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Toddler feeding, WASH conditions, and clinical complaints during the 2024 flash flood disaster in Jorong Galuang, Sungai Pua District, Agam Regency, West Sumatra

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Abstract. This study focuses on the impact of flash floods in Jorong Galuang, Sungai Pua, particularly on toddler nutrition, water, sanitation, hygiene (WASH), and clinical health. A qualitative study conducted through interviews and direct observation, data were collected from mothers of toddlers, health officers, midwives, and NGO representatives AIMI. Despite the absence of dedicated MPASI kitchens during the disaster, toddlers did not experience significant difficulties with feeding due to aid from NGOs and the availability of undamaged kitchens in some homes. Water access remained sufficient through local springs and additional supplies from the PMI (*Palang Merah Indonesia*), although hygiene practices, particularly handwashing, were inadequate. Clinical complaints among toddlers were predominantly respiratory issues, including coughs and colds, with a few cases of diarrhea reported.

1 Introduction

Disasters bring significant changes to human life, including economic and infrastructure losses, as well as health problems for the victims [1, 2]. A severe flood in Jakarta is predicted to result in economic losses reaching 36 trillion rupiahs by 2027 if flooding continues [3]. Besides economic damage, disasters also cause health issues, such as physical injuries, diseases due to poor sanitation, and psychological trauma [4]. In Somalia, many refugees lack access to clean water and proper sanitation, increasing the risk of diseases in unhygienic environments [5].

Malnutrition is a common issue among children living in refugee camps, putting them at risk for respiratory infections and malnutrition, such as stunting or severe malnutrition, as seen in Kenya and Somalia. Many children suffer from these conditions [5, 6]. A 2021 study by Astuti revealed that complementary feeding practices in disaster situations often fail to meet the minimum standards recommended by WHO, especially in terms of dietary diversity and hygiene [7]. Research conducted in Somali refugee camps in 2020 found that 85% of children did not receive food that met the Minimum Dietary Diversity (MDD). These camps were overcrowded with poor sanitation, inadequate waste disposal, and water shortages in the toilets. Milk was the main food for children aged 6-23 months, with limited fruits and vegetables, high food prices, and cereal-dominant aid. The consumption of fruits, vegetables, and eggs was extremely low [5].

One of the groups that often receives little attention in disaster situations is infants and toddlers. In many cases, the humanitarian aid provided during disasters focuses more on general needs, while the specific needs of toddlers, such as the availability of complementary feeding (MPASI) and hygiene, often go unnoticed. For example, during the Masamba flood in 2020, public kitchens did not provide special food for young children, resulting in inadequate nutrition [8].

In May 2024, West Sumatra experienced flash floods, affecting several areas, including Agam, Tanah Datar, and Padang Panjang, causing severe damage and loss of life. The flood was triggered by extremely high rainfall upstream of Mount Marapi, which caused cold lahar flows to form after heavy rains eroded volcanic material deposits on the mountain slopes, resulting in more than 58 deaths and dozens of others missing. Many families were forced to evacuate, and many homes and infrastructure, including bridges and roads, were severely damaged, causing major transportation routes in the province to be paralyzed. The impact of the flash flood in Agam, according to BPBD data, included 24 fatalities, 22 injuries, and 704 people displaced. Many houses were affected by this disaster, with 59 severely damaged units, 36 moderately damaged units, and 221 lightly damaged units. The flood also damaged agricultural land, with 348 hectares of farmland being destroyed [9].

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2 Methods

A qualitative study conducted through interviews and direct observation in Jorong Galuang flood disaster. The study involved observation and interviews on the 7th day of the disaster, which was May 17, 2024. Data was collected from various sources, including the interviews that were conducted in an organized sequence, beginning with the BPBD of Agam Regency, followed by the head of AIMI, a non-governmental organization. Subsequently, discussions took place with the nutrition officers from Puskesmas Sungai Pua, village midwives, and local health workers.

