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Breastfeeding problems and associated factors: a cross-sectional study after the 2023 Türkiye earthquake

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Abstract

Background Breastfeeding offers critical benefits in disasters but faces significant barriers. In this study, we aimed to determine the association between experiencing the 2023 Türkiye earthquake and breastfeeding problems.

Method This cross-sectional descriptive study was conducted in pediatric clinics in eight different provinces of Türkiye, three earthquake-affected provinces and five earthquake-unaffected provinces, between April and July 2023. Breastfeeding mothers and their 0–23 month infants were included in the study. A structured questionnaire was applied to mothers face-to-face. Multivariate logistic regression analysis was performed to determine independent parameters associated with breastfeeding problems.

Results A total of 761 mother-child pairs participated in the study. Among these mothers, 49% ($n=373$) were living in the earthquake-affected region, and 51% ($n=388$) were not. Breastfeeding problems were more common in the earthquake-affected mother-child pairs (48.8%) compared to unaffected pairs (28.6%). Perceived insufficient milk supply was the most common breastfeeding problem, reported by 33.0% in earthquake-affected regions and 11.1% in unaffected region. Breastfeeding problems were 2.01 times more common in mothers from earthquake-affected region (95% CI: 1.45, 2.77) and 1.66 times more common in those who bottle-fed their infants (95% CI: 1.45, 2.37). Perceived insufficient milk supply was 4.12 times more prevalent in earthquake-affected regions (95% CI: 2.73, 6.22) and 1.78 times higher in bottle-feeding mothers (95% CI: 1.23, 2.57). The likelihood of perceived insufficient milk supply was lower in mothers receiving mental health support (AOR: 0.53, 95% CI: 0.33, 0.84) and nutritional support (AOR: 0.49, 95% CI: 0.27, 0.89).

Conclusion Perceived insufficient milk supply is the most common breastfeeding challenge reported by mothers affected by earthquakes, occurring more frequently than among mothers who were not affected. This issue is associated with increased bottle feeding, limited mental health support, and inadequate nutritional support. Addressing this issue through adherence to the International Code of Marketing of Breast-milk Substitutes, controlling donation and distribution of commercial milk formula to discourage bottle feeding, alongside ensuring nutritional and mental health support for mothers, could significantly mitigate breastfeeding difficulties during disasters.

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Keywords Breastfeeding, Perceived insufficient milk supply, Earthquake, Disasters

Background

Breastfeeding has numerous benefits for children, mothers, and society. Therefore, the World Health Organization (WHO) recommends that breastfeeding should be initiated within the first hour of life, that babies should be exclusively breastfed for the first six months, and breastfeeding should be continued with appropriate and sufficient complementary foods until the age of two and beyond [1]. These recommendations are vital in extraordinary conditions such as disasters [2, 3]. An earthquake is one of the most devastating natural disasters. Earthquakes can leave thousands of people homeless and cause many public health problems in the early and late-term [4]. Damage to infrastructure and health systems due to disasters and poor living conditions both put access to safe food at risk and make children more vulnerable to infections [5, 6]. Therefore, the nutritious and infection-protective properties of breast milk are indispensable after earthquakes [7]. Disasters are challenging not only for physical health but also for mental health. In addition to physical effects, breastfeeding has a protective effect against mental health problems such as anxiety [8], postpartum depression [9], and post-traumatic stress disorder (PTSD) [10]. On the other hand, breastfeeding problems are associated with negative mental health outcomes [11]. Although breastfeeding has many benefits during earthquakes, there are many barriers to achieving this. Insufficient privacy or supportive spaces for breastfeeding, stress or exhaustion, limited fluid/nutritious intake for mothers, perception of inadequate breastmilk supply, breastfeeding discouraged by healthcare workers, constant movement or lack of time, untargeted breast milk substitutes (BMS) distribution or easy access to BMS, breastfeeding misconceptions or latching and positioning difficulties, lack of breastfeeding support, perception of contaminated/reduced quality of breastmilk, infant loss of appetite, lack of breastmilk expression equipment, no electricity for breastmilk storage are most common breastfeeding barriers in disasters [12].

The 2023 Türkiye earthquake disaster affected eleven provinces, more than 48,000 people died and hundreds of thousands of people were injured. More than half a million buildings were damaged and many people were left homeless [13]. The Ministry of Health of the Republic of Türkiye reported that just five days after the earthquake, 2840 babies were born in the earthquake-affected region [14]. Crowded breastfeeding environments, stress and fear, decreased breastfeeding support due to changes in social relationships, difficulty in fulfilling basic physiological needs, and lack of professional health workers in the earthquake region were reported to be factors negatively affecting infant feeding in disaster-affected provinces in the 2023 Türkiye earthquake [15]. There is an ongoing need for further data on the breastfeeding problems faced by earthquake-affected mother-child pairs for determining and overcoming breastfeeding difficulties during disasters. This study aimed to evaluate the association between experiencing the 2023 Türkiye earthquake and breastfeeding problems. By identifying specific breastfeeding problems, such as perceived insufficient milk supply, and their associations with disaster conditions, the findings can inform tailored interventions and policies.

Methods

Study design

This cross-sectional descriptive study was conducted between April and July 2023 in pediatric clinics in eight different provinces in Türkiye. Three of the provinces (Adıyaman, Adana and Şanlıurfa) where the study was carried out were earthquake-affected provinces and five (Ankara, İstanbul, Niğde, Kayseri and Mersin) were unaffected (Fig. 1). Nursing mothers and their 0-23-month-old infants who attended the pediatric outpatient clinics for any reason in the hospitals where the study was carried out and agreed to participate were included. Children born before 37 gestation weeks, children born from multiple pregnancies, and mothers who had stopped breastfeeding before the earthquake, and children who attended to hospitals due to a serious illness were not included in the study. The study included infants aged 0–23 months, born from singleton pregnancies with a gestational age of ≥ 37 weeks, resulting in a total of 962 mother-infant pairs. Of these, 466 were from the earthquake-affected region, and 496 were from the unaffected region. 78 infants from the earthquake-affected region and 123 from the unaffected region were excluded due to early cessation of breastfeeding prior to the earthquake. As a result, 388 and 373 mother-infant pairs were included in the final analysis from the earthquake-affected and unaffected regions, respectively (Fig. 2).

Data collection

A questionnaire was applied to the eligible mothers through a face-to-face interview. The questionnaire consisted of 24 questions and took about 15 min to administer. This questionnaire included the social demographic characteristics of mothers and children, breastfeeding characteristics and breastfeeding problems mothers experienced after the earthquake.

