
PUBLIC HEALTH RESEARCH

Breastfeeding Under Siege: A Scoping Review of Flood Impacts on Lactating Mothers

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ABSTRACT

Introduction	Floods, as one of the most frequent and devastating natural disasters, create unique challenges for breastfeeding mothers. However, there is limited understanding of the multifaceted impacts of floods on breastfeeding practices. This review aims to examine the impact of floods on breastfeeding mothers and aims to guide disaster response strategies to support maternal and infant health.
Methods	A scoping review was conducted using the Arksey and O'Malley framework and the PRISMA-ScR methodology. A systematic search of PubMed, Web of Science, and Scopus databases identified eight studies that met predefined inclusion criteria. Eligibility criteria encompassed peer-reviewed articles with quantitative, qualitative, or mixed methods designs. Studies were included if they focused on breastfeeding mothers affected by floods.
Results	Eight studies from diverse geographic regions reported significant impacts on breastfeeding practices, including environmental hazard, sociocultural, malnutrition and psychosocial impacts dimensions. Displacement and lack of privacy (e.g., overcrowded shelters, absence of breastfeeding-friendly spaces) disrupted feeding routines. Additionally, maternal malnutrition, stress, and unregulated distribution of formula milk further undermined breastfeeding efforts.
Conclusions	Flood disasters pose significant challenges in terms of environmental hazard, sociocultural, malnutrition and psychosocial impacts on breastfeeding mothers, jeopardising maternal and infant well-being. Addressing these issues requires integrated disaster response strategies, including breastfeeding-friendly facilities, nutritional aid, and mental health support. These findings underscore the importance of prioritising breastfeeding in disaster preparedness and response plans to enhance resilience and reduce infant mortality during crises.
Keywords	Breastfeeding; Flood disasters; Lactating mothers; Nutrition; Maternal health

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INTRODUCTION

Floods were the most frequent natural disasters, accounting for 44% of all occurrences. The number of significant flood events increased significantly, doubling from 1,389 incidents between 1980 and 1999 to 3,254 incidents between 2000 and 2019.¹ It represents one of the most significant challenges to public health, particularly affecting vulnerable populations such as breastfeeding mothers and their infants.² These natural calamities not only lead to immediate physical destruction but also disrupt essential services and displace families, creating a myriad of barriers that hinder breastfeeding practices. In flood relief camps in Pakistan, more than half of the mothers (21 out of 40; 52.5%) reported a negative impact on their breastfeeding practices due to the floods.

Breastfeeding is crucial for infant nutrition and immunity, especially during emergencies when access to clean water and safe food sources is compromised. The American Academy of Pediatrics (AAP) emphasises the importance of breastfeeding in providing essential nutrients and protection against diseases. It is a vital practice in disaster settings, particularly in contexts where access to clean water and formula preparation facilities is limited.³ Despite its benefits, maintaining breastfeeding practices during floods is fraught with challenges, including displacement and a lack of breastfeeding-friendly facilities.⁴ In low-income settings, the primary measurable benefits of breastfeeding for children include reduced rates of diarrhoea, respiratory infections, and mortality. In high-income settings, breastfeeding provides protection against otitis media, likely reduces the risk of type 2 diabetes, overweight, and obesity, and may offer some protection against type 1 diabetes.^{5,6} In addition to protecting mothers from chronic diseases such as hypertension, cardiovascular disease, hyperlipidemia, and certain types of cancer⁷, breastfeeding also helps reduce anxiety⁸ and depression, for which the benefits tend to diminish if breastfeeding is discontinued prematurely.⁹

While some studies highlight the barriers faced by breastfeeding mothers in disaster settings, such as displacement and lack of facilities, there is an absence of comprehensive reviews explicitly addressing the impact of floods on breastfeeding mothers. This gap underscores the need for further investigation to provide actionable insights for disaster management and maternal health policies. This scoping review aims to explore the multifaceted impacts of floods on breastfeeding mothers. By synthesising findings from diverse studies, this review seeks to inform disaster response frameworks that support maternal and infant health, emphasising the critical importance of breastfeeding in ensuring survival and well-being during crises.

METHODS

Methodology

This scoping review was designed based on the Arksey and O'Malley¹⁰ framework and conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR, 2018). The steps outlined in the framework were methodically followed.

Research question formulation

The primary research question for this study is: What are the impacts of floods on breastfeeding mothers? This question has been formulated using the PEO framework, where the Population (P) is breastfeeding mothers, the Exposure (E) is flood disasters, and the Outcome (O) is the impacts experienced by these mothers. This framework helps clearly define the study's scope and ensures a focused investigation on how breastfeeding mothers are affected during flood disasters.

