Maternal food-avoidance diets and dietary supplements during breastfeeding

Live S. Nordhagen1,2,3 | Vibeke S. Løfsgaard3 | Milada C. Småstuen3 | Kari Glavin3 | Kai-Håkon Carlsen1,† | Monica Hauger Carlsen4 | Berit Granum5 | Malén Gubrandsgard2 | Guttorm Haugen1,6 | Gunilla Hedlin7,8 | Christine M. Jonassen9,10 | Björn Nordlund7,8 | Eva Maria Reh binder1,11 | Knut Rudi9 | Carina M. Saunders1,2 | Håvard O. Skjerven1,2 | Anne Cathrine Staff1,6 | Cilla Söderhäll7,8 | Riyas Vettukattil1,2 | Hilde Aaneland2 | Karin C. Lødrup Carlsen1,2

1 Institute of Clinical Medicine, University of Oslo, Oslo, Norway
2 Division of Paediatric and Adolescent Medicine, Oslo University Hospital, Oslo, Norway
3 VID Specialized University, Oslo, Norway
4 Institute of Basal Medical Sciences, University of Oslo, Oslo, Norway
5 Department of Environmental Health, Norwegian Institute of Public Health, Oslo, Norway
6 Division of Obstetrics and Gynaecology, Oslo University Hospital, Oslo, Norway
7 Astrid Lindgren Children’s Hospital, Karolinska University Hospital, Stockholm, Sweden
8 Department of Women’s and Children’s Health, Karolinska Institutet, Stockholm, Sweden
9 Faculty of Chemistry, Biotechnology and Food Science, Norwegian University of Life Sciences, Ås, Norway
10 Genetic Unit, Centre for Laboratory Medicine, Østfold Hospital Trust, Norway
11 Department of Dermatology and Venerology, Oslo University Hospital, Oslo, Norway

Abstract

Aims: To identify maternal food-avoidance diets and dietary supplement use during breastfeeding, and to explore factors associated with food avoidance diets.

Design: A prospective mother–child birth cohort study.

Methods: Electronic questionnaires were answered by 1,462 breastfeeding mothers 6 months postpartum in the Preventing Atopic Dermatitis and Allergies in Children (PreventADALL) study from 2014–2016. Demographic and antenatal factors were analysed for associations with food avoidance diets in 1,368 women by multiple logistic regression.

Results: Overall, 289 breastfeeding women (19.8%) avoided at least one food item in their diet, most commonly cow’s milk in 99 women (6.8%). Foods were most often avoided due to conditions in the child, maternal factors or lifestyle choice. The odds for food avoidance diets were 2.1 (95% CI: 1.3, 3.4) for food allergy (presumed or
1 | INTRODUCTION

Exclusive breastfeeding is recommended for the first 6 months of life (Swedish Food Agency, 2020; The Norwegian Directorate of Health, 2019b; World Health Organization, 2011). Avoidance of specific foods in the maternal diet during breastfeeding may influence the nutritional composition of breastmilk and increase the risk of micronutrient deficiencies in the infant (Dror & Allen, 2018). There is little knowledge of the current prevalence of (Abe et al., 2016) and reasons for maternal food-avoidance diets as well as use of dietary supplements during breastfeeding.

2 | BACKGROUND

During the first months after birth, exclusive breastfeeding is the optimal nutrition for healthy term infants. European recommendations for exclusive breastfeeding are generally 4–6 months (EFSA Panel on Nutrition et al., 2019), with 6 months being recommended in Norway and Sweden (Swedish Food Agency, 2020; The Norwegian Directorate of Health, 2019b). Specific diets in breastfeeding women may influence the nutritional composition of their breastmilk (Bravi et al., 2016; Innis, 2014; Valentine & Wagner, 2013). Avoidance of milk or meat may increase the risk of micronutrient deficiencies in the child (Abe et al., 2016; Kocaoglu et al., 2014; Marangoni et al., 2016); in particular, fatty acids and micronutrients such as fat and water-soluble vitamins, iodine, selenium and folic acid are influenced by maternal diet (Bravi et al., 2016; Innis, 2014; Lutter et al., 2018; Marangoni et al., 2016; Valentine & Wagner, 2013).

In a study from Poland, 29.1% of breastfeeding mothers reported eliminating certain foods (Karcz et al., 2020), while 70% of breastfeeding women in a New Zealand study (Brown et al., 2020) and 100% (145) in a Korean study (Jeong et al., 2017) avoided specific foods or beverages. The types of foods avoided vary, as do the reasons for avoiding them. Prevention of allergies, cultural background, peer pressure and symptoms in the child were reported in Poland (Karcz et al., 2020). In New Zealand, dairy products were avoided due to a belief that dairy causes infant colic, reflux or allergic symptoms (Brown et al., 2020). In Korea, caffeine (90.3%), spicy foods (85.5%) and raw foods (75.2%) were most frequently avoided during breastfeeding, adding to the 12.4% who avoided milk and the 13.1% avoiding wheat without a specified reason (Jeong et al., 2017).

Food avoidance during breastfeeding may negatively impact the nutritional status of both mother and child and may influence motivation for and length of breastfeeding (Jeurink et al., 2019; Karcz et al., 2020). Thus, unwarranted food-avoidance diets should be discouraged for women during breastfeeding (Jeurink et al., 2019; Muraro et al., 2014).

In general, breastfeeding women can follow the same nutritional recommendations as the general population. In Norway, supplementation with vitamin D or cod liver oil is recommended (The Norwegian Directorate of Health, 2019a), while in Sweden, women are advised to choose foods rich in vitamin D, omega-3 fats and folic acid (Swedish Food Agency, 2019). Two recent reports found that 70% of breastfeeding women in the United States used one or more dietary supplements (Jun et al., 2020) while a study from New Zealand found that 26% used folic acid, 63% iodine and 60% alternative supplements during breastfeeding (Brown et al., 2020). Dietary supplements during breastfeeding should be used with care: women should be sure that composition and purity are known (Berlin & van den Anker, 2013; Swedish Food Agency, 2019) and avoid high doses or intake of several supplements containing the same nutrient (The Norwegian Directorate of Health, 2014).

3 | RESEARCH QUESTION

The primary aim of our study was to determine the prevalence of maternal food-avoidance diets and dietary supplement use during breastfeeding, and subsequently to identify factors associated with the use of food-avoidance diets during breastfeeding.