The survey included the following questions about breastfeeding, combining both closed and open-ended

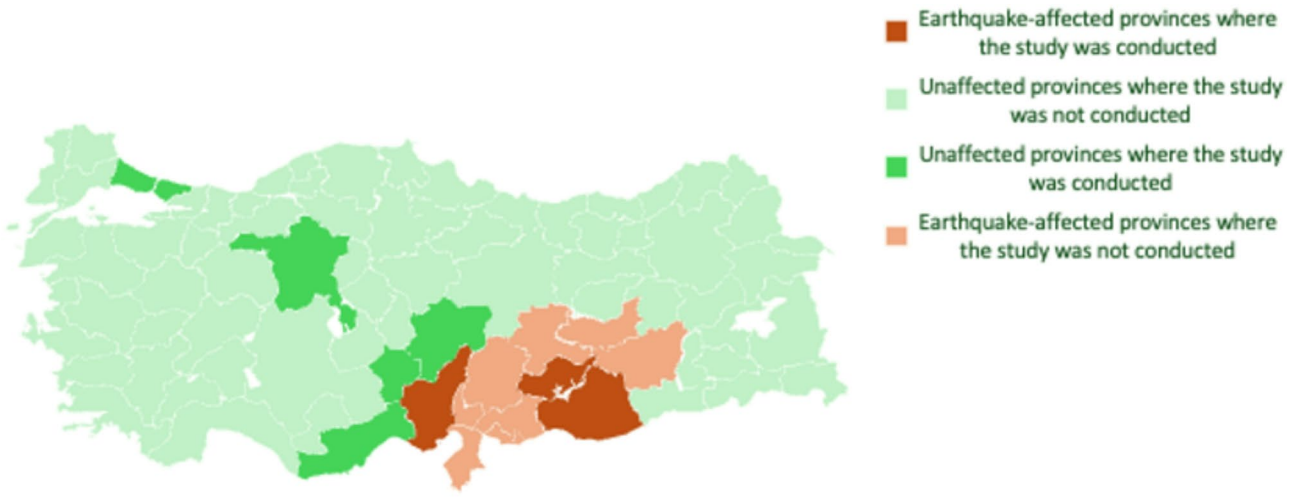

Fig. 1 Provinces in Türkiye where the study was conducted, including both earthquake-affected and non-affected regions

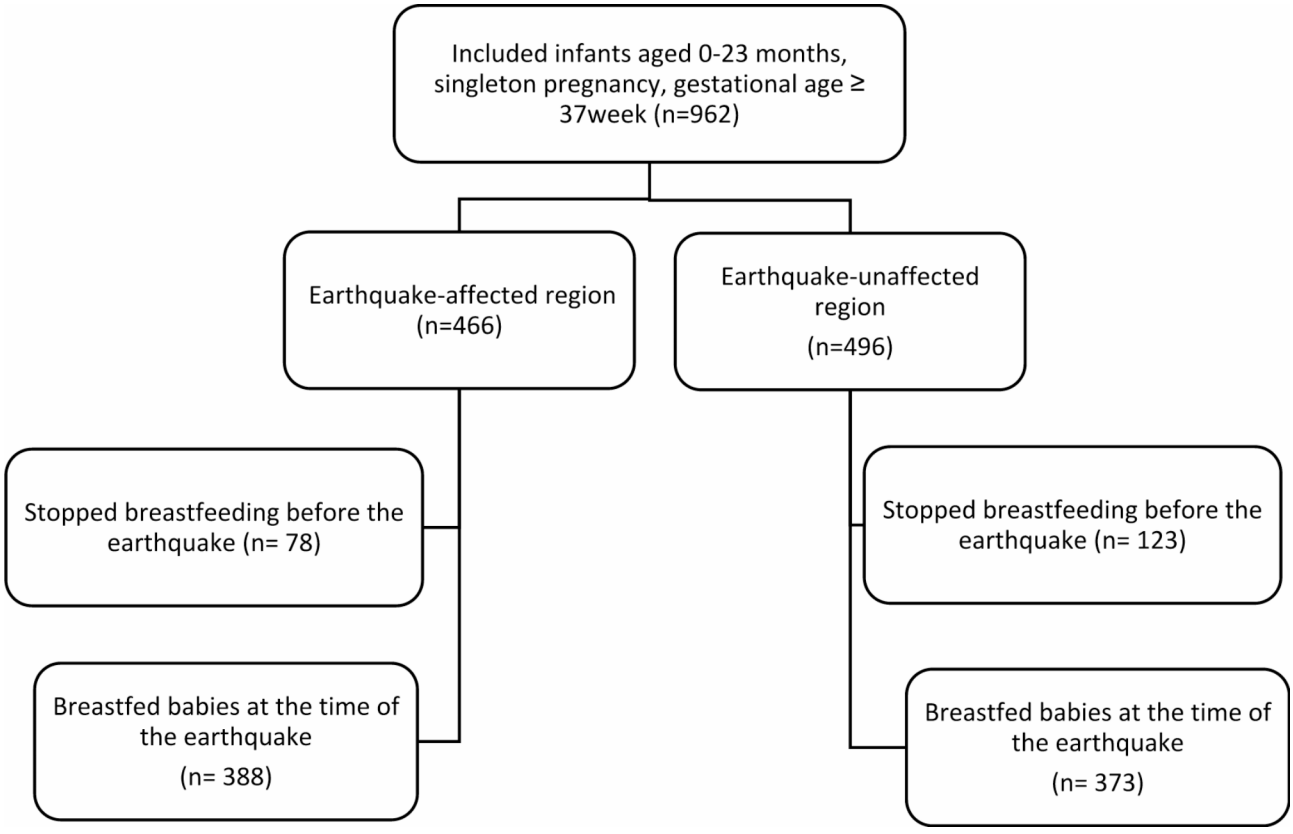

Fig. 2 Selection of participants

questions to capture a wide range of experiences, informed by previous research [16–20]: "Did you breastfeed your child within the first hour after birth?" (Yes, No); "What is the duration (in months) that your child exclusively received breast milk?"; "At what age did you completely stop breastfeeding your child?"; "How many of your children are currently being breastfed?" (A. Not breastfeeding, B. One child, C. Two children, D. Two children of different ages); "If you are breastfeeding, have you experienced any problems with your breasts?" (Multiple options can be selected: No, Nipple pain, Nipple cracks, Breast engorgement, Mastitis, Breast abscess, Excessive milk supply, Insufficient milk supply, Breast rejection, Other [please specify.]); "What is your child's use of bottle-feeding?" (Used before the earthquake,

Used after the earthquake); and "If there was a change in feeding, please specify."