Data source and search strategy

A comprehensive search was conducted to gather relevant literature across three significant databases: Web of Science (WOS), Scopus, and PubMed. The search strategy used a search string combining population, exposure, and outcome-related keywords. This approach was intended to ensure that all relevant studies were captured, providing a broad overview of existing research on the topic. The search string included terms such as "breastfeeding mothers", "nursing mothers" and "lactating women" for the population, which allowed the search to encompass various terminologies used in different studies. For the exposure, terms like "flood disasters", "flash floods", "coastal floods" and "storm surges" were used to cover a wide range of flood-related events that could impact breastfeeding mothers. The outcome keywords included "impact", "effects", "consequences" and "outcomes" which ensured that various dimensions of the impacts were covered, including both direct and indirect effects on maternal health, breastfeeding practices, and child well-being. This exhaustive search strategy was critical in identifying studies that provided quantitative data and qualitative insights into breastfeeding mothers' experiences during flood disasters. By employing such a thorough approach, the search aimed to capture both the breadth and depth of research available on the impacts of floods on breastfeeding mothers.

Inclusion and Exclusion Criteria

Studies were included if they met the following criteria: they were peer-reviewed original research articles, focused on breastfeeding mothers affected by flood events, and employed observational quantitative designs (such as cross-sectional,

exploratory, or descriptive studies), qualitative methods (such as ethnography or phenomenology), or mixed-methods approaches. One secondary data analysis study was included due to its relevance in describing regional post-disaster food insecurity that impacts breastfeeding practices. Studies were excluded if they were editorials, opinion pieces, government reports, conference abstracts, or non-peer-reviewed grey literature, or if they were not specifically focused on flood-related impacts on breastfeeding mothers.

Study Selection and Data Extraction

The study selection process was conducted in several phases to ensure that only the most relevant and high-quality studies were included in the review. A systematic search across three databases—Scopus, PubMed, and WOS—yielded 77 records (34 from Scopus, 26 from PubMed, and 17 from WOS), as summarised in Figure 1. The records were imported into EndNote 20, where 34 duplicate citations were removed, leaving 43 articles for screening. Initially, titles and abstracts of all articles were screened to determine their relevance

to the research question. This step resulted in 12 articles meeting the inclusion criteria, while 31 were excluded. During the retrieval phase, efforts were made to access all selected articles; however, two articles could not be retrieved despite repeated attempts. Additionally, two articles were excluded during the eligibility assessment because they were found to be unrelated to the context of floods. These exclusions were critical for maintaining the specificity of the research focus on flood-related events. Ultimately, a total of 8 studies were retained for a detailed review. These studies were then organised in a Microsoft Excel spreadsheet for data extraction, documenting study design, geographic location, population characteristics, and the impacts of floods on breastfeeding. This comprehensive approach facilitated the identification of key patterns across the included studies, which were categorised into physical, psychological, and social impacts, enabling a thematic analysis. The selection process ensured the final evidence was reliable and applicable and contributed significantly to a comprehensive understanding of the subject.