Data on toddler feeding, WASH conditions (water, sanitation, and hygiene) from interviews with 23 mothers of toddlers affected were conducted on July 23, 2024. The research variables included clean water, sanitation, hygiene, and clinical complaints. Sanitation is defined as the provision and use of facilities and services for the safe disposal of human urine and feces, thereby preventing environmental contamination. Sanitation practices are categorized into 'Good' and 'Poor' based on specific criteria. 'Good' practices involve using the bathroom for urination and defecation, and disposing of children's diapers in a trash can that is subsequently burned or taken to a final disposal site. In contrast, 'Poor' practices include not using the bathroom for these needs and failing to properly dispose of children's diapers by not placing them in a trash can for burning or final disposal

Hygiene refers to the practice of washing hands with soap after defecating and disposing of children's feces, before preparing and handling food, and before eating. Good hygiene practices include washing hands before eating and preparing food. On the other hand, poor hygiene practices involve either occasionally or not always washing hands before eating and preparing food.

3 Results

Data from the Agam Regency BPBD recorded that a flash flood struck Jorong Galuang, located in Agam Regency, and it was one of the most severely affected areas by the flood. According to data from BPBD and interviews with local residents, the flash flood in Jorong Galuang brought mud, stones, and wood from the hillside, which then buried parts of the settlement and agricultural land in the area. Other areas in Agam Regency were also affected by the flash flood, but Jorong Galuang was among the worst-hit. The floodwaters that passed through Jorong Galuang carried debris and caused a flash flood that destroyed several houses and public facilities. On the seventh day, the researcher went to the field and also observed the disaster's impact on buildings. Not all areas were severely affected, but some houses were destroyed, and debris carried by the flood was piled up.

In addition to Jorong Galuang, other areas affected by the flash flood in Agam Regency included several areas along the river, located at the foot of the mountain. The affected sub-districts included Canduang, Sungai Pua, IV Koto, Ampek Angkek, Tilatang Kamang, Kamang Magek, Palembayan, Malalak, Tanjung Raya, Baso, Banuhampu, and Palupuah. The damage in these areas varied, ranging from minor to severe damage, depending on proximity to the flood source and the area's topography (Fig. 1).

Fig. 1. Community service for the flash flood in Jorong Galuang, Sungai Pua

According to data from BPBD Agam Regency, in Jorong Galuang, 15 houses were severely damaged, 5 houses sustained moderate damage, and 15 houses were slightly damaged. There were six fatalities: two children aged 10 and 15, one person aged 53, and the rest were elderly individuals aged 61 and 71.

3.1 Feeding toddlers in disaster areas

Interviews with village midwives, health workers, and mothers in Jorong Galuang revealed that most areas were not severely damaged during the flash floods (Fig. 2). One-third of the affected areas did not have significant home damage, allowing families to prepare meals for their children. Lower-lying areas were hit harder, but no toddlers lived there, so nutritional needs were not significantly impacted. In the first three days, most families received food aid from neighbors and family members, with no need for specially prepared MPASI. Some children over 12 months were given instant porridge during this time.

On the 7th day, researchers observed that the public kitchen did not provide special MPASI meals. Interviews with the nutrition officers of Puskesmas Sungai Pua revealed a lack of specific feeding protocols for toddlers during the disaster, although toddlers were registered. The nutrition officers mentioned they had no prior training in disaster nutrition, making toddler nutrition management a challenge.

Fig. 2. Direct observation of public kitchens and interviews, along with counselling for mothers of toddlers

Mothers whose homes were not heavily damaged could continue cooking, although ingredient variety was limited. Families with intact homes had better access to food and supplies, while those with damaged homes struggled. By the third day, local markets reopened, improving food access. Support from AIMI (Indonesian Breastfeeding Mothers Association) and PERSAGI (Indonesian Nutritionists Association) was significant in providing both funds and pre-arranged menus for toddlers.

The village midwives reported that public kitchens were established three days after the disaster, with assistance from volunteers and Universitas Islam Negeri Batusangkar. AIMI provided MPASI for 23 toddlers in Jorong Galuang. AIMI organized donations through social media and worked with the local Puskesmas to plan menus and distribute food. Meals included carbohydrates, protein, vegetables, and fruit, and were cooked by local volunteers. Evaluations showed that children consumed the meals provided by AIMI.