4 | THE STUDY

4.1 | Design

This study has a cross-sectional design and uses antenatal and demographic data collected in the Preventing Atopic Dermatitis and Allergies in children (PreventADALL) study, a population-based, prospective mother–child birth cohort, described in detail elsewhere (Lødrup Carlsen et al., 2018). Pregnant women scheduled for routine ultrasound examination at 18 weeks of pregnancy from December 2014–October 2016 were invited to participate in the study at Oslo University Hospital and Østfold Hospital Trust in Norway, and at Karolinska University Hospital, Sweden. Briefly, 2,697 women with 2,701 singleton or twin pregnancies (four women were enrolled with two separate pregnancies) were enrolled with the inclusion criteria of no severe maternal or foetal illness and sufficient, and Scandinavian language skills. Exclusion criteria were severe maternal...
or foetal disease and plans to move from the catchment area of any of the participating hospitals within the first year of the child's life. The women signed a written informed consent during the enrolment visit in connection with the ultrasound examination. Their healthy infants born with a gestational age (GA) of at least 35.0 weeks were included at birth, resulting in 2,395 mother–child pairs. At birth, both guardians signed the informed consent for their child. Twins were excluded from this study, as shown in Figure 1.

We identified 1,462 mothers who reported breastfeeding at 6 months postpartum (Figure 1) as eligible participants for this study. As antenatal data at 18 weeks GA were not available for 95 women, 1,368 women were included for analysis of factors associated with food-avoidance diets 6 months postpartum.

5 | METHOD

Details on the use of avoidance diets or dietary supplements during breastfeeding were recorded in electronic questionnaires distributed 6 months after the child was born, with a reminder 2 weeks later in the absence of response. Women who reported that they were still breastfeeding at 6 months were asked whether they had avoided certain foods or been on a specific diet for the previous 3 months and the reason(s) for their food-avoidance diets. Multiple responses to pre-specified food categories were possible: no or yes due to own disease or ailment, due to suspected intolerance/allergy in the child, due to ailment in the child (not disease), due to disease in the child, to prevent disease in the child or lifestyle choice. The women were subsequently asked to record which food(s) they excluded completely from their diet: cow’s milk, lactose, gluten, egg, peanut, nuts (other than peanuts), meat, fish, dairy products or others, described in free text. Regarding dietary supplements, the women were asked whether they had used any of the following supplements: folic acid, multivitamins, cod liver oil, omega fatty acids, fish oils, iron, or other dietary supplements.

The antenatal questionnaire, completed at the time of enrolment, included information on age, education, marital status, country and area of residence, family income, and relevant medical and allergy history.

The electronic questionnaires included information on health status and disease in the mother, child and family; lifestyle; environment; stress; quality of life; and type of diet. The questionnaire was developed by the study team, which consisted of highly skilled paediatricians, healthcare professionals and PhD fellows. Wherever possible, questions from collaborative studies including the MeDALL questionnaire, the Isle of Wight 3rd-generation study, Barrier Enhancement for Eczema Prevention (BEEP; Lødrup Carlsen et al., 2018), the Norwegian Mother, Father and Child Cohort Study, and Environment and Childhood Asthma study (ECA) were used, giving the questionnaire good content validity. A pilot survey of the questionnaire was conducted before dispatch to ensure that the questions and answer alternatives were understood. To assess possible selection bias, we compared distributions of variables among those who answered the 6-month questionnaire versus those who did not.

The main outcome was the prevalence of food avoidance diets in the previous 3 months, reported 6 months postpartum. Further outcomes were exclusion of specific foods, including cow’s milk, dairy products, lactose, gluten, eggs, peanuts, nuts, meat, fish, and other.

| Included | 2697 women, 2701 pregnancies 2718 fetuses |
| -------- | ----------------------------------------- |
|          | Withdraw (n=2)                            |
|          | Excluded twin2 (n=5)                      |
|          | Other reasons (n=316)                     |

| Included in mother – child cohort n= 2395 (including 12 twin pregnancies) |
|----------------------------------------------------------------------------|
| Failed to return six month questionnaire (n=690 include 1 twin2)          |
| Excluded twin2 (n=11)                                                     |

| Completed six months questionnaire (n=1694) |
|--------------------------------------------|
| Not breastfeeding (n=232)                  |

| Included breastfeeding mothers (n=1462) |

**FIGURE 1** Flowchart showing the present study population
5.1 | Analysis

Categorical variables are presented as counts and percentages. Possible associations between pairs of explanatory categorical variables were analyzed using the Chi-squared test. The variables selected to be examined for possible association with food-avoidance diets were those known from the literature and our own clinical experience. Variables were first tested for possible association in univariate binary logistic regression analyses and those that reached p-value <.05 were included in the multivariate model. The results are expressed as odds ratios (OR) with 95% confidence interval (CI). Significance level was set to 0.05. All analyses were performed by IBM® SPSS© statistics version 25.

5.2 | Ethical considerations

The PreventADALL study was approved by the Regional Committee for Medical and Health Research Ethics in South-Eastern Norway (2014/518) and the relevant Swedish authorities (2014/2242–31/4), in addition to being registered at clinicaltrials.gov (number NCT02449850).

6 | RESULTS

Of the 1,694 women returning the 6 months postpartum questionnaire, 1,462 (86.3%) reported breastfeeding. The group of women who were currently breastfeeding had a higher educational level and/or higher income, were older, and more often lived in a city centre compared to non-breastfeeding women (Table 1). The included participants were somewhat older, with a higher educational level, more often of Nordic ethnic origin and primiparous compared to those who did not return the 6-month questionnaire (Table S1).

6.1 | Food-avoidance diets

The prevalence of food-avoidance diets 6 months postpartum was 19.8% (n = 289) in breastfeeding women. The most commonly avoided foods were cow’s milk in 99 (6.8%) women and dairy products in 46 (3.1%) women, followed by lactose in 33 (2.3%) women and gluten in 36 (2.5%) women with further details in Table 2. Among the 289 women who reported being on a food-avoidance diets, 203 (70.2%) avoided one type of food, 49 (17%) avoided two and 37 (12.8%) avoided three or more types of food.