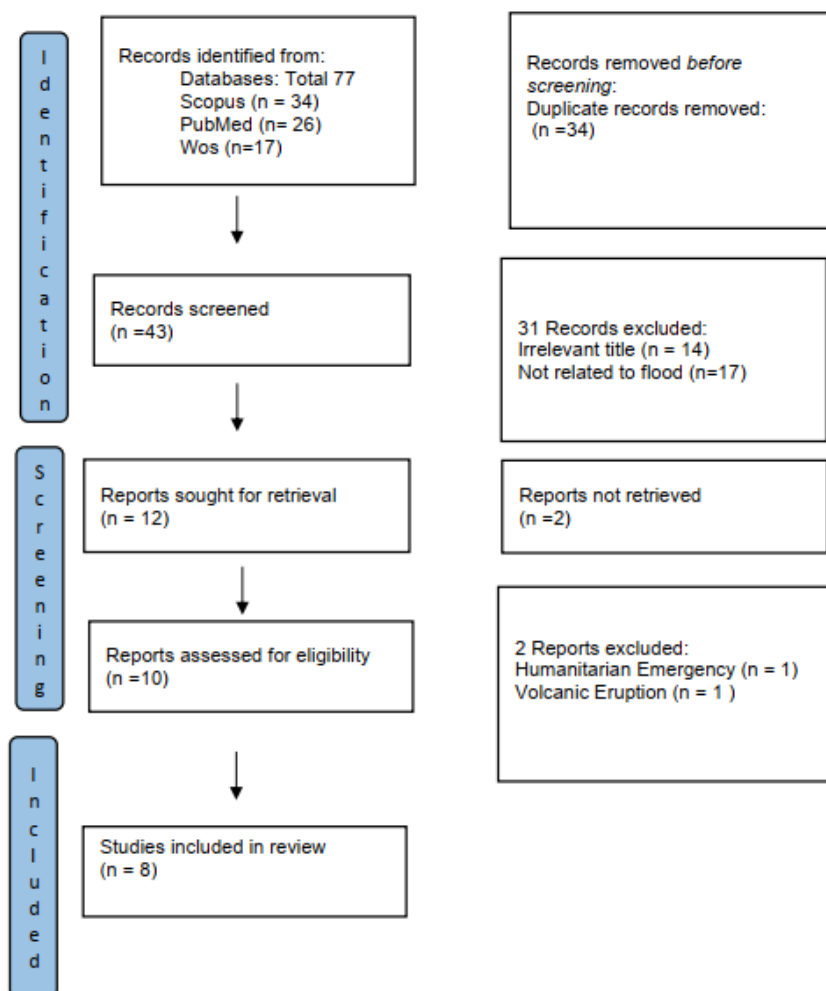


Figure 1 Prisma Flow Chart

RESULT**The Characteristics of the Studies**

Eight studies were included in this review, spanning various geographic locations and study designs, all focused exclusively on lactating mothers as the study population. The studies were published across a broad timeline with no time filter to ensure a comprehensive understanding of the topic. Geographically, the studies represented Pakistan (2 studies), Bangladesh (2 studies), Sudan (1 study),

Japan (1 study), Malaysia (1 study), and the Caribbean region (1 study). The study designs included quantitative studies (n=2), cross-sectional studies (n=2), mixed methods (n=1), ethnography (n=1), exploratory observational (n=1), qualitative descriptive (n=1), and a case study/field report (n=1). These studies provided a comprehensive view of the challenges faced by lactating mothers during floods. The summarised characteristics of the included studies are presented in Table 1.

Table 1 The characteristics of all the studies included in the scoping review

Study, Year	Country	Study Design	Characteristics of Population	Objective
Abdelmoneium et al ¹³	Sudan	Qualitative-Ethnographic Study	129 displaced children aged 10-18 in four camps (Sudan); gender breakdown provided	This paper examines the role of non-governmental organizations (NGOs) in addressing the health delivery system for displaced children in Khartoum, Sudan, with a focus on adopting a rights-based approach to health care and education.
Choi et al ¹²	Japan	Observational-Cross-sectional Study	100 lactating mothers; breast milk samples analysed	To analyse the levels of persistent organic pollutants (POPs), such as polychlorinated biphenyls (PCBs), in breast milk samples from Sendai (prefectural capital city of Miyagi Prefecture, Tohoku region, Japan)
Goudet et al ¹¹	Bangladesh	Mixed Methods- Qualitative & Household Survey	18 mothers, 5 community health workers, 55 children	To identify the impact of flooding on infant and young children's feeding practices
Hirani et al ¹⁵	Pakistan	Qualitative-Ethnographic Study	Displaced women in flood relief camps (Chitral, Pakistan)	To identify and address the factors affecting breastfeeding practices among displaced mothers residing in disaster relief camps
McIntosh ¹⁷	Caribbean Region	Secondary Data Analysis Descriptive analysis	Not specified; regional focus on food security in the Caribbean	To explore methods for increasing food self-sufficiency in the Commonwealth Caribbean following disasters, with a focus on agricultural rehabilitation and food security as well as the impacts of catastrophic events such as hurricanes and floods on food

				availability and nutritional status
Rah et al ¹⁸	Bangladesh	Observational-Cross-Sectional Study	358 lactating mothers (intervention) and 361 (control) in Bangladesh	To document the experience and findings of a cross-sectional assessment of the micronutrient powder program implemented as part of the emergency response to Cyclone Sidr
Rizwan et al ¹⁶	Pakistan	Observational-Exploratory Cross Sectional study	40 lactating mothers in flood relief camps (Pakistan)	To explore the impact of the flood on breastfeeding practices and identify barriers to the continuation of breastfeeding among mothers living in flood relief camps in Pakistan
Sulaiman et al ¹⁴	Malaysia	Qualitative-Descriptive Study Semi-structured interview	30 mothers from flood-affected areas in Kelantan, Malaysia	To explore the concerns and challenges related to infant feeding during the 2014 Kelantan flood in Malaysia. It seeks to identify the impacts of the disaster on breastfeeding and infant nutrition, highlight barriers to optimal feeding practices, and propose strategies to support breastfeeding mothers and their infants during natural disasters.