Interviews conducted on May 19, 2024, revealed that most toddlers were eating according to their needs, consuming three meals daily with occasional fruit and vegetable snacks. Breastfeeding continued without issue, and one child on formula milk prior to the disaster continued receiving it, with no problems preparing the formula. Families purchased some food, and formula donations allowed more children to start consuming formula regularly. The formula was distributed by the village midwife after being donated by volunteers to the Poskesri (*Pos Kesehatan Nagari*).

3.2 WASH conditions in Jorong Galuang

Table 1. Results of interviews on sanitation overview among mothers of toddlers in Jorong Galuang

	Good	Poor
Sanitation	23 (100%)	0 (0%)
Hygiene	5 (21.7%)	18 (78.3%)

In Jorong Galuang, interviews with residents indicated that the majority of households relied on spring water for drinking, washing, and preparing food. The village midwives reported that additional clean water was supplied by PMI (Palang Merah Indonesia) using four water tank trucks. Conversations with mothers revealed that while sanitation conditions for both mothers and children were generally adequate, there were issues with hygiene practices. Many did not wash their hands with soap before preparing or serving food, and children did not always wash their hands before eating. Despite the disaster, the clean water supply remained largely unaffected. On the 7th day of the disaster, researchers observed that the public kitchen had access to spring water, which was used for cooking and cleaning utensils, as confirmed by kitchen staff (Table 1).

3.3 Clinical complaints among children in Jorong Galuang

Table 2. Results of interviews on clinical complaints among mothers of toddlers in Jorong Galuang

	f (%) n = 23	
	Yes	No
Diarrhea	4 (17.4%)	19 (82.6%)
Cough	9 (39.1%)	14 (60.9%)
Cough and Runny Nose	9 (39.1%)	14 (60.9%)
Hospitalized	0 (0%)	23 (100%)

On July 23, 2024, interviews and nutritional counseling sessions for toddlers were held in Jorong Galuang (Table 2). The interviews were conducted solely with the mothers of 23 toddlers. During the interviews, a few clinical symptoms were reported. Most of the children had suffered from coughs and colds during the disaster, while

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only four cases of diarrhea were noted. No skin-related issues were reported, and no serious conditions requiring hospitalization were observed.

4 Discussion

4.1 Feeding toddlers in the Jorong Galuang flash flood disaster

Based on the interviews, the quality of food provided during the disaster was considered good due to external aid, and most homes remained intact, supporting the preparation of good-quality meals. However, the quantity of food could not be measured as the researcher did not directly observe all feeding processes. Darwis et al. highlighted challenges in meeting food needs for toddlers in disaster-prone areas, such as Desa Nagrakjaya, Sukabumi, where people rely on small shops and mobile vendors for food. No special provisions for toddlers were made, and during disasters, residents depended on aid from others, without stocking up on food for both adults and toddlers, who require different nutrition [10].

Research in Desa Dasan Geria, Lombok Barat, found that both the quantity and quality of food for toddlers in disaster areas were inadequate. Toddlers in evacuation centers often consumed instant noodles and snacks, which did not meet their daily calorie needs. Their food was not separated from adult meals, differing only in spice level, leaving them with limited nutrition. Despite efforts to provide nutritious food, including MP-ASI biscuits, aid mostly consisted of instant food, lacking fruits, vegetables, and sufficient animal protein [11].

The quality of the food provided also did not meet the recommended Nutritional Adequacy Ratio (AKG). Although there were efforts from some parties to provide nutritious food, such as distributing MP-ASI biscuits, food aid was still dominated by instant foods and lacked sufficient fruits, vegetables, and animal proteins. The food provided was less varied and often did not contain all the nutrients toddlers need for optimal growth and development [11].

The issue of good-quality food but insufficient quantity for toddlers in disaster areas remains critical. While the food provided may have high nutritional value, inadequate portions can cause health issues. Balanced nutrition is essential for toddlers' growth, and fortified food aid with additional nutrients, along with vitamin and mineral supplementation programs, are often implemented in disaster situations [12].