The reported reasons for maternal food-avoidance diets were related to conditions in the child in 169 (58.5%) cases, maternal causes in 87 (30.1%), both child and maternal causes in 11 (3.8%) and lifestyle choice in 45 (15.6%) cases while 5 women (1.7%) avoided foods to prevent disease development in their child. Most women (247 of 289) reported only one reason for following a food-avoidance diet, while 40 (13.8%) reported two reasons and two (0.7%) reported more than two reasons. Maternal food-avoidance diets related to conditions in the child included suspected intolerance/food allergy in 96 cases (33.2%), ailment or discomfort in 92 cases (31.8%), other diseases not specified in 8 cases (2.8%) and both suspected intolerance/food allergy and ailment/other disease in 25 cases (8.7%). Among the 169 women who reported following a food-avoidance diet due to conditions in the child only, cow’s milk was the most commonly avoided food, reported by 92 women (54.4%), while gluten (34; 39.1%) and lactose (20; 23.0%) were most frequently avoided by women reporting maternal causes as the reason for their diet. Women avoiding foods as a result of lifestyle choices (n = 45) most often excluded meat from their diet (64.4%; Figure 2). While cow’s milk, gluten, cabbage or other foods were excluded for primary prevention reasons (n = 5).

6.2 | Dietary supplements

Overall, 1,136 of 1,462 (77.8%) breastfeeding women reported using at least one dietary supplement 6 months postpartum. Of these, 423 (28.9%) used one type of dietary supplement, 384 (26.2%) used two types of dietary supplements and 329 (22.5%) used three or more types of dietary supplements. Cod liver oil was the most commonly used dietary supplement, reported in 711 women (48.6%), followed by multivitamins in 573 (39.2%), other dietary supplements in 315 (21.5%), iron in 318 (21.7%), fish oil/omega fatty acids in 288 (19.7%) and folic acid in 156 (10.7%). There was a significant difference in the use of dietary supplements among participants reporting food-avoidance diets (86.1%) compared with those not reporting food-avoidance (75.7%).

6.3 | Factors associated with food-avoidance diets

In the univariate logistic regression analyses, the following variables were significantly associated with the use of food-avoidance...
**TABLE 1** Background characteristics for breastfeeding and not breastfeeding women who responded to the 6-month postpartum questionnaire (n = 1,694) form December 2014–October 2016 in Norway and Sweden

| Background characteristics | Breastfeeding (n = 1,462) n (%) | Not breastfeeding (n = 232) n (%) | p-value |
|----------------------------|----------------------------------|----------------------------------|--------|
| **Age at enrolment (n = 1,694)** |                                  |                                  |        |
| 16–24 years                | 19 (1.3)                         | 11 (4.7)                         | <.01   |
| 25–34 years                | 1,005 (68.7)                     | 153 (65.9)                       |        |
| >35 years                  | 438 (30.0)                       | 68 (29.3)                        |        |
| **Education (n = 1,583)**  |                                  |                                  |        |
| Primary/High school        | 98 (7.2)                         | 51 (23.8)                        | <.01   |
| Higher education <4 years  | 424 (31.0)                       | 74 (34.6)                        |        |
| Higher education >4 years  | 845 (61.7)                       | 89 (41.6)                        |        |
| **Marital status (n = 1,586)** |                                |                                  |        |
| Married                    | 604 (44.0)                       | 92 (42.8)                        | .05    |
| Cohabitant                 | 743 (54.1)                       | 113 (52.6)                       |        |
| Single                     | 27 (2.0)                         | 10 (4.7)                         |        |
| **Country of origin (n = 1,586)** |                              |                                  |        |
| Norway                     | 950 (69.2)                       | 126 (58.9)                       | <.01   |
| Sweden                     | 290 (21.1)                       | 63 (29.4)                        |        |
| Other Nordic               | 21 (1.5)                         | 0 (0.0)                          |        |
| Other than Nordic          | 111 (8.1)                        | 25 (11.7)                        |        |
| **Family income (n = 1,567)** |                                |                                  |        |
| Low                        | 7 (0.5)                          | 4 (1.9)                          | <.01   |
| Middle                     | 714 (52.5)                       | 135 (65.2)                       |        |
| High                       | 639 (47.0)                       | 68 (32.9)                        |        |
| **Living environment (n = 1,586)** |                             |                                  |        |
| City, densely              | 550 (40.1)                       | 67 (31.3)                        | .02    |
| City, less densely populated | 520 (37.9)                      | 85 (39.7)                        |        |
| Suburb                     | 216 (15.8)                       | 39 (18.2)                        |        |
| Countryside, in village    | 28 (2.0)                         | 5 (2.3)                          |        |
| Countryside, outside village | 58 (4.2)                     | 18 (8.4)                         |        |
| **Previous pregnancy (n = 1,692)** |                             |                                  |        |
| 0                          | 890 (61.0)                       | 155 (66.8)                       | .22    |
| 1                          | 499 (30.8)                       | 62 (26.7)                        |        |
| >1                         | 121 (8.3)                        | 15 (6.5)                         |        |
| **Reported maternal diseases** |                                |                                  |        |
| Celiac disease (n = 1,687)  | 18 (1.2)                         | 3 (1.3)                          | n.a.   |
| Asthma doctor diagnosed (n = 1,586) | 233 (17.0)                 | 42 (19.6)                        | .34    |
| Atopic eczema doctor diagnosed (n = 1,586) | 287 (20.9)                  | 45 (21.0)                        | .97    |
| Allergic rhinitis doctor diagnosed (n = 1,586) | 294 (21.4)                   | 48 (22.4)                        | .94    |
| Food allergy any reported (n = 1,045) | 339 (37.7)                  | 63 (43.4)                        | .16    |
| Food allergy doctor diagnosed (n = 1,586) | 174 (12.7)                  | 33 (15.4)                        | .42    |

**Note:** Chi-squared test where used with p-value <.05.
p-value <.05 in bold.
n.a. = p-value could not be calculated due to too small cell counts.
In a general population of almost 1,700 breastfeeding women, one in five excluded one or more foods from their diet at 6 months postpartum. Maternal food-avoidance diets due to conditions in the child most often involved exclusion of cow’s milk and dairy products, while gluten was most often avoided for reasons related to maternal health, and meat avoidance was most often reported due to lifestyle choices. 

**FIGURE 2** The type(s) of food being avoided is shown based on the reason provided for the food-avoidance diet in 289 breastfeeding women at six-months, with the possibility of several answers. The proportions of specific foods excluded from the diet (%) are based upon the overall number of women reporting maternal causes ($n = 87$), conditions in the child ($n = 169$), and lifestyle choices ($n = 45$). Data from the five women who avoided (cow’s milk $n = 1$, gluten $n = 1$, onion $n = 1$, and other diets $n = 3$) to prevent disease in their child and 11 women who reported both maternal and child causes for their diet are not shown in the figure.