Impact of Flood on Breastfeeding Mothers

Floods are among the most devastating natural disasters, disproportionately affecting vulnerable populations, including lactating mothers and their infants. During such crises, breastfeeding—a critical source of nutrition and immunity for infants—faces numerous barriers that compromise both maternal and child health. The challenges stem from deprivations in living conditions, limited access to food and healthcare, and the psychological toll of displacement and uncertainty. This review

synthesised findings from eight studies conducted across diverse geographic regions to understand the impacts of floods on breastfeeding practices. The thematic analysis identified three four domains—Environmental hazard, sociocultural, malnutrition and psychosocial effects—that highlight the complex and interconnected barriers lactating mothers face during floods. The results pertaining to impacts are detailed below and presented in summary in Figure 2.

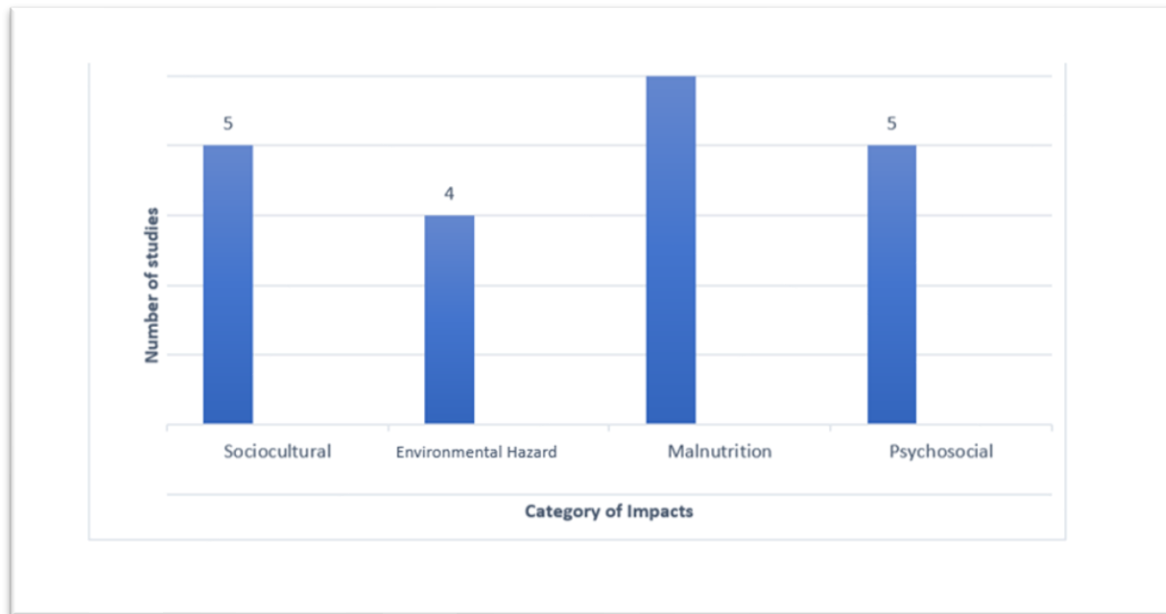


Figure 2 Bar Chart of Impacts of Flood Disasters on Breastfeeding Mothers

Environmental Hazard Impacts

Floods pose significant environmental challenges to breastfeeding mothers, as shown by findings from studies.¹¹⁻¹³ Displaced mothers in Sudan experienced severe challenges in maintaining hygiene and accessing healthcare in displacement camps, which directly impacted their breastfeeding practices.¹³ Key issues included poor environmental cleanliness, such as foul-smelling water, contaminated water and infestations of cockroaches, rats, and snakes.¹¹ Poor sanitation in evacuation centres also exposed mothers to illnesses¹², such as diarrhoea and respiratory infections,¹¹ further impairing maternal health and their ability to breastfeed effectively. Additionally, Choi et al¹² identified persistent organic pollutants (POPs), including polychlorinated biphenyls (PCBs), in breast milk samples from Japan, emphasising the risk posed by environmental contamination during floods. These pollutants raised significant concerns about potential health risks to breastfeeding infants.