Insufficient food quantity means that toddlers do not receive enough calories to meet their daily energy needs. Although the food may be of good quality, a lack of quantity can hinder daily activity and growth. Research shows that toddlers in disaster-affected areas often receive only a fraction of their required daily caloric intake due to limited food access and distribution [13].

This insufficient food intake can lead to malnutrition, weakened immunity, growth issues, and cognitive problems. Malnourished toddlers are more prone to infections and diseases as their immune systems are compromised. Chronic malnutrition can cause stunting, affecting height and brain development, which can later impair learning abilities [14].

To address these issues, sufficient food distribution, fortified food with micronutrients, parental education on providing adequate and nutritious food, and regular monitoring of nutritional status are necessary. By ensuring that food is both high in quality and quantity, the risk of malnutrition can be reduced, supporting optimal recovery and growth for toddlers in disaster-affected areas [15].

4.2 WASH conditions for toddlers in the Jorong Galuang flood disaster

Water availability in the area was adequate, with the primary source being local springs. The water used for daily needs, especially drinking, was boiled first to ensure cleanliness. Additionally, the community received additional support in the form of water supplies, which helped ensure the availability of clean water. The sanitation conditions in the area were considered good, with adequate systems in place to maintain environmental cleanliness. However, hygiene levels were still suboptimal, indicating areas that required more attention to ensure better personal and environmental hygiene.

Providing food during emergency disaster response based on WASH (Water, Sanitation, and Hygiene) principles is an important step in ensuring that the food distributed to disaster victims is not only nutritious but also safe and hygienic. WASH principles include providing clean water, adequate sanitation, and good hygiene practices, all aimed at preventing the spread of diseases that can exacerbate emergency situations. By integrating these principles, disaster emergency responses can be more effective in protecting the health and well-being of affected communities [16].

Good sanitation is essential to prevent food contamination and the spread of diseases during emergency response. Measures that need to be taken include providing adequate toilet facilities and preventing environmental contamination. Temporary emergency sanitation facilities, such as portable toilets or makeshift sanitation, should be installed to ensure that human waste is properly managed and does not contaminate water sources or the surrounding environment. Effective waste management, including the safe collection and disposal of waste, is essential to maintaining cleanliness and public health. Food storage areas should also be regularly cleaned and disinfected to prevent contamination [16].

Good hygiene practices are key to preventing food- and waterborne diseases. Promoting hand washing with soap before preparing or consuming food, after using the toilet, and after handling raw materials is crucial. The distribution of hygiene supplies such as soap, hand sanitizers, and other hygiene equipment to affected communities must be done evenly. Education on the importance of hygiene practices should be carried out through community awareness campaigns and training for healthcare workers and volunteers [16].

Access to clean water often becomes a challenge during disasters, requiring efforts like distributing water

via tankers or using purification tablets. Sanitation facilities, including portable toilets, are crucial to managing waste safely and preventing disease spread. Hygiene education and distribution of supplies such as soap and hand sanitizers are also key [16].

A study by Uprety et al. following the 2015 Gorkha earthquake in Nepal revealed that despite efforts to provide water and sanitation, contamination and inadequate hygiene education remained problems [17]. Similarly, research by Sneha Krishnan after Cyclone Phailin in India showed that even with improvements in water access and hygiene education, changing sanitation practices remained difficult due to cultural norms. An integrated approach involving health education, changes in social norms, and better sanitation facilities are needed to improve WASH conditions during disaster recovery [18].

During disasters, access to clean drinking water often becomes a major issue. Damaged infrastructure results in many water sources being contaminated by pathogens, making the water unsafe to consume. Contaminated drinking water increases the risk of waterborne diseases such as diarrhea and cholera, which are particularly dangerous for toddlers, as their immune systems are weaker compared to adults [17].