---

**DISCUSSION**

In general population of almost 1,700 breastfeeding women, one in five excluded one or more foods from their diet at 6 months postpartum. Maternal food-avoidance diets due to conditions in the child most often involved exclusion of cow’s milk and dairy products, while gluten was most often avoided for reasons related to maternal health, and meat avoidance was most often reported due to lifestyle choices. 

---

**TABLE 2** The types of foods excluded from the diet in 289 of 1,462 breastfeeding women 6-month postpartum are given overall, as well as by reported maternal diseases among 87 women reporting maternal causes for the diet.

| Food-avoidance diets       | Overall n (%) | Maternal food allergy, DD | Maternal food allergy, presumed or DD | Asthma, allergy or atopic dermatitis, DD | Celiac disease |
|----------------------------|---------------|----------------------------|---------------------------------------|------------------------------------------|---------------|
| Total use of food-avoidance diets | 289 (19.8) | 38 (2.6) | 50 (3.4) | 51 (3.5) | 15 (1.0) |
| **Type of food-avoidance** |               |               |               |               |               |
| Cow milk                   | 99 (6.8)      | 5 (0.3)       | 6 (0.4)      | 10 (0.7)     | 2 (0.1)       |
| Dairy products             | 46 (3.1)      | 3 (0.2)       | 4 (0.3)      | 6 (0.4)      | 2 (0.1)       |
| Lactose                    | 33 (2.3)      | 6 (0.4)       | 8 (0.6)      | 11 (0.8)     | 2 (0.1)       |
| Gluten                     | 36 (2.5)      | 11 (0.8)      | 16 (1.1)     | 17 (1.2)     | 15 (1.0)      |
| Egg                        | 19 (1.3)      | 1 (0.07)      | 2 (0.1)      | 3 (0.2)      | 2 (0.1)       |
| Peanuts                    | 16 (1.1)      | 10 (0.7)      | 10 (0.7)     | 13 (0.9)     | 1 (0.07)      |
| Nuts                       | 15 (1.0)      | 11 (0.8)      | 11 (0.8)     | 12 (0.8)     | 1 (0.07)      |
| Meat                       | 29 (2.0)      | 1 (0.07)      | 1 (0.07)     | 3 (0.2)      | 2 (0.1)       |
| Fish                       | 16 (1.3)      | 3 (0.2)       | 3 (0.2)      | 4 (0.3)      | 1 (0.07)      |
| Other                      | 121 (8.3)     |               |             |             |               |
| Onion                      | 34 (2.3)      | 1 (0.07)      | 1 (0.07)     | 1 (0.07)     | 0 (0.00)      |
| Cabbage                    | 17 (1.2)      | 3 (0.2)       | 4 (0.3)      | 4 (0.3)      | 0 (0.00)      |

Abbreviation: DD, doctor diagnosed.
The odds for the use of food avoidance diets during breastfeeding at six-month postpartum is shown by univariate and multivariate analyses.

|                          | n      | Univariate analyses |                     | Multivariate analyses |                     |
|--------------------------|--------|---------------------|---------------------|-----------------------|---------------------|
|                          |        | OR (95% CI) p-value  |                     | OR (95% CI) p-value   |                     |
| **Age mother**           |        |                     |                     |                       |                     |
| 16–24 years (ref)        | 1,332  |                     |                     |                       |                     |
| 25–34 years              |        | 0.87 (0.28–2.64) .80|                     | 0.88 (0.29–2.73) .82  |                     |
| >35 years                |        |                     |                     |                       |                     |
| **Education mother**     |        |                     |                     |                       |                     |
| Primary/high school (ref)| 1,336  |                     |                     |                       |                     |
| Higher education <4 years|        | 0.87 (0.50–1.53) .62|                     |                       |                     |
| Higher education >4 years|        | 1.02 (0.60–1.73) .93|                     |                       |                     |
| **Marital status**       |        |                     |                     |                       |                     |
| Married (ref)            | 1,357  |                     |                     |                       |                     |
| Cohabitant               |        | 0.88 (0.67–1.15) .35|                     | 0.74 (0.21–2.58) .63  |                     |
| Single/separated/other   |        | 0.65 (0.36–1.16) .14|                     |                       |                     |
| **Country of origin**    |        |                     |                     |                       |                     |
| Norway (ref)             | 1,368  |                     |                     |                       |                     |
| Sweden                   |        | 1.40 (1.02–1.92) .03| 1.26 (0.88–1.82) .21|                       |                     |
| Other Nordic countries   |        | 1.40 (0.51–3.86) .52|                     |                       |                     |
| Other                    |        | 0.65 (0.36–1.16) .14|                     |                       |                     |
| **Family income**        |        |                     |                     |                       |                     |
| Low/Middle (ref)         | 1,356  |                     |                     |                       |                     |
| High                     |        | 0.80 (0.61–1.06) .11|                     |                       |                     |
| **Living environment**   |        |                     |                     |                       |                     |
| City, densely populated  | 1,368  |                     |                     |                       |                     |
| City, less densely populated|      | 0.81 (0.60–1.11) .18|                     |                       |                     |
| Suburb                   |        | 1.17 (0.80–1.71) .42|                     |                       |                     |
| Village                  |        | 0.30 (0.07–1.28) .10|                     |                       |                     |
| Countryside, outside village|     | 0.64 (0.29–1.38) .25|                     |                       |                     |
| **Parity**               |        |                     |                     |                       |                     |
| 0 (ref)                  | 1,368  |                     |                     |                       |                     |
| 1                        |        | **0.70 (0.50–0.98) .03**|                     | **0.75 (0.51–1.09) .12**|         |
| >1                       |        | 0.98 (0.71–1.35) .88|                     |                       |                     |
| **Maternal asthma, doctor diagnosed** | 233    | **2.30 (1.68–3.15) <.01**|                     | **1.44 (0.95–2.18) .08**|         |
| Yes                      |        |                     |                     |                       |                     |
| **Maternal allergic rhinitis, doctor diagnosed** | 294    | **1.66 (1.22–2.25) <.01**|                     | **1.21 (0.82–1.79) .33**|         |
| Yes                      |        |                     |                     |                       |                     |
| **Maternal atopic dermatitis, doctor diagnosed** | 286    | **1.85 (1.36–2.49) <.01**|                     | **1.21 (0.82–1.80) .33**|         |
| Yes                      |        |                     |                     |                       |                     |
| **Maternal food allergy presumed, or doctor diagnosed** | 338    | **2.55 (1.92–3.40) <.01**|                     | **212 (1.32–3.41) <.01**|         |
| Yes                      |        |                     |                     |                       |                     |
| **Maternal celiac disease** | 18     | **22.60 (6.50–78.60) <.01**|                     | **19.41 (5.37–70.10) <.01**|         |
| Yes                      |        |                     |                     |                       |                     |

Note: p-value <.05 in bold.
in relation to lifestyle choices. Maternal celiac disease and food
alergy were both independently associated with food avoidance
during breastfeeding. Eight in 10 breastfeeding women used at
least one dietary supplement, with cod liver oil being used by
around half of these.