Social-cultural Impacts

Floods have profound social effects on breastfeeding mothers, primarily due to displacement.^{13,14} Displaced mothers often find themselves in overcrowded disaster relief camps or temporary shelters without adequate privacy for breastfeeding. This lack of confidentiality undermines maternal confidence and disrupts breastfeeding routines.¹³⁻¹⁶ Constant relocation in flood relief camps disrupted breastfeeding continuity.¹⁶ Additionally, the unregulated distribution of formula milk or liquid suji as substitutes further contributed to this disruption, undermining breastfeeding practices and affecting infant nutrition.^{11,14} Gender-related challenges, such

as gender insensitive (male-led breastfeeding education)¹³ and minimal spousal support further exacerbates these difficulties, leaving mothers to cope with these burdens alone.¹⁵ In Bangladesh, it was documented how increased caregiving and domestic burdens in flood-affected slums left mothers with insufficient time and resources to focus on breastfeeding, leading to a decline in these practices.¹¹

Malnutrition Impacts

6 out of 8 studies reported malnutrition as one of the prominent impacts of flood disasters on breastfeeding mothers. Malnutrition and poor diets were prevalent among mothers in flood relief camps in Pakistan, leading 45% of mothers to reduce breastfeeding frequency and 7.5% to cease breastfeeding entirely due to perceived milk insufficiency.¹⁶ The exclusive breastfeeding rate for infants under six months was notably low at 28.5%.¹¹ This was primarily attributed to a decline in food security, as mothers faced limited access to diverse and sufficient food. As a result, many mothers reported a decrease in their milk supply or even the cessation of breastfeeding altogether, as Hirani et al also supported.¹⁵ Similarly, Rizwan et al¹⁶ observed that food insecurity during floods in Malaysia led to inadequate dietary intake among mothers, causing a noticeable decline in breast milk supply; frequency decreased in 45% of mothers, and 7.5% totally stopped breastfeeding. Lactating women are highly vulnerable to severe dietary deficiencies, particularly in energy, protein, and iron.¹⁷ This is evident from findings where 40% of mothers in the affected areas were classified as thin (BMI < 18.5 kg/m²), indicating chronic energy deficiency. Additionally, anaemia was prevalent

among 55% of lactating mothers, further emphasising the critical nutritional challenges they faced.¹⁸

Psychosocial Impacts

Floods impose substantial psychological burdens on breastfeeding mothers, as demonstrated by findings from five studies.^{11,13,14,15,16} Displaced mothers in Sudan experienced significant stress and anxiety due to displacement, compounded by cultural and structural barriers such as male-led health sessions, which left them feeling embarrassed and hesitant to ask questions or seek support.¹³ Psychological distress, including depression and anxiety, was prevalent among mothers in flood relief camps in Pakistan, with 10% of mothers citing emotional exhaustion as a barrier to continued breastfeeding.¹⁶ These feelings were further amplified by

perceptions of insufficient milk supply caused by poor diet and displacement-related stress. Sulaiman et al¹⁴ observed that mothers in Malaysian evacuation centres faced significant psychological stress due to the lack of privacy and displacement-induced challenges, which disrupted breastfeeding routines. Similarly, Hirani et al¹⁵ documented that displaced woman in Pakistan faced covert oppression, lack of empowerment, and economic hardships, all of which contributed to emotional stress and negatively impacted their breastfeeding practices. Goudet et al¹¹ noted that mothers in flood-affected slums in Bangladesh struggled with overwhelming caregiving burdens and unsanitary conditions, which further contributed to feelings of exhaustion and distress. Collectively, these studies highlight the profound psychological toll floods take on breastfeeding mothers.

Table 2 Impacts of Flood Disasters on Breastfeeding Mothers

Study, Year	The Impacts			
	Sociocultural	Environmental Hazard	Malnutrition	Psychosocial
Abdelmoneium et al ¹³	Displacement from their homes. Privacy issue Husbands do not take part in the health education sessions provided	Lack of access to healthcare Difficulty in maintaining hygiene during times of displacement		Embarrassed to ask questions, especially since the sessions were led by male health promoters lead to stress and anxiety
Choi et al ¹²		Presence of persistent organic pollutants (POPs) in breast milk		
Goudet et al ¹¹	Increased domestic burden, caring for their children with limited resources	Lack of environmental cleanliness (smell of bad water, dirty water with human waste floating everywhere, spread of cockroaches, rats and snakes More morbidity episodes, e.g. diarrhoea, scabies, acute respiratory infection, fever and cold	Decrease and cessation of maternal milk supply as they ate less in quantity and a limited variety of food. Exclusive breastfeeding rate for the under 6 months old was low (28.5%). Liquid <i>suji</i> or diluted powdered milk was given as replacement	Some mothers reported feeling overwhelmed and resorted to stopping breastfeeding altogether due to their psychological distress and exhaustion
Hirani et al ¹⁵	No privacy to breastfeed Gender Insensitivities		Malnutrition lead to negative impact on their breast milk supply	Psychological aftermaths of disaster and displacement.
McIntosh ¹⁷			Lactating women are liable to suffer severe deprivation in dietary intake of energy, protein and iron.	
Rah et al ¹⁸			40% of the mothers in both areas were	

