Because no child with a negative DBPCFC was on a cow's milk-free diet 6 months after the DBPCFC, the likelihood of false negatives is minimal. The video recordings were also made in a prospective, blinded, uniform manner, with expert scorers analysing the results.

This study has certain limitations. The study size was small, and caution is needed, especially when interpreting results relating to the DBPCFC-positive group. The observed rate for placebo symptoms was high – almost 50% in the DBPCFC-negative group (5) – so some of our patients might in fact be false positives for CMA. The food challenges were not repeated, because of the rate of feeding-related problems. The video record duration (15–20 min) may raise questions. However, previous studies using ten to 15-min observations lend credence to the validity of choosing this duration for measuring EA (20, 24), although longer observations might have increased the reliability of the findings (25). For practical reasons, it was not possible to video mother–child interactions for longer, as the median age of the patients was 10 months, and the setting was a busy outpatient clinic. Videotaping the children being fed might have given us more insight into the FD-related symptoms. This could have resulted in even lower EAS scores for children with feeding problems. We opted, however, to analyse the general interaction profiles in settings that were as consistent as possible.

We recruited the patients for our study from referrals to our unit, which is both a secondary and tertiary centre for paediatric care within the Helsinki and Uusimaa Hospital district in southern Finland. The referrals came from general practitioners and general paediatricians, with few children referred from other hospitals. Regarding the study subject characteristics, the maternal age, number of first-born children and level of maternal education were above the Finnish average (Table 1) (26). The high level of maternal education in nonconfirmed suspicion of CMA was in line with previous reports (4, 27).

The reason behind this phenomenon can only be hypothesized. It is possible, for example, that media and internet coverage on problems associated with cow's milk might add to heightened awareness of CMA and parental anxiety over their child's unspecific symptoms.

Based on our findings, we strongly suggest using the DBPCFC in first-line practice to minimize false-positive CMA diagnosis and reduce unnecessary parental worry regarding their child's health. We also think it is important for clinicians to recognize the potential for dysfunctional

mother–child emotional interactions and address them in negative DBPCFC cases, rather than focus solely on the putative food allergy. Further research is urgently needed to determine the psychological support or intervention needed to best manage DBPCFC-negative symptomatic infants.

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CONFLICT OF INTEREST

The authors have no financial conflict of interest to declare.

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