The finding that one in five breastfeeding women excluded one
or more foods 6 months postpartum is lower than observed in a
Polish survey from 2019 with 1,074 participants, in which 29% of
respondents reported following an elimination diet excluding one or
more foods during breastfeeding (Karcz et al., 2020). Nutritional rec-
ommendations during breastfeeding are similar in the Nordic coun-
tries and Poland (Karcz et al., 2020; The Norwegian Directorate of
Health, 2019a). An explanation for the higher use of elimination diets
in Poland might be the cultural prevalence of ‘myths’ about prophyl-
tactic dietary restrictions during breastfeeding (Karcz et al., 2020).

In a Korean study, 100% (145) of respondents reported avoid-
ance of one or more types of foods during breastfeeding (Jeong et al.,
2017), while in a study from New Zealand, 70% of 458 women
avoided specific types of food and beverages during breastfeeding
(Brown et al., 2020). The difference with breastfeeding Korean
women can possibly be explained by the difference in cultural
food habits and tradition, as Asian woman are recommended to
avoid both raw and spicy foods to prevent harm and discomfort
in infants (Jeong et al., 2017). Different sources of dietary guid-
ance may also be an explanation: in Korea, family and friends were
the main source of nutritional information and advice. Only a small
proportion of the women got information from medical profession-
als (Jeong et al., 2017). In the New Zealand study, over half of the
women avoided alcohol, a factor not investigated in the present
study. However, 35% of the participants in the New Zealand study
reported avoiding milk and milk products (Brown et al., 2020). In
the New Zealand study, the majority relied on alternative health
practitioners, the Internet, and family and friends regarding dietary
recommendations (Brown et al., 2020). Our study did not inves-
tigate where participants obtained information regarding dietary
recommendations.

One in 10 breastfeeding women avoided cow’s milk or dairy
products in their diet. However, cow’s milk is among the main
sources of iodine in the Norwegian diet (Nerhus et al., 2018) and
breasted infants depend on sufficient maternal iodine intake for
optimal growth and neurological development (Azizi & Smyth, 2009;
Jorgensen et al., 2016). The iodine concentrations in breastmilk are
likely to be suboptimal with inadequate maternal intake of iodi-
ne from food and supplements (Henjum et al., 2017) highlighting the
importance of nutritional awareness in breastfeeding women
who avoid cow’s milk and other dairy products (The Norwegian
Directorate of Health, 2019a).

Conditions in the child were most frequently reported as the rea-
son for food-avoidance diets in our study, in line with studies report-
ing avoidance of milk or dairy products during breastfeeding due to
a belief that dairy causes infant colic, reflux or allergic symptoms
(Brown et al., 2020) or to prevent development or symptoms of al-
lergies (Karcz et al., 2020).

Such conditions, including suspected intolerance/food allergy,
were the reason 57% of the participants avoided some food prod-
ucts. However, there is no scientific evidence to support dietary
restrictions during pregnancy or breastfeeding to prevent allergic
disease development (Greer et al., 2019). Our results indicate that a
significant proportion of food-avoidance diets during breastfeeding
may not be indicated, which is of concern as elimination of food is
not without nutritional risk (Rajani et al., 2020).

Lactose and gluten were the food ingredients most frequently
avoided by women who reported maternal causes for their diet.
Having celiac disease was associated with food avoidance during
breastfeeding and may be one reason for avoiding gluten. The de-
mand for gluten-free products is increasing, including people not di-
agnosed with celiac disease. There is no scientific evidence of health
benefits for this trend (Forsknings.no, 2020). However, a gluten-free
diet may result in a lack of special dietary fibre, as well as miner-
als such as magnesium, zinc, iron and calcium and micronutrients
such as vitamin B, vitamin C and folate (Vici et al., 2016). Gluten-
free products are less nutritious, and following a gluten-free diet
should therefore be restricted to those with medical requirements
(Myhrstad et al., 2021).

Over half of those who cited lifestyle as the cause of food avoid-
ance avoided meat. This is in line with the increasing number of veg-
etarians in Norway (IPSOS, 2020). A breastfeeding women follow-
ing a meatless or vegetarian diet can follow the same dietary advice as
for the general population but needs an extra supply of some vi-
tamins and minerals such as vitamin B12, iodine, vitamin D, folate,
selenium, riboflavin and vitamin B6 (The Norwegian Directorate of
Health, 2019a).

Nearly 80% of the breastfeeding women in the current study
used dietary supplements, which is in line with studies from New
Zealand and the United States (Brown et al., 2020; Jun et al., 2020;
Picciano & McGuire, 2008). Around half of the breastfeeding partic-
ipants used cod liver oil supplements as a source of vitamin D, which
is a Norwegian recommendation and tradition (The Norwegian
Directorate of Health, 2019a). In addition, cod liver oil may have
positive neurological and cardiovascular effects for the infant
(Drevon, 2004). In addition, 20% used omega fatty acids other than
cod liver oil, in line with the national recommendations to main-
tain sufficient levels of vitamin D (The Norwegian Directorate of
Health, 2019a, 2019b). Maternal intake of fish oil might have ben-
efits for the child, including a decreased risk of atopic dermatitis
and sensitization to food allergens (Garcia-Larsen et al., 2018). Both
omega fatty acids and cod liver oil contain Omega-3 polyunsatu-
rated fatty acids (PUFA), which, when ingested in breast milk, have
been suggested to have a positive impact on the health and develop-
ment of infants later in life in some studies (Olafsdottir et al., 2006),
although not all (Delgado-Noguera et al., 2015). Presently, there is
inconclusive evidence to support or dismiss the practice of PUFA
supplementation in breastfeeding women in terms of neurodevel-
opment (Delgado-Noguera et al., 2015) and as to whether maternal
supplements are beneficial or carry a potential risk for excessive nu-
trient supply in the child (Zeisel, 2008).
The prevalence of multivitamin use found in our study (40%) is lower than among breastfeeding women in United States (64%; Jun et al., 2020). However, multivitamin supplements are not routinely recommended for healthy breastfeeding women in Norway and Sweden due to uncertainty as to the benefits or potentially harmful effects to the child (Norden., 2012; Swedish Food Agency, 2019; The Norwegian Directorate of Health, 2019a).