Rizwan et al ¹⁶	Displacement issue Lack of support and privacy	Mother's illness (n=3, 7.5%),	thin (BMI < 18.5 kg/m ²), reflecting chronic energy deficiency. Anemia was prevalent 55% of lactating mothers Inadequate diet: More than half of the mothers (21 out of 40; 52.5%) experienced a negative impact on their breastfeeding practices as a result of the floods. Frequency decreased in 18(45%) mothers and 3(7.5%) totally stopped breastfeeding. Perception of insufficient breast milk (n=6, 15%) Many mothers experienced reduced food availability, which impacted their nutritional intake and subsequently led to a decrease in breast milk production. Uncontrolled donations of infant formula	Depression and anxiety (n=4, 10%),
Sulaiman et al ¹⁴	Displacement issue Lack of privacy			The stress and anxiety caused by displacement and the lack of privacy in evacuation centers further hindered breastfeeding practices among the affected mothers

DISCUSSION

This review highlights the multifaceted impacts of floods on breastfeeding mothers, with displacement emerging as a significant factor exacerbating challenges related to privacy, nutrition, and psychological well-being. Displacement caused by floods forces mothers and their families into overcrowded relief camps or temporary shelters, often lacking the infrastructure needed to support breastfeeding practices.^{13,14,16} These conditions create social and cultural barriers, with mothers frequently reporting discomfort and diminished confidence due to the lack of privacy for breastfeeding in public spaces.¹⁹ Disasters significantly impacted mothers' infant feeding practices, with contributing factors including overcrowded breastfeeding spaces, elevated stress and fear, diminished support due to disrupted social networks, difficulties in meeting basic physiological needs, and a lack of professional health workers in the affected areas.²⁰ Portable solutions, such as

partitions, curtains, and breastfeeding-friendly areas, are crucial in alleviating breastfeeding challenges and supporting maternal well-being during emergencies. Twenty-one revealed that incorporating Apron and Disaster Evacuation Baby Carrier into the Breastfeeding Education Program significantly enhanced mothers' self-efficacy in exclusively breastfeeding in disaster-affected areas. A holistic approach for lactating mothers in disaster settings is crucial to prevent child mortality and developmental delays. Similarly, a holistic approach is essential for lactating mothers in disaster settings to reduce child mortality and developmental delays. The "Baby Friendly Spaces" program in Cameroon, designed for Central African refugees, demonstrated significant positive effects ($p < 0.01$) on maternal mental health, breastfeeding practices, and mother-child relationships, further emphasising the effectiveness of such comprehensive interventions.²¹

Threats to breastfeeding are particularly evident during natural disasters, where factors such as environmental contamination and unregulated formula distribution undermine its benefits. Natural disasters can affect the composition of breast milk, as evidenced by the detection of persistent organic pollutants (POPs).¹² Persistent organic pollutants (POPs) contamination during floods primarily arises from the remobilization of legacy contaminants previously accumulated in soils, sediments, and floodplains, as well as runoff from agricultural, urban, and industrial areas.²² Floodwaters can disturb sediments and soils, releasing pesticides such as organochlorines (e.g., DDT, aldrin, dieldrin), organophosphates, and herbicides, alongside industrial chemicals like polychlorinated biphenyls (PCBs), dioxins, and furans.²³ Persistent and diverse POPs released or redistributed by floods pose long-term environmental and health risks, with floodplains and river systems acting as major reservoirs and transport pathways for these contaminants.²² In disaster settings, formula milk is often distributed to supplement infant feeding.¹⁴ However, the unregulated distribution of formula—meaning distribution without proper oversight, adequate guidance, or adherence to safety and infant feeding guidelines—is highly problematic.²⁴ This practice not only undermines breastfeeding but also faces severe challenges, including limited access to clean water for formula preparation and unhygienic conditions, such as the inability to clean bottles or store excess formula safely.²⁵ Apart from that, the unregulated distribution of breast milk substitutes (BMS), including powdered milk in food rations, can discourage women from breastfeeding, potentially leading to a complete cessation of breastfeeding efforts.¹⁴