In addition, the questionnaire evaluated the housing, health care, safety, nutrition and mental health support resources of the participants in the environment they lived in the post-earthquake period. A 10-point Likert-type scale was used for this evaluation, similar to the maternal life satisfaction scale in the Syrian sample of the Türkiye Demographic Health Survey [21]. The data were categorized as follows: 0 = very poor, 1-2-3 = poor, 4-5-6 = average, 7-8-9 = good, and 10 = very good. Mothers living in earthquake-affected region were staying in various accommodations, including tents, containers, student dormitories, hotels, relatives' homes, and their own undamaged homes.

Study ethics

Written informed consent was obtained from all mothers before enrolment in the study. Study procedures were performed following the Declaration of Helsinki and approved by the Mersin University Clinical Research Ethics Committee (2023-04-12/241).

Sample size

According to the 2018 Turkey Demographic and Health Survey [22], the prevalence of age-appopriate breastfeeding among infants aged 0–23 months is 52.8%. Sample size was calculated using G*Power (version 3.1.9.4, Franz Faul, Universitat Kiel, Germany) for two independent proportions (Chi-square test), with an alpha error of 0.05, power of 85%, and an expected event frequency of 50% in one group and 40% in the other. The minimum required sample size was 376 participants per group (total $n = 752$). Considering a 15% incomplete survey rate, the target sample size was adjusted to 865 participants, with 433 per group planned. Overall, 373 (84%) of these mothers were from the earthquake-affected region, and 388 (87%) from the non-affected region completed the survey.

Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as numbers and percentages for categorical data. The answers to the questions, which included a 10-point Likert-style scale (housing, health care, safety, nutrition and mental health support resources of the participants in the environment they lived in during the post-earthquake period), were divided into two categories as "good" and "poor". 0–6 points were defined as poor and 7–10 points as good. The Chi-square test or Fisher's Exact test was used to compare categorical variables. $P < 0.05$ was considered statistically significant. In conditions where significance was detected in 3×2 and 4×2 contingency tables, post hoc analyses were conducted to identify characteristics, using Bonferroni correction and adjusted residuals. The multivariable logistic regression analysis was performed to determine the associated factors of breastfeeding problems and perceived insufficient breast-milk supply. Since experiencing an earthquake and living conditions (home, health care, safety, nutrition, and mental health support) are related, we put them in separate models. Adjusted odds ratios (AORs) were calculated at 95% confidence intervals (CI).

Results

A total of 761 mother-child pairs participated in the study. Of these, 49% of the mothers were living in the earthquake-affected region, while 51% were from unaffected areas. There was a significant difference in maternal education levels between the two groups ($p < 0.001$). While 38.1% of mothers in the earthquake-affected region had only one child, this rate was 49.5% among those living in the unaffected region. Of the children who participated in the study from the earthquake-affected region, 42.9% were female, compared to 51.5% in the unaffected region ($p = 0.017$). In terms of breastfeeding initiation, 81.5% of the earthquake-affected children started breastfeeding within the first hour after birth, compared to 88.1% in unaffected group ($p = 0.011$). Additionally, the rate of bottle feeding was higher in the earthquake-affected region than other region (50.1% and 40.7% respectively, $p = 0.011$). While 7.5% of the earthquake-affected mothers stopped breastfeeding after the earthquake, this rate was only 0.8% among unaffected mothers ($p < 0.001$). Mothers in the earthquake-affected region rated housing (57.1% vs. 86.1%, $p < 0.001$), healthcare (62.5% vs. 88.9%, $p < 0.001$), safety (68.6% vs. 88.7%, $p < 0.001$), nutrition (67.6% vs. 89.4%, $p < 0.001$) and mental health support (33.5% vs. 65.2%, $p < 0.001$) as "good" at a lower rate. There was no significant difference between the two groups in terms of maternal age and children's age (Table 1).

Breastfeeding problems were reported by 44.8% of mothers in earthquake-affected regions, compared to 28.6% in unaffected regions ($p < 0.001$). Perceived insufficient milk was identified in 33.0% of mothers in the earthquake-affected group, significantly higher than the 11.1% observed in unaffected regions ($p < 0.001$). Among mothers with children aged 12–23 months, breast refusal was reported by 10.2% in earthquake-affected regions, compared to 1.5% in unaffected regions. Additionally, 1.3% of mothers in earthquake-affected regions experienced breast abscesses, while no cases were reported in the unaffected group ($p = 0.028$) (Table 2).

In the earthquake-affected region, female babies had more breastfeeding problems than male babies (50.6% and 40.4% respectively, $p = 0.049$), while there was no

Table 1 The characteristics of mother-child pairs according to living zone, n(%)

	Overall, (*N* = 761)	**Earthquake-affected region, (*N* = 373)**	**Unaffected region, (*n* = 388)**	***p* value**
Maternal age, year				0.305
< 25	145 (19.0)	77 (20.6)	68 (17.5)	
25–34	502 (66.0)	236 (63.3)	266 (68.6)	
≥35	114 (15.0)	60 (16.1)	54 (13.9)	
Maternal education				< 0.001
Middle school and below	241 (31.7)	165 (44.2)[a]	76 (19.6)[b]	
High school	228 (30.0)	111 (29.8)[a]	117 (30.2)[a]	
University and above	292 (38.3)	97 (26.0)[a]	195 (50.2)[b]	
Number of children				< 0.001
1	334 (43.9)	142 (38.1)[a]	192 (49.5)[b]	
2	248 (32.6)	105 (28.2)[a]	143 (36.9)[b]	
≥3	179 (23.5)	126 (33.8)[a]	53 (13.7)[b]	
Sex (female)	360 (47.3)	160 (42.9)	200 (51.5)	0.017
Age, months				0.540
< 6	240 (31.5)	118 (31.6)	122 (31.4)	
6–11	254 (33.4)	118 (31.6)	136 (35.1)	
12–23	267 (35.1)	137 (36.7)	130 (33.5)	
Early initiation of breastfeeding (within first hour)	646 (84.9)	304 (81.5)	342 (88.1)	0.011
Bottle feeding	345 (45.3)	187 (50.1)	158 (40.7)	0.011
Stopped breastfeeding after the earthquake	31 (4.1)	28 (7.5)	3 (0.8)	< 0.001
Housing (good)	547 (71.9)	213 (57.1)	334 (86.1)	< 0.001
Health care (good)	578 (76.0)	233 (62.5)	345 (88.9)	< 0.001
Safety (good)	600 (78.8)	256 (68.6)	344 (88.7)	< 0.001
Nutrition (good)	599 (78.7)	252 (67.6)	347 (89.4)	< 0.001
Mental health support (good)	378 (49.7)	125 (33.5)	253 (65.2)	< 0.001