The prevalence of food avoidance during breastfeeding in the present study is lower than what has been reported in other countries; however, all studies show that evidence-based communication of dietary recommendations is needed during the breastfeeding period. In Norway, public health nurses, in collaboration with clinical nutritionists, have an important role as nutritional counsellors during follow-up consultations with new mothers (The Norwegian Directorate of Health, 2016).

7.1 | Strengths and limitations

The assessment of risk factors associated with maternal food-avoidance diets during breastfeeding in the present study is strengthened by the prospective cohort design from a general population. Furthermore, in our study, we asked the mothers about their reasons for excluding certain foods during breastfeeding, which reflect their perceptions rather than being restricted to documented disease. The questions with pre-specified food categories explicitly asked for foods that were excluded from the diet rather than those consumed in reduced quantities or partially avoided. Furthermore, we used pre-specified categories to report causes of avoidance diets to limit classification and interpretation by the researchers during analysis.

However, the present study aimed to assess the reasons for following an avoidance diet as perceived by the mother, rather than documenting the correctness of her assumptions. Furthermore, we report the foods avoided for maternal causes based on reported maternal disease, without ascertaining a link between the excluded food and the disease.

One limitation of our study is the participants’ generally higher educational attainment level compared to both the non-included participants and the national average. The prevalence of celiac disease is as expected in a general population, as is the 12.7% doctor-diagnosed food allergy, and 38% reported food allergy (presumed or diagnosed). Current national data from Norway and Sweden on food allergies in adults are lacking; thus, we cannot rule out some bias due to increased allergic disease in our cohort, limiting the generalizability of our study. However, our discrepant findings may also represent a trend change in increasing use of food-avoidance diets. Further limitations include the lack of free-text responses for causes of food-avoidance diets and no additional details for the option ‘symptoms or other diseases in the child’. There were also limited answer options to the question regarding ‘other’ dietary supplements. The data in this study are based on self-reported questionnaires; the questions go back 3 months in time, potentially leading to recall bias that must be considered when interpreting the findings. The use of food diaries would provide more reliable dietary data, but given the size of our study, this burdensome methodology was not logistically feasible and would likely have resulted in a lower response rate, thereby introducing a selection bias.

8 | CONCLUSION

Six months postpartum, 20% of breastfeeding women reported following a food-avoidance diet, most often due to intolerance, allergy, ailment or other disease in the child; around one third were due to maternal causes. Cow’s milk and other dairy products were most often excluded due to conditions in the child. Gluten was most often avoided for reasons related to the maternal causes, while meat avoidance was most often a lifestyle choice. Food-avoidance diets during breastfeeding were associated with maternal food allergy (presumed or diagnosed) and celiac disease and not with general demographic factors.

As use of a maternal food-avoidance diet during breastfeeding may impact the child, our results suggest a need for increased awareness and knowledge about nutritional intake in breastfeeding women, perhaps through the inclusion of dietary guidance as part of the nursing practice in primary care. Further research on the use of food-avoidance diets and dietary supplements during breastfeeding and the possible effects on infants is needed.

AUTHOR CONTRIBUTIONS

All authors have contributed substantially to the design and/or clinical follow-up of the PreventADALL study, and they have revised the work critically for important intellectual content and approved the final version before submission.

ACKNOWLEDGEMENTS

The study was performed within the ORAACLE group (the Oslo Research Group of Asthma and Allergy in Childhood; the Lung and Environment). We sincerely thank all the study participants and the individuals involved in facilitating and running the study.

At Oslo University Hospital and ORAACLE group: Thea Aspelund Fatnes, Elke Maes, Ingvild Essén, Mari Kjendslí, Andrea Dystvold Hansen, Kristine Wedum Davanger, Angelica Johansen Winger, Kristine Eikenæs, Oda C. Lødrup Carlsen, Kim A. Endre, Haugen, Katarina Hilde, Henrik Holmström, Geir Håland, Unni C. Nygaard, Ingebjørg Skrindo, Ina Kreyberg, Åshild Wik Desprise, Karen Eline Stensby Bains, Hrefna K. Gudmundsdóttir, Asima Locmic.

At Sykehuset Østfold: Jon Terje Lunde, Åse-Berit Mathisen, Line Norman Kvenshagen, Sigrid Sjølmo, Camilla Furlund Nystrand, Anbjørg Ranberg, Yvonne Sandberg, Birgitte Bekker Trinborg, Ellen Sophie Berntsen, Kathrine D. Sjøborg, Magdalena R. Værnesbranden, Johanna Wilk, Anne Lovise Eriksen, Sigve Ådalen.

At Karolinska University Hospital and Karolinska Institutet: Sandra Götberg, Nora Nilsson, Päivi Söderman, Ann Berglind, Monika Nordenbrand, Ellen Tegnerud, Natasha Sedergren, Lovisa
Tolander, Kajsa Sedergren, Karina Barhag, Jessica Björk, Alexandra Goldberg, Anna Asarnoj, Caroline-Aleksi O. Mägi, Sandra G. Tedner.

**FUNDING INFORMATION**
The study was funded by the following funding bodies: The Regional Health Board South East, the Norwegian Research Council, Oslo University Hospital, The University of Oslo, Health and Rehabilitation Norway, Østfold Hospital Trust, by unrestricted grants from the Norwegian Association of Asthma and Allergy, the Kloster Foundation, Norwegian society of Dermatology and Venerology, Arne Ingel's legat, Först Medical Laboratory, the Foundation for Healthcare and Allergy Research in Sweden-Vårdalstiftelsen, Swedish Asthma- and Allergy Association's Research Foundation, Swedish Research Council-the initiative for Clinical Therapy Research, the Swedish Heart-Lung Foundation, SFO-V Karolinska Institutet, Hesselman Research Foundation, Thermo-Fisher, Uppsala, Sweden.

**CONFLICT OF INTEREST**
The authors have no conflicts of interests to disclose.

**FINANCIAL DISCLOSURE**
Dr. Rehbinder reports personal fees from Sanofl Genzyme, Novartis and Omega Pharma, outside the submitted work.