Water contamination in these settings also poses significant risks, as formula feeding under such conditions increases the likelihood of diarrhoea and other illnesses in infants. According to the study by Lee et al²⁷ the most common health impact of floods was water-borne diseases (39.7%, n = 31), followed by mental health problems (25.6%, n = 20), other health issues (12.8%, n = 10), and vector-borne diseases (10.3%, n = 8). In Asia, water-borne diseases are the most prevalent health impact, reported in 57% of case studies on the health impacts of floods and droughts, appearing 25 times. Ten of these case studies specifically mention gastrointestinal diseases due to flooding, likely due to overwhelmed sanitation and drainage systems unable to manage sudden water inundation. Enhancing sanitation facilities in evacuation centres is essential to provide mothers with access to clean water and safe, private spaces for breastfeeding. Such improvements would help mitigate health risks and support better breastfeeding outcomes during disasters, ensuring maternal and infant well-being. Breastfeeding is vital in emergencies as it reduces

the risk of infectious diseases and mortality among infants, making it the safest feeding method during disasters.²⁷

During flood disasters, ensuring a clean and adequate water supply for lactating mothers and infants is a major challenge, with several recommendations and contingency strategies suggested by health authorities and disaster response experts. Firstly, regular monitoring of water quality parameters—including in-situ measures such as turbidity, chlorine residual, coliforms, and physical assessments—is essential; when chlorine residual is low, adding chlorine tablets is a common practice to disinfect water, but this should follow local guidelines for dosing and safety.²⁸ For infant feeding, it is recommended to prioritize breastfeeding where possible to minimize infection risks and dependence on water for formula preparation.²⁹ Community-level plans should include redundancy in supply systems, temporary distribution points, and coordination with emergency services to address both quality and quantity needs in disaster settings. Rainwater harvesting can also supplement clean water supplies when conventional systems are disrupted, provided the rainwater is collected and stored in hygienic conditions. Overall, the combination of regular water quality monitoring, effective disinfection, safe storage, the promotion of breastfeeding, prioritizing ready-to-use formula, stockpiling, and robust contingency planning is vital for protecting vulnerable groups during floods.³⁰

A study highlighted the critical role of breastfeeding during disasters. One participant shared, “Breastfeeding helped us survive. My exclusively breastfed baby stayed hydrated in the sweltering heat. I did not have to worry about mixing formula at a time when we could not shower or flush a toilet”.³¹ This underscores breastfeeding's practicality and life-saving benefits in crises, mainly when access to clean water and sanitation is severely limited. The American Academy of Pediatrics (AAP) emphasises breastfeeding for its unique nutritional, medical, and neurodevelopmental benefits to infants. In disaster situations, it is the cleanest, safest, and most recommended source of nutrition for infants under 12 months of age.³²

Malnutrition emerged as a significant challenge among lactating mothers during flood disasters. Six out of eight studies highlighted malnutrition among breastfeeding mothers as a significant consequence of flood disasters. Limited access to food in disaster-affected areas results in maternal malnutrition, directly reducing breast milk production and increasing reliance on formula feeding. and Sulaiman¹⁴ reported that displaced mothers in flood relief camps often perceived insufficient milk supply, exacerbating feelings of inadequacy. Water contamination in these settings also poses significant risks, as formula feeding

under such conditions increases the likelihood of diarrhoea and other illnesses in infants.³³ Despite evidence showing reduced food availability and poor dietary intake among displaced women, there was limited documentation on the availability of structured postnatal monitoring within evacuation centres. Ideally, evacuation sites should include scheduled follow-ups by healthcare professionals, including doctors and nutritionists, to assess the nutritional status of breastfeeding mothers. These professionals not only play a role in managing malnutrition but are also crucial in addressing psychological stress, infections, and other health complications that may compromise breastfeeding. The integration of maternal health services—covering nutritional support, mental health counselling, and clinical follow-up—within emergency shelters is critical for safeguarding maternal and infant health during and after disasters. Nutritional interventions, such as high-protein snacks and fortified supplements for mothers, should be prioritised to sustain breastfeeding during displacement during disaster.³⁴ Micronutrient powder may reduce anaemia among lactating mothers when compliance rates are high. In the intervention area, mothers who consumed at least 75% of the sachets had lower prevalence rates of thinness (31% vs 46%, $p < .05$) and anaemia (50% vs. 61%, $p = .07$) compared to those who consumed less than 75%.¹⁸