The letters a and b indicate statistically significant differences between groups in the same row

Table 2 Distribution of breastfeeding problems according to living zone in studied age groups

		< 6 months		**6–11 months**		**12–23 months**		**0–23 months**	
		Eq-Affected (*n* = 118)	**Eq-Unaffected (*n* = 122)**	**Eq-Affected (*n* = 118)**	**Eq-Unaffected (*n* = 136)**	**Eq-Affected (*n* = 137)**	**Eq-Unaffected (*n* = 130)**	**Eq-Affected (*n* = 377)**	**Eq-Unaffected (*n* = 388)**
Had breastfeeding problems	n (%)	44 (37.3)	47 (38.5)	49 (41.5)	36 (26.5)	74 (54.0)	28 (21.5)	167 (44.8)	111 (28.6)
	p value	0.844		0.011		< 0.001		< 0.001	
Insufficient breast milk supply	n (%)	31 (26.3)	16 (13.1)	43 (36.4)	17 (12.5)	49 (35.8)	10 (7.7)	123 (33.0)	43 (11.1)
	p value	0.010		< 0.001		< 0.001		< 0.001	
Nipple pain	n (%)	14 (11.9)	12 (9.8)	5 (4.2)	11 (8.1)	19 (13.9)	12 (9.2)	38 (10.2)	35 (9.0)
	p value	0.613		0.208		0.237		0.585	
Cracked nipples	n (%)	14 (11.9)	20 (16.4)	7 (5.9)	7 (5.1)	13 (9.5)	7 (5.4)	34 (9.1)	34 (8.8)
	p value	0.314		0.784		0.203		0.865	
Breast refusal	n (%)	5 (4.2)	8 (6.6)	12 (10.2)	7 (5.1)	14 (10.2)	2 (1.5)	31 (8.3)	17 (4.4)
	p value	0.427		0.129		0.003		0.026	
Hyperlactation#	n (%)							3 (0.8)	7 (1.8)
	p value							0.341	
Mastitis#	n (%)							10 (2.7)	12 (3.1)
	p value							0.735	
Breast abscess#	n (%)							5 (1.3)	0 (0.0)
	p value							0.028	

#Since the number of mothers experiencing these problems was low, they were not divided into age groups. Eq: earthquake

difference in the unaffected group. In the earthquake-affected region, mothers with babies aged 12–23 months had more breastfeeding problems than mothers with babies aged 6–11 months and babies under 6 months (54.0%, 41.5%, and 37.3% respectively, $p = 0.019$). However, in unaffected region, mothers with babies under 6 months had more breastfeeding problems than mothers with babies 6–11 months and babies 12–23 months (38.5%, 26.5%, and 21.5% repectively, $p = 0.009$). While 53.5% of bottle-fed babies in the earthquake-affected region had breastfeeding problems, this percentage was 36.0% in those not bottle-fed ($p < 0.001$). In the earthquake-affected region, those with poor nutritional resources had a higher prevalence of breastfeeding problems than those with good nutritional resources (57.0%, and 38.9%, respectively, $p < 0.001$). There was no statistically significant difference in the unaffected group (30.0%, and 17.1% respectively, $p = 0.084$). In the earthquake-affected region, 36.0% of those with good mental health support had breastfeeding problems compared to 49.1% of those with poor support ($p = 0.016$). In the unaffected region, these rates were 20.2% and 44.4%, respectively ($p < 0.001$) (Table 3).

While there was no association between the child's sex and perceived insufficient breast milk supply in the earthquake-affected region, it was observed that in the unaffected region, if the breastfed baby was a boy, there was a higher rate of perceived insufficient breast milk supply (14.4% and 8.0%, $p = 0.046$).

Among mothers in the earthquake-affected region, 38% of those who bottle-fed their babies experienced a milk shortage, compared to 28% of those who did not use bottles ($p = 0.040$). In the unaffected region, the corresponding percentages were 15.2% and 8.3%, respectively ($p = 0.033$). While poor nutrition resources were not associated with insufficient breast milk supply in the unaffected region, it was more common in the earthquake-affected region for those with poor nutrition resources (27.4% vs. 44.6%, $p < 0.001$). While poor mental health support was associated with insufficient breast milk supply in earthquake-affected group, no relation was found in the unaffected group (Table 4).

After adjusting for maternal age (25–34 years vs. <25; ≥35 years vs. <25), education level (high school vs. middle school or below; university and above vs. middle school or below), number of children (2 vs. 1; ≥3 vs. 1), child's age (6–11 months vs. <6; 12–23 months vs. <6), breastfeeding initiation time (within the first hour vs. later), sex (female vs. male), bottle feeding (yes vs. no), and living in an earthquake-affected area (yes vs. no), multivariable analysis (Model 1) revealed that breastfeeding problems were positively associated with bottle feeding [AOR: 1.66 (95% CI: 1.22, 2.26)] and residing in earthquake-affected areas [AOR: 2.01 (95% CI: 1.45, 2.77)]. When additional factors, including housing quality (good vs. poor), safety (good vs. poor), nutrition (good vs. poor), and mental health support (good vs. poor), were considered instead of earthquake exposure, multivariable analysis (Model 2) showed that breastfeeding problems were 1.73 times more likely in bottle-feeding mothers [AOR: 1.73 (95% CI: 1.26, 2.37)]. Moreover, breastfeeding problems were less likely among mothers receiving adequate mental health support [AOR: 0.33 (95% CI: 0.22, 0.49)] (Table 5).

After accounting for confounding factors, multivariable analysis (Model 3) showed that perceived insufficient milk supply was positively associated with bottle feeding [AOR: 1.78 (95% CI: 1.23, 2.57)] and residing in earthquake-affected areas [AOR: 4.12 (95% CI: 2.73, 6.22)]. When accounting for additional factors such as housing, safety, nutrition, and mental health support, excluding earthquake exposure, multivariable analysis (Model 4) indicated that perceived insufficient milk supply was 1.85 times more likely in bottle-feeding mothers [AOR: 1.85 (95% CI: 1.29, 2.66)]. Furthermore, perceived insufficient milk supply was less likely among mothers with nutritional support [AOR: 0.49 (95% CI: 0.27, 0.89)] and those receiving good mental health support [AOR: 0.53 (95% CI: 0.33, 0.84)] (Table 6).