**DATA AVAILABILITY STATEMENT**
Data available on request from the authors.

**ETHICAL APPROVAL**
Norway (2014/518) and Sweden (2014/2242–31/4).

**ORCID**
Live S. Nordhagen [https://orcid.org/0000-0001-5945-1082](https://orcid.org/0000-0001-5945-1082)
Riyas Vettukattil [https://orcid.org/0000-0002-2152-4933](https://orcid.org/0000-0002-2152-4933)

**REFERENCES**
Abe, S. K., Balogun, O. O., Ota, E., Takahashi, K., & Mori, R. (2016). Supplementation with multiple micronutrients for breastfeeding women for improving outcomes for the mother and baby. *Cochrane Database of Systematic Reviews*, 2(2), CD010647.

Azizi, F., & Smyth, P. (2009). Breastfeeding and maternal and infant iodine nutrition. *Clinical Endocrinology*, 70(5), 803–809.

Berlin, C. M., & van den Anker, J. N. (2013). Safety during breastfeeding: Drugs, foods, environmental chemicals, and maternal infections. *Seminars in Fetal and Neonatal Medicine*, 18(1), 13–18. [https://doi.org/10.1016/j.siny.2012.09.003](https://doi.org/10.1016/j.siny.2012.09.003)

Bravi, F., Wiens, F., Decarli, A., Dal Pont, A., Agostoni, C., & Ferraroni, M. (2016). Impact of maternal nutrition on breast-milk composition: A systematic review. *The American Journal of Clinical Nutrition*, 104(3), 646–662.

Brown, K., von Hurst, P., Rapson, J., & Conlon, C. (2020). Dietary choices of New Zealand women during pregnancy and lactation. *Nutrients*, 12(9), 2692. [https://doi.org/10.3390/nu12092692](https://doi.org/10.3390/nu12092692)

Delgado-Noguera, M. F., Calvache, J. A., Cosp, X. B., Kotanidou, E. P., & Galli-Tsinopoulou, A. (2015). Supplementation with long chain polyunsaturated fatty acids (LCPUFA) to breastfeeding mothers for improving child growth and development. *Cochrane Database of Systematic Reviews*, 7, CD007901.

Drevon, C. A. (2004). Medisn og vitenskap-Legemidler i praksis-Bruk og misbruk av koststilkodd. *Tidsskrift for den Norske Lægeforening*, 124(9), 1240–1242.

Dror, D. K., & Allen, L. H. (2018). Overview of nutrients in human milk. *Advances in Nutrition*, 9(suppl. 1), 2785–2945.

EFSA Panel on Nutrition, Novel Foods and Food Allergens, Castenmiller, J., de Henauw, S., Hirsch-Ernst, K. I., Kearney, J., & Naska, A. (2019). Appropriate age range for introduction of complementary feeding into an infant’s diet. *EFSA Journal*, 17(9), e05780.

Forsknings.no. (2020). *Er det sunt å kutte ut gluten?* [https://www.forsknings.no/glu ten-mat-og-helse-sykdommer/er-det-sunt-a-kutte-ut-gluten/1728868](https://www.forsknings.no/glu ten-mat-og-helse-sykdommer/er-det-sunt-a-kutte-ut-gluten/1728868)

Garcia-Larsen, V., Ierodiakonou, D., Jarrold, K., Cunha, S., Chvinge, J., Robinson, Z., Geoghegan, N., Ruparelia, A., Devani, P., Trivella, M., Leonardi-Bee, J., & Trivella, M. (2018). Diet during pregnancy and infancy and risk of allergic or autoimmune disease: A systematic review and meta-analysis. *PloS Medicine*, 15(2), e1002507.

Greer, F. R., Sicherer, S. H., & Burks, A. W. (2019). The effects of early nutritional interventions on the development of atopic disease in infants and children: The role of maternal dietary restriction, breastfeeding, hydrolyzed formulas, and timing of introduction of allergenic complementary foods. *Pediatrics*, 143(4), e20190281. [https://doi.org/10.1542/peds.2019-0281](https://doi.org/10.1542/peds.2019-0281)

Henjum, S., Lilleengen, A., Aakre, I., Dudareva, A., Gjengedal, E., Meltzer, H., & Brantsæter, A. (2017). Suboptimal iodine concentration in breastmilk and inadequate iodine intake among lactating women in Norway. *Nutrients*, 9(7), 643.

Innis, S. M. (2014). Impact of maternal diet on human milk composition and neurological development of infants. *The American Journal of Clinical Nutrition*, 99(3), 7345–7415. [https://doi.org/10.3945/ajcn.113.072595](https://doi.org/10.3945/ajcn.113.072595)

IPSOS. (2020). *Ipsos i media i februar 2021: Refleksbruk, gaming, taco, politikk, podkast, vegetar mattrend og mer.* [https://www.ipsos.com/nb-no/ipsos-i-media-i-februar-2021-refleksbruk-gaming-taco-politikk-podkast-vegetar-mattrend-og-mer](https://www.ipsos.com/nb-no/ipsos-i-media-i-februar-2021-refleksbruk-gaming-taco-politikk-podkast-vegetar-mattrend-og-mer)

Jeong, G., Park, S. W., Lee, Y. K., Ko, S. Y., & Shin, S. M. (2017). Maternal food restrictions during breastfeeding. *Korean Journal of Pediatrics*, 60(3), 70–76.

Jeurink, P., Knipping, K., Wiens, F., Barańska, K., Stahl, B., Garssen, J., & Krolak-Olejnik, B. (2019). Importance of maternal diet in the training of the infant’s immune system during gestation and lactation. *Critical Reviews in Food Science and Nutrition*, 59(8), 1311–1319.

Jorgensen, A., O’Leary, P., James, I., Skeaff, S., & Sherriff, J. (2016). Assessment of breast milk iodine concentrations in lactating women in Western Australia. *Nutrients*, 8(11), 699.

Jun, S., Gaehje, J. J., Potischman, N., Dwyer, J. T., Guenther, P. M., Sauder, K. A., & Bailey, R. L. (2020). Dietary supplement use and its micronutrient contribution during pregnancy and lactation in the United States. *Obstetrics & Gynecology*, 135(3), 623–633.

Karcz, K., Lehman, J., & Krolak-Olejnik, B. (2020). Foods to avoid while breastfeeding? Experiences and opinions of polish mothers and healthcare providers. *Nutrients*, 12(6), 1644.

Kocaoglu, C., Akin, F., Çakşen, H., Böke, S. B., Arslan, S., & Aygün, S. (2014). Cerebral atrophy in a vitamin B12-deficient infant of a vegetarian mother. *Journal of Health, Population, and Nutrition*, 12(2), 367–371.