The psychological toll of displacement during floods is equally significant. Mothers face heightened stress, anxiety, and depression due to the loss of their homes, caregiving burdens, and economic pressures.^{14,16} These mental health challenges disrupt breastfeeding routines as mother's struggle to adapt to the demands of displacement. Deteriorated mental health resulting from floods is usually due to comorbid physical health problems, financial losses, and community or social disruption.³⁵ Stress, anxiety, and depression not only affect mothers' mental health but also create barriers to breastfeeding, underscoring the need for disaster response strategies that include mental health support, access to counselling, and culturally sensitive interventions to address these psychological challenges. Studies have shown that peer counselling, mother-to-mother support networks, and access to mental health professionals can significantly mitigate psychological distress and encourage continued breastfeeding. Building these support systems into disaster response frameworks can help mothers manage the emotional and practical challenges of displacement. Oz et al.³⁶ highlights the protective role of breastfeeding against PTSD in disaster settings. Mothers in tents had higher PTSD scores (47.6 ± 17.4) compared to those continuing breastfeeding (37.0 ± 16.4), with 78.6% reporting reduced milk supply due to the disaster. Breastfeeding training improved

breastfeeding behaviours (BAES 106.8 ± 56.8) and reduced PTSD scores (32.5 ± 11.0).³⁶ The findings emphasise the importance of breastfeeding education and transitioning to permanent housing to support maternal mental health.

The lack of standardised policies to support breastfeeding in disaster contexts further exacerbates the challenges faced by displaced mothers. Rizwan et al.¹⁶ noted the absence of formal breastfeeding programs in flood-prone regions, such as Pakistan, leaving mothers without adequate resources or guidance. UNICEF 2021³⁷ and WHO (2021)³⁸ emphasize the importance of integrating breastfeeding support into emergency management plans, including privacy accommodations, nutritional aid, and psychosocial interventions. Training healthcare workers and volunteers is essential for delivering culturally sensitive and effective assistance to displaced mothers.³⁹

Recommendations Across Disaster Management Phases

To comprehensively address the vulnerabilities of nursing mothers during flood disasters, interventions should be structured around the four phases of disaster management:

- I. Preparedness: Incorporate breastfeeding-friendly emergency planning at local and national levels, train healthcare workers in infant feeding in emergencies⁴⁰ (IFE), and conduct community awareness campaigns on maintaining breastfeeding during disasters.
- II. Response: Ensure immediate provision of breastfeeding-safe spaces, deploy trained lactation support personnel in relief centers, and avoid uncontrolled distribution of formula milk.⁴¹
- III. Recovery: Offer post-disaster counselling, nutrition support, and follow-up for lactating mothers to restore and maintain breastfeeding practices.
- IV. Mitigation: Invest in resilient infrastructure, integrate IYCF (Infant and Young Child Feeding)⁴² into disaster risk reduction (DRR) strategies, and strengthen health systems to support maternal nutrition and mental health in vulnerable regions.

Strength and Limitation

This review offers a comprehensive understanding of the impacts of flood disasters on breastfeeding mothers, drawing on diverse studies from various geographical regions. Including studies across different research designs and cultural contexts provides a robust and holistic perspective, capturing the social, physical, and psychological dimensions of the challenges lactating mothers face. Furthermore, the review highlights practical,

actionable strategies—such as breastfeeding education programs, improved sanitation, and nutritional support—that can inform disaster response and policy-making. Many of the included studies had small sample sizes, which may limit the generalizability of the findings. Additionally, most of the studies were conducted in Asia, introducing a potential geographical bias and limiting insights into flood impacts in other regions. Despite these limitations, the findings provide valuable insights into the challenges and interventions needed to support breastfeeding mothers during flood disasters.

CONCLUSION

Flood disasters present significant barriers to breastfeeding, jeopardising maternal and infant health. Key impacts or challenges include displacement, inadequate privacy, malnutrition, and stress, which collectively disrupt breastfeeding practices. Addressing these issues requires integrated disaster response strategies prioritising breastfeeding support, including privacy accommodations, nutritional aid, and mental health services. Strengthening these interventions and incorporating breastfeeding-friendly policies into disaster preparedness plans will enhance maternal resilience and protect infant nutrition during crises. To ensure comprehensive support for nursing mothers, disaster interventions should be aligned with the four phases of disaster management: **preparedness** (training, planning, and community education), **response** (safe breastfeeding spaces and trained personnel), **recovery** (psychosocial and nutritional follow-up), and **mitigation** (long-term health system strengthening and DRR integration). Future research should focus on evaluating the long-term impacts of such phased interventions to further refine maternal-infant disaster response frameworks and improve resilience across diverse settings.

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