Discussion

We found that breastfeeding problems were more common in the earthquake-affected region compared to the unaffected region. The most common breastfeeding problem in both regions was perceived insufficient milk supply. While one in every ten breastfeeding women in the unaffected region experienced this problem, one in every three in the earthquake-affected region experienced this problem. During emergencies, mothers may perceive that their milk supply has decreased and that they will not be able to feed their babies, and their self-confidence may decrease [23–26]. Unfortunately, violations of the International Code of Marketing of BMS by untargeted formula donation and distribution during disasters are a widespread problem [27–30]. It can cause many babies to be given formula unnecessarily, deprived of the benefits of breast milk and exposed to the risks of bottle feeding [28]. Violations of the Code and uncontrolled BMS donations were also experienced during the 2023 Türkiye earthquake [27, 31, 32]. Consequently, we found that 50% of babies aged 0–23 months in the earthquake-affected region were bottle-fed, and this rate was higher than in the unaffected region. According to Türkiye Demographic and Health Survey (TDHS) 2018 data, the bottle feeding rate among babies aged 0–23 months is 53% [22]. In addition, in a study using the last 30 years of TDHS data, it was found that bottle feeding has increased the most in low-income and low-educated groups over the years however, the bottle-feeding rate is still higher in

Table 3 Factors associated with breastfeeding problems among breastfeeding mothers according to where they live

	Earthquake-affected region *n* (%)*	*p* value	Unaffected region *n* (%)*	*p* value
Overall, having breastfeeding problems	167 (44.8)		111 (28.6)	< 0.001
Maternal age, year		0.128		0.351
< 25	34 (44.1)		20 (29.4)	
25–34	113 (47.9)		80 (30.1)	
≥35	20 (33.3)		11 (20.4)	
Maternal education		0.738		**0.029**
Middle school and below	71 (43.0)		21 (27.6)[ab]	
High school	53 (47.7)		44 (37.6)[b]	
University and above	43 (44.3)		46 (23.6)[a]	
Number of children		0.121		0.555
1	63 (44.4)		51 (26.6)	
2	55 (52.4)		42 (29.4)	
≥3	49 (38.9)		18 (34.0)	
Sex		**0.049**		0.618
Female	81 (50.6)		55 (27.5)	
Male	86 (40.4)		56 (29.8)	
Age, months		**0.019**		**0.009**
< 6	44 (37.3)[a]		47 (38.5)[a]	
6–11	49 (41.5)[a]		36 (26.5)[b]	
12–23	74 (54.0)[b]		28 (21.5)[b]	
Initiation of breastfeeding		0.767		0.453
Within the first hour	135 (44.4)		100 (29.2)	
After the first hour	32 (46.4)		11 (23.9)	
Bottle feeding		**0.001**		0.385
No	67 (36.0)		62 (27.0)	
Yes	100 (53.5)		49 (31.0)	
Housing		0.479		0.884
Poor	75 (46.9)		15 (27.8)	
Good	92 (43.2)		96 (28.7)	
Health care		**0.174**		0.410
Poor	69 (49.3)		10 (23.3)	
Good	98 (42.1)		101 (29.3)	
Safety		0.300		0.359
Poor	57 (48.7)		10 (22.7)	
Good	110 (43.0)		101 (29.4)	
Nutrition		**0.001**		0.084
Poor	69 (57.0)		7 (17.1)	
Good	98 (38.9)		104 (30.0)	
Mental health support		**0.016**		**< 0.001**
Poor	122 (49.1)		60 (44.4)	
Good	45 (36.0)		51 (20.2)	

*row percentage

The letters a and b indicate statistically significant differences among subgroups of variable in the same column

the high-income population [33]. Given that only babies who continued breastfeeding were included in this study, and considering that mothers in the earthquake-affected mothers had a lower socioeconomic level, it can be concluded that this percentage is higher than the Turkish average.

An earthquake is a very devastating disaster, both physically and psychologically. People can become homeless in an instant without access to safe food, clean water, sanitation, and health services. They can also witness many deaths and lose family members, friends, and social support [4]. In this study, the difference between the two groups in terms of both socio-economic and living conditions is obvious. In this study, after adjusting for the demographic characteristics of the mothers other than their living conditions, we found that breastfeeding

Table 4 Factors associated with perceived insufficient milk supply among breastfeeding mothers according to where they live

	Earthquake-affected region *n* (%)*	*P* value	Unaffected region *n* (%)*	*P* value
Overall, perceiving insufficient milk	123 (33.0)		43 (11.1)	< 0.001
Maternal age, year		0.167		0.757
< 25	20 (26.0)		6 (8.8)	
25–34	86 (36.4)		30 (11.3)	
≥35	17 (28.3)		7 (13.0)	
Maternal education		0.307		0.935
Middle school and below	48 (29.1)		9 (11.8)	
High school	42 (37.8)		12 (10.3)	
University and above	33 (34.0)		22 (11.3)	
Number of children		0.196		0.295
1	43 (30.3)		18 (9.4)	
2	42 (40.0)		16 (11.2)	
≥3	38 (30.2)		9 (17.0)	
Sex		0.165		**0.046**
Female	59 (36.9)		16 (8.0)	
Male	64 (30.0)		27 (14.4)	
Age, months		0.172		0.316
< 6	31 (26.3)		16 (13.1)	
6–11	43 (36.4)		17 (12.5)	
12–23	49 (35.8)		10 (7.7)	
Initiation of breastfeeding				0.961
Within the first hour	98 (32.2)		38 (11.1)	
After the first hour	25 (36.2)		5 (10.9)	
Bottle feeding		**0.040**		**0.033**
No	52 (28.0)		19 (8.3)	
Yes	71 (38.0)		24 (15.2)	
Housing		0.783		0.646
Poor	54 (33.8)		5 (9.3)	
Good	69 (32.4)		38 (11.4)	
Health care		**0.075**		0.250
Poor	54 (38.6)		7 (16.3)	
Good	69 (29.6)		36 (10.4)	
Safety		0.417		0.279
Poor	42 (35.9)		7 (15.9)	
Good	81 (31.6)		36 (10.5)	
Nutrition		**0.001**		0.775
Poor	54 (44.6)		4 (9.8)	
Good	69 (27.4)		39 (11.2)	
Mental health support		**0.036**		0.170
Poor	91 (36.7)		19 (14.1)	
Good	32 (25.6)		24 (9.5)	