Lødrup Carlsen, K. C., Rehbinder, E. M., Skjerven, H. O., Carlsen, M. H., Castenmiller, J., & Krolak-Olejnik, B. (2019). Importance of maternal diet in the training of the infant’s immune system during gestation and lactation. *Critical Reviews in Food Science and Nutrition*, 59(8), 1311–1319.

Jeong, G., Park, S. W., Lee, Y. K., Ko, S. Y., & Shin, S. M. (2017). Maternal food restrictions during breastfeeding. *Korean Journal of Pediatrics*, 60(3), 70–76.

Karcz, K., Lehman, J., & Krolak-Olejnik, B. (2020). Foods to avoid while breastfeeding? Experiences and opinions of polish mothers and healthcare providers. *Nutrients*, 12(6), 1644.

Kocaoglu, C., Akin, F., Çakşen, H., Böke, S. B., Arslan, S., & Aygün, S. (2014). Cerebral atrophy in a vitamin B12-deficient infant of a vegetarian mother. *Journal of Health, Population, and Nutrition*, 12(2), 367–371.

Lødrup Carlsen, K. C., Rehbinder, E. M., Skjerven, H. O., Carlsen, M. H., Fatnes, T. A., Fugelli, P., & Jonassen, C. M. (2018). Preventing atopic dermatitis and ALL ergies in children—The prevent ADALL study. *Allergy*, 73, 2063–2070.

Lutter, C. K., Iannotti, L. L., & Stewart, C. P. (2018). The potential of a simple egg to improve maternal and child nutrition. *Maternal & Child Nutrition*, 14, e12678.
Marangoni, F., Cetin, I., Verduci, E., Canzone, G., Giovannini, M., Sollo, P., & Poli, A. (2016). Maternal diet and nutrient requirements in pregnancy and breastfeeding. An Italian consensus document. Nutrients, 8(10), 629.

Muraro, A., Balken, S., Arshad, S. H., Beyer, K., Dubois, A. E., Du Toit, G., & Sheikh, A. (2014). EAACI food allergy and anaphylaxis guidelines. Primary prevention of food allergy. Allergy, 69(5), 590–601. https://doi.org/10.1111/all.12398

Myhrstad, M. C., Slydahl, M., Hellmann, M., Garmweidner-Holme, L., Lundin, K. E., Henriksen, C., & Telle-Hansen, V. H. (2021). Nutritional quality and costs of gluten-free products: A case-control study of food products on the Norwegian market. Food & Nutrition Research, 65, Published Online.

Nerhus, I., Markhus, M. W., Nilsen, B. M., Øyen, J., Maage, A., Ødegård, E. R., & Graff, I. E. (2018). Iodine content of six fish species, Norwegian dairy products and hen’s egg. Food & Nutrition Research, 62, Published Online.

Norden. (2012). Nordic nutrition recommendations 2012 https://www.norden.org/en/publication/nordic-nutrition-recommendations-2012

Olausdottir, A. S., Thorsdottir, I., Wagner, K., & Elmadfa, I. (2006). Polysaturated fatty acids in the diet and breast milk of lactating Icelandic women with traditional fish and cod liver oil consumption. Annals of Nutrition and Metabolism, 50(3), 270–276.

Picciano, M. F., & McGuire, M. K. (2008). Use of dietary supplements by pregnant and lactating women in North America. The American Journal of Clinical Nutrition, 89(2), 663S–667S.

Rajani, P. S., Martin, H., Groetch, M., & Järvinen, K. M. (2020). Presentation and management of food allergy in breastfed infants and risks of maternal elimination diets. The Journal of Allergy and Clinical Immunology. In Practice, 8(1), 52–67.

Swedish Food Agency. (2019). Food for you who are breastfeeding. https://www.livsmedelsverket.se/en/food-habits-health-and-environment/dietary-guidelines/food-for-you-who-are-breastfeeding

Swedish Food Agency. (2020). Food for you who are breastfeeding. https://www.livsmedelsverket.se/globalassets/publikationsdatatabas/andra-sprak/andra-sprak/food-for-you-who-are-breastfeeding

The Norwegian Directorate of Health. (2014). Anbefalinger om kosthold, ernæring og fysisk aktivitet (IS-2170). https://www.helsedirektoratet.no/rapporter/anbefalinger-om-kosthold-ernaerings-og-fysisk-aktivitet/Anbefalinger%20om%20kosthold%20ern%C3%A6ring%20og%20fysisk%20aktivitet.pdf

The Norwegian Directorate of Health. (2016). Nasjonal faglig retningslinje for helsestasjon og skolehelsetjenesten. https://www.helsedirektoratet.no/retningslinjer/helsestasjons-og-skolehelsetjenesten

The Norwegian Directorate of Health. (2019a). Advice for women who are breastfeeding. https://www.helsedirektoratet.no/faglige-rad/rad-till-kvinner-som-ammaer

The Norwegian Directorate of Health. (2019b). Spedbarnsernæring - Nasjonal faglig retningslinje. https://www.helsedirektoratet.no/retningslinjer/spedbarnsernaering

Valentine, C. J., & Wagner, C. L. (2013). Nutritional management of the breastfeeding dyad. Pediatric Clinics, 60(1), 261–274.

Vici, G., Belli, L., Biondi, M., & Polzonetti, V. (2016). Gluten-free diet and nutrient deficiencies: A review. Clinical Nutrition, 35(6), 1236–1241. https://doi.org/10.1016/j.clnu.2016.05.002

World Health Organization. (2011). Exclusive breastfeeding for six months best for babies everywhere https://www.who.int/news/item/15-01-2011-exclusive-breastfeeding-for-six-months-best-for-babies-everywhere

Zeisel, S. H. (2008). Is maternal diet supplementation beneficial? Optimal development of infant depends on mother’s diet. The American Journal of Clinical Nutrition, 89(2), 6855–6875.

SUPPORTING INFORMATION
Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Nordhagen, L. S., Løfsgaard, V. S., Småstuen, M. C., Glavin, K., Carlsten, K-H, Carlsten, M. H., Granum, B., Gübrandsdæg, M., Haugen, G., Hedlin, G., Jonassen, C. M., Nordlund, B., Rehbiner, E. M., Rudl, K., Saunders, C. M., Skjerven, H. O., Staff, A. C., Söderhäll, C., Vettukattil, R., ... Leddorf Carlsten, K. C. (2023). Maternal food-avoidance diets and dietary supplements during breastfeeding. Nursing Open, 10, 230–240. https://doi.org/10.1002/nop2.1298