Sanitation facilities in evacuation sites are generally inadequate. Many evacuees have to share a limited number of toilets, which are not always clean. The lack of proper sanitation facilities leads to the spread of infectious diseases, severely affecting the health of toddlers. Poor sanitation also creates an unhygienic environment, worsening the general health conditions of evacuees. Hygiene practices are often neglected in emergency situations. The lack of access to soap and clean water makes it difficult to maintain personal hygiene, including regular hand washing. For toddlers, poor hygiene increases the risk of skin infections, respiratory illnesses, and digestive diseases. Education on the importance of hygiene in emergency situations needs to be enhanced to reduce health risks associated with poor hygiene [17].

Research conducted by Sneha Krishnan in Odisha, India, after Cyclone Phailin in 2013 provides insight into the WASH conditions for toddlers during the disaster recovery period. The study showed that although there were improvements in access to clean water and increased hygiene awareness, there were still significant challenges in changing sanitation practices within disaster-affected communities. The interventions included improvements and installation of clean water sources, construction of communal toilets, and hygiene promotion campaigns. However, significant changes in sanitation practices were still difficult to achieve due to strong cultural norms supporting open defecation. To improve the effectiveness of WASH recovery programs, a more integrated and participatory approach is needed, involving health education, changes in social norms, and improved access to proper sanitation facilities [18].

4.3 Clinical complaints in toddlers during the Jorong Galuang flood disaster

Most children experienced coughs and colds during the disaster, with only four cases of diarrhea. This aligns with research by Bahie Mary Rassekh and Mathuram Santoshamb in Aceh after the 2004 tsunami, which found that children aged 1-5 were most vulnerable to diarrhea, respiratory infections, fever, and skin diseases. Similarly, a study by Ashlesha Datar et al. in India showed that exposure to natural disasters increased the risk of acute illnesses such as diarrhea, fever, and respiratory infections in children under five by 9-18%. Disaster exposure also negatively impacted physical growth, leading to a 7% increase in stunting and underweight, and reduced age-appropriate immunization coverage by nearly 18% [19].

Both studies highlight that children affected by disasters are highly susceptible to infectious diseases and experience deteriorating overall health, both in terms of acute illness and long-term growth and development. Health interventions should prioritize access to formal healthcare, health education, and targeted support for children who have lost parents or live in evacuation centers [19, 20].

In this study, sanitation was generally adequate, but hygiene practices were poor, with inconsistent handwashing using soap by both mothers and children. Despite the disaster, the clean water supply remained stable, supported by PMI's additional water deliveries. This aligns with research by Uprety et al. and Datar et al., along with analyses by Rassekh and Santosham, revealed that diarrhea and cough are the most common complaints in children during natural disasters, often due to poor water quality, sanitation, and hygiene [17, 19, 20]. After the 2015 Gorkha earthquake in Nepal, many children experienced diarrhea from contaminated water and inadequate sanitation in evacuation centers, which also led to an increase in respiratory infections. Children from disaster-affected homes without parental access often receive inadequate healthcare, heightening their risk for illnesses like diarrhea and cough. Addressing these issues requires proper interventions in clean water supply, sanitation facilities, and healthcare services to protect children's health during crises [17].

5 Conclusion

During the flash floods in Jorong Galuang, there was a public kitchen, but no dedicated kitchen for MPASI (complementary feeding for toddlers), but toddlers still received adequate food due to aid from NGOs, community support, and minimal damage to homes. Water supply remained sufficient through local springs and PMI assistance. While sanitation access was available, many mothers exhibited poor hygiene, particularly in handwashing. Toddlers' primary health issues were coughs, colds, and diarrhea. To improve disaster preparedness, health officers, nutritionists, and volunteers should receive training on MPASI kitchen implementation, and hygiene education should be enhanced.

The limitations of this study include that the research conducted fieldwork for interviews and observations independently without collaboration with governmental departments, such as the BPBD, Social Services Department, and the Health Department, which are key policy makers. This lack of cooperation during disaster response and interviews hindered access to direct data from these agencies. Other than that, the interview with the mother of the toddler was conducted 2 months after the disaster, so an accurate food recall during the disaster could not be obtained. Support from the BPBD, Social Services, and the local Health Department is necessary in conducting disaster research to ensure direct access to data from relevant agencies in affected areas.

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