*row percentage

problems were two times more common, and perceived insufficient milk supply was four times more common in mothers who experienced the earthquake. Mothers in the earthquake-affected region rated housing, health care, safety, nutrition, and mental health support as "good" at a lower rate than other mothers. Studies conducted after the 2023 Türkiye earthquake have shown that dietary diversity, adequate nutritious diet, and food safety cannot be ensured in the earthquake region [31, 32]. Poor nutrition and mental health support were associated with perceived milk insufficiency. In a qualitative study conducted with mothers who experienced the 2023 Türkiye earthquake, mothers reported that limited access to fluids and nutrients reduced their milk production [15]. In another qualitative study conducted after the Haiti earthquake, it was observed that mothers believed that the quality of their milk had decreased due to poor diet, for these reasons, they started complementary feeding

Table 5 Breastfeeding problems and associated factors, multivariable logistic regression analysis

	Model 1			Model 2		
	AOR	**95%CI**	***P* value**	**AOR**	**95%CI**	***P* value**
Maternal age, year			0.077			0.172
25–34 vs. <25	1.23	0.80, 1.90	0.346	1.27	0.81, 1.98	0.299
≥ 35 vs. <25	0.74	0.40, 1.35	0.320	0.84	0.45, 1.57	0.589
Maternal education			0.089			0.149
High school vs. middle and below	1.35	0.90, 2.02	0.152	1.46	0.96, 2.22	0.080
University and above vs. middle and below	0.88	0.56, 1.39	0.589	1.09	0.67, 1.77	0.735
Number of children			0.331			0.573
2 vs. 1	1.30	0.90, 1.87	0.165	1.20	0.83, 1.74	0.343
≥3 vs. 1	1.03	0.65, 1.65	0.890	1.00	0.62, 1.62	0.993
Age, months			0.521			0.587
6–11 vs. <6	0.80	0.55, 1.18	0.265	0.82	0.55, 1.21	0.309
12–23 vs. <6	0.93	0.64, 1.36	0.710	0.93	0.64, 1.36	0.710
IBF; within the first hour vs. later	0.93	0.61, 1.43	0.739	0.97	0.63, 1.50	0.903
Sex; Female vs. male	0.85	0.63, 1.16	0.315	0.88	0.65, 1.21	0.443
Bottle feeding, yes vs. no	**1.66**	**1.22**, **2.26**	**0.001**	**1.73**	**1.26**, **2.37**	**0.001**
Affected by the earthquake; yes vs. no	**2.01**	**1.45**, **2.77**	**<0.001**			
Housing; good vs. poor				1.18	0.72, 1.92	0.519
Health care; good vs. poor				1.02	0.60, 1.73	0.942
Safety; good vs. poor				1.47	0.84, 2.58	0.176
Nutrition; good vs. poor				0.76	0.44, 1.28	0.299
Mental health support; good vs. poor				**0.33**	**0.22**, **0.49**	**<0.001**
Constant	0.30		0.000	0.50		0.029

IBF: initiation of breastfeeding; AOR: adjusted odds ratio; CI: confidence interval.

Model 1: adjusted for maternal age, maternal education, number of children, child's age, IBF, sex, bottle feeding, and being affected by the earthquake

Model 2: adjusted for maternal age, maternal education, number of children, child's age, IBF, sex, bottle feeding, housing, safety, nutrition, and mental health support

earlier and weaned their babies earlier [34]. In addition, there are many studies in the literature showing the relationship between poor nutrition and insufficient milk production in emergencies [12, 16, 30, 35].

Breastfeeding or having breastfeeding problems can be related to maternal mental health problems [16, 17, 25, 36]. Mental health problems may occur in the post-earthquake period [37]. In a study conducted with mothers of children aged 0–24 months after the 2023 Türkiye earthquake, breastfeeding mothers showed lower PTSD scores compared to non-breastfeeding mothers [10]. 78.6% of mothers said their milk supply had decreased. Mothers with decreased milk supply had higher PTSD scores [10]. In another study conducted in Japan, mothers' high Edinburgh Postpartum Depression Scale (EPDS) scores were significantly associated with a lower prevalence of breastfeeding [37]. On the contrary, in a study conducted after the 2023 Türkiye earthquake, the rates of exclusively breastfeeding their babies in the first 6 months and the EPDS scores were similar in earthquake-affected and unaffected mothers [38]. The breastfeeding self-efficacy score was reported to be higher in earthquake-affected mothers. However, the results of that study cannot be generalized due to the insufficient sample size and the unclear selection of the participants. In our study, 34% of the earthquake-affected mothers scored mental health support as good. In comparison, 65% of the unaffected mothers scored it as good, and perceived milk insufficiency was less common in those with good mental health support. Among other needs such as housing, healthcare, safety and nutrition, mental health support was rated lowest in both regions. This shows us that although earthquake-affected mothers need mental health support much more, this is an unmet need for all mothers.

In addition to perceived insufficient milk supply, breast refusal and breast abscess were also found at higher percentages in the earthquake-affected region. Breast refusal may be associated with high rates of bottle feeding. Earthquake-affected mothers scored access to health care as "good" at a lower rate. Not being able to access adequate health care and not receiving early treatment for mastitis may be related to development of breast abscess.

There are some limitations in this study. First, we lack baseline data on bottle-feeding rates prior to the earthquake, which prevents us from directly establishing the changes in bottle-feeding percentages after.

the earthquake. However, the presence of an unaffected group, available data on bottle-feeding practices, and studies documenting violations of the code after the 2023

Table 6 Perceived insufficient milk supply and associated factors, multivariable logistic regression analysis

	Model 3			Model 4		
	AOR	**95% CI**	***P* value**	**AOR**	**95% CI**	***P* value**
Maternal age, year			0.322			0.457
25–34 vs. <25	1.46	0.86, 2.49	0.164	1.38	0.81, 2.37	0.237
≥ 35 vs. <25	1.20	0.59, 2.44	0.614	1.20	0.58, 2.47	0.620
Maternal education			0.339			0.310
High school vs. middle and below	1.43	0.89, 2.32	0.143	1.46	0.90, 2.37	0.130
University and above vs. middle and below	1.29	0.75, 2.22	0.355	1.36	0.77, 2.38	0.292
Number of children			0.184			0.231
2 vs. 1	1.52	0.97, 2.36	0.066	1.40	0.91, 2.17	0.131
≥3 vs. 1	1.30	0.76, 2.24	0.343	1.50	0.86, 2.59	0.152
Age, months			0.434			0.421
6, 11 vs. <6	1.32	0.83, 2.08	0.237	1.29	0.82, 2.04	0.264
12–23 vs. <6	1.05	0.67, 1.66	0.831	1.01	0.64, 1.59	0.981
IBF; within the first hour vs. later	1.10	0.68, 1.78	0.705	1.20	0.74, 1.94	0.452
Sex; Female vs. male	1.03	0.71, 1.50	0.861	1.10	0.76, 1.58	0.611
Bottle feeding, yes vs. no	**1.78**	**1.23**, **2.57**	**0.002**	**1.85**	**1.29**, **2.66**	**0.001**
Affected by the earthquake; yes vs. no	**4.12**	**2.73**, **6.22**	**< 0.001**			
Housing; good vs. poor				1.58	0.89, 2.84	0.121
Health care; good vs. poor				0.56	0.31, 1.01	0.054
Safety; good vs. poor				1.31	0.70, 2.46	0.405
Nutrition; good vs. poor				**0.49**	**0.27**, **0.89**	**0.019**
Mental health support; good vs. poor				**0.53**	**0.33**, **0.84**	**0.007**
Constant	0.04		0.000	0.18		0.000

IBF: initiation of breastfeeding; AOR: adjusted odds ratio; CI: confiedence interval.

Model 3: adjusted for maternal age, maternal education, number of children, child's age, IBF, sex, bottle feeding, and being affected by the earthquake

Model 4: adjusted for maternal age, maternal education, number of children, child's age, IBF, sex, bottle feeding, housing, safety, nutrition, and mental health support

Türkiye earthquake [27, 31, 32, 38] allow for an indirect association to be considered.

Second, this study relied on mothers' self-reports and perceptions. Therefore, housing, healthcare, safety, nutrition, and mental health support may have been assessed differently than actual conditions. Additionally, perceived insufficient milk supply may vary based on individual maternal perceptions.

Third, as this was a hospital-based study, there may have been a segment of the population without access to healthcare, limiting the generalizability of the findings. Furthermore, our sample included breastfeeding mothers with infants aged 0–23 months who visited pediatric outpatient clinics for any reason. This could introduce a potential selection bias, as mothers seeking healthcare services in earthquake-affected areas may have done so due to more severe or complex health concerns for their children compared to those in unaffected areas. Additionally, there is no information on breastfeeding practices among women who did not visit hospitals, making it unclear whether their characteristics, opinions, and experiences were similar across regions.

Despite these limitations, this study provides valuable insights into breastfeeding practices during the 2023 Türkiye earthquake by comparing earthquake-affected and unaffected groups. It captures a range of factors, including maternal perceptions, mental health, and support systems, providing a comprehensive view of the challenges mothers face in disaster settings.

Conclusion

The most common breastfeeding problem identified was perceived insufficient milk supply, which was significantly more prevalent in the earthquake-affected region. Mothers in this area faced worse conditions regarding housing, healthcare, safety, and mental health support. Additionally, bottle feeding was more common in the earthquake-affected region. Perceived insufficient milk supply was associated with bottle feeding, poor nutrition, and inadequate mental health support. To support continued breastfeeding during disasters, it is crucial to ensure that pregnant women and breastfeeding mothers have access to proper nutrition and mental health care as soon as possible. Furthermore, governments should develop and implement official guidelines for infant and young child feeding during emergencies to prevent the unregulated donation and distribution of commercial milk formula.

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Author contributions
Study conception and design: SSY, MEN, ÖT, BG, AB, EKÜ, NK, ZYÖ, HA, EÖ; Acquisition of data: MEN, ÖT, BG, AB, EKÜ, NK, ZYÖ, HA, EÖ; Data transfer from google form to SPSS database and coding; SSY, MEN; Analysis and interpretation of data: SSY, MEN; Drafting of manuscript: MEN; Critical revision: SSY; All authors approved the final version of manuscript and agree to be accountable for authenticity and integrity of the work.

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Data availability
The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This study was performed in line with the principles of the Declaration of Helsinki. The study protocol was approved by Mersin University Ethics Committe (MEU 2023/240). Informed consent is obtained from all parents. Informed consent was obtained for all participants.

Consent to publish
Not applicable.

Conflict of interests
The authors have no relevant financial or non-financial interests to disclose.

Competing interests
The authors declare no competing interests.

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References

1. World Health Organization. United Nations Children's Fund: Infant and young child feeding counselling: an integrated course: trainer's guide. 2nd ed. Geneva: World Health Organization; 2021.
2. World Health Organization. Guiding principles for feeding infants and young children during emergencies. Geneva: World Health Organization; 2004.
3. de Vera Reyes M, Gaul J, Rodriguez E. Breastfeeding issues. In: *Nursing Management of Pediatric Disaster.* edn. Edited by Goodhue CJ, Blake N. Switzerland AG: Springer; 2020: 377–387.
4. Mavrouli M, Mavroulis S, Lekkas E, Tsakris A. The impact of earthquakes on public health: A narrative review of infectious diseases in the post-disaster period aiming to disaster risk reduction. Microorganisms. 2023;11(2):419.
5. Najafi S, Akahavan Rezayat A, Beyzaei SF, Shahriari Z, Taheri Tabar M, Ghasemi Nour M, et al. Incidence of infectious diseases after earthquakes: a systematic review and meta-analysis. Public Health. 2022;202:131–8.
6. Gökçay G, Keskindemirci G, Aşkan ÖÖ, Aksakal MZT. Child health protection during emergency situations. İstanbul Tıp Fakültesi Dergisi. 2023;86(3):254–63.
7. Bilgin DD, Karabayır N. Infant and young child feeding in emergencies: A narrative review. Turk Arch Pediatr. 2024;59(2):135.
8. Miksic S, Uglesic B, Jakab J, Holik D, Milostic Srb A, Degmecic D. Positive effect of breastfeeding on child development, anxiety, and postpartum depression. Int J Environ Res Public Health. 2020;17(8):2725.
9. Tucker Z, O'Malley C. Mental health benefits of breastfeeding: A literature review. Cureus. 2022;14(9):e29199.
10. Oz E, Kucukkelepce O, Kurt O, Kapici Y. The relationship between earthquake-induced post-traumatic stress disorder and breastfeeding attitude and behavior. BMC Psychiatry. 2024;24:343.
11. Yuen M, Hall OJ, Masters GA, Nephew BC, Carr C, Leung K, et al. The effects of breastfeeding on maternal mental health: A systematic review. J Womens Health (Larchmt). 2022;31(6):787–807.
12. Hwang CH, Iellamo A, Ververs M. Barriers and challenges of infant feeding in disasters in middle- and high-income countries. Int Breastfeed J. 2021;16:62.
13. Türkiye Cumhuriyet Strateji ve Bütçe Başkanlığı. Kahramanmaraş ve Hatay depremleri raporu [Republic of Türkiye Strategy and Budget Directorate, Kahramanmaraş and Hatay Earthquake Report] [https://www.sbb.gov.tr/wp-content/uploads/2023/03/2023-Kahramanmaras-ve-Hatay-Depremleri-Raporu.pdf].
14. Türkiye Cumhuriyeti Sağlık Bakanlığı. Duyurular [Republic of Türkiye Ministry of Health, Announcements] [https://www.saglik.gov.tr/TR,94764/bakan-koca-hatay-afet-koordinasyon-merkezinde-aciklamalarda-bulundu.htm].
15. Mizrak Sahin B, Kabakci EN. Breastfeeding experiences of mothers staying in temporary shelter areas in disaster-affected provinces in the 2023 Turkiye earthquake. J Hum Lact. 2024;40(4):613–22.
16. Yalcin SS, Erat Nergiz M, Yalcin S. Evaluation of breastfeeding and infant feeding attitudes among syrian refugees in Turkey: observations of Syrian healthcare workers. Int Breastfeed J. 2023;18:38.
17. Karaburun IEG, Yalçın SS. Breast refusal: an analysis of frequency, onset timing, recovery status, and their interplay with breastfeeding self-efficacy and maternal depression. BMC Public Health. 2024;24:3568.
18. Güneş B, Yalçın SS. Breast refusal and maternal and perinatal risk factors in the newborn period from a single center in Şanlıurfa: Reasons for breast refusal. J Pediatr Acad. 2023;4(3):102–6.
19. Erdal İ, Yalçın SS. Emzirmede sık karşılaşılan problemler [Common problems while breastfeeding]. In: *Turkiye Klinikleri Social Pediatrics-Special Topics: İlk İki Yaşta Sık Karşılaşılan Sorunlar [Frequently Encountered Problems in the First Two Years of Age]. Volume 2*, edn. Edited by Yalçın SS. Ankara: Turkiye Klinikleri, 2021: 26–36.
20. Yalçın SS. Emzirme Danışmanlığı Uygulayıcı Kitabı [Breastfeeding Consultancy Practitioner's Handbook]. Ankara: *TC Sağlık Bakanlığı Halk Sağlığı Genel Müdürlüğü Çocuk ve Ergen*. Sağlığı Dairesi Başkanlığı;; 2019.
21. Yalcin SS, Aydin Aksoy E, Yalcin S, Eryurt MA. Breastfeeding status and determinants of current breastfeeding of Syrian refugee children in Turkey. Int Breastfeed J. 2023;18:10.
22. Hacettepe University Institute of Population Studies. 2018 Turkey Demographic and Health Survey. Ankara: *Hacettepe University Institute of Population Studies, T.R. Presidency of Turkey Directorate of Strategy and Budget and TÜBİTAK;* 2019.
23. DeYoung S, Suji M, Southall HG. Maternal perceptions of infant feeding and health in the context of the 2015 Nepal Earthquake. J Hum Lact. 2018;34(2):242–52.
24. MirMohamadalile M, Khani Jazani R, Sohrabizadeh S, Nikbakht Nasrabadi A. Barriers to breastfeeding in disasters in the context of Iran. Prehosp Disaster Med. 2019;34(1):20–4.
25. Yalcin SS, Erat Nergiz M, Elci OC, Zikusooka M, Yalcin S, Sucakli MB, Keklik K. Breastfeeding practices among Syrian refugees in Turkey. Int Breastfeed J. 2022;17:10.
26. Hargest-Slade AC, Gribble KD. Shaken but not broken: Supporting breastfeeding women after the 2011 Christchurch New Zealand earthquake. Breastfeed Rev. 2015;23(3):7–13.

27. Guan J, Iellamo A, Chase J, Ververs M. Infant formula donations and code violations during earthquake relief efforts in Turkiye in 2023: an observational study. Int Breastfeed J. 2024;19:62.
28. Hipgrave DB, Assefa F, Winoto A, Sukotjo S. Donated breast milk substitutes and incidence of diarrhoea among infants and young children after the May 2006 earthquake in Yogyakarta and Central Java. Public Health Nutr. 2012;15(2):307–15.
29. Giusti A, Marchetti F, Zambri F, Pro E, Brillo E, Colaceci S. Breastfeeding and humanitarian emergencies: the experiences of pregnant and lactating women during the earthquake in Abruzzo, Italy. Int Breastfeed J. 2022;17:45.
30. Vilar-Compte M, Perez Navarro C, Burrola-Mendez S, Sachse-Aguilera M, Veliz P. Barriers and enablers of breast-feeding protection and support after the 2017 earthquakes in Mexico. Public Health Nutr. 2021;24(8):2286–96.
31. Atasoy ZBK, Kurt SC, Beckerman-Hsu J, Soyunen S, Kalyoncu MF, Kaptanoglu A. Evaluation of the emergency nutrition response in Malatya after Türkiye–Syria earthquake. Br J Nutr. 2024;131(7):1244–58.
32. Alatas H. N Arslan 2024 Challenges in the food supply chain following the great earthquake disaster in Turkey: A study of the regions of Malatya, Adiyaman and Kahramanmaras. J Educ Health Promot 13 452 https://doi.org/10.4103/jehp.jehp_1961_23 eCollection 2024.
33. Erat Nergiz M, Yalcin SS, Eryurt MA. Trends and associated factors of bottle-feeding in Turkey: dramatic change over the last three decades under the limited implemented code. Int J Environ Health Res. 2024;34(3):1299–313.
34. Dörnemann J, Kelly AH. It is me who eats, to nourish him': a mixed-method study of breastfeeding in post-earthquake Haiti. Matern Child Nutr. 2013;9(1):74–89.
35. Amat Camacho N, Chara A, Briskin E, Pellecchia U, Kyi HA, de Rubeis ML, et al. Promoting and supporting breastfeeding in a protracted emergency setting-Caregivers' and health workers' perceptions from North-East Nigeria. Front Public Health. 2023;11:1077068.
36. Yalçin SS, Orün E. Breastfeeding status and maternal psychopathologies: in a longitudinal study. Arch Dis Child. 2011;96(9):900.
37. Ando S, Kuwabara H, Araki T, Kanehara A, Tanaka S, Morishima R, et al. Mental health problems in a community after the Great East Japan earthquake in 2011: A systematic review. Harv Rev Psychiatry. 2017;25(1):15–28.
38. Akyıldız C, Şipar V, Yavuz MA, Gur K. The effect of the 2023 Turkey-Syria earthquakes on the sixth-month breastfeeding rate of infants: A single-centre cohort study. Iran J Pediatr. 2024;35(1):e150787.

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