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REVIEW PAPER

NUTRITION MANAGEMENT OF INFANTS AND TODDLERS IN A POST-DISASTER SITUATION

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ABSTRACT

Indonesia is highly susceptible to natural disasters, making nutrition management crucial for supporting refugees, especially infants and toddlers. This article reviews post-disaster nutritional interventions, focusing on this vulnerable group. Data were collected through searching articles covering national and international studies using databases such as Science Direct, ProQuest, and local journals based on relevant keywords. The present review showed that post-disaster nutrition interventions for toddlers in Indonesia include various forms, including the distribution of ready-to-eat food, locally-based complementary foods (MP-ASI,

makanan pendamping air susu ibu), micronutrient supplementation, and providing educational services for caregivers. Several key factors can reduce the effectiveness of emergency nutrition programs, including limited infrastructure, limited trained human resources, funding constraints, and weak inter-agency coordination. In addition, efforts are needed to ensure the sustainability of post-disaster nutrition assistance programs through a multidimensional approach involving integration into public health services, policy and budget support from the government, community empowerment, and collaboration with non-governmental organizations (NGOs). In summary, while short-term nutritional interventions for toddlers in post-disaster contexts can significantly reduce malnutrition rates, addressing sustainability is vital to prevent future risks as support diminishes. This can be achieved through enhanced integration into public health frameworks, robust policy support, and community capacity building.

Keywords: crisis situations; malnutrition; nutritional programs; post disaster scenario; young children

INTRODUCTION

Indonesia is highly vulnerable to natural disasters, ranking as one of the three countries at the most significant risk [1]. One area mainly affected is the province of Gorontalo. Over the past 20 years, Gorontalo has experienced two significant flood events, in 2008 and 2024. The region is prone to floods, flash floods, and landslides, particularly during the rainy season when intense rainfall occurs. Almost all areas of Gorontalo Province are affected during this time. Several factors contribute to the flooding in Gorontalo City, including heavy rainfall, basin-shaped topography, land use, soil type, and an inadequate drainage system. In July 2024, the Regional Disaster Management Agency (BPBD, *Badan Penanggulangan Bencana Daerah*) reported 36,100 flood victims. Additionally, a landslide in a mining area in East Suwawa resulted in 325 casualties: 283 people survived, 27 lost their lives, and 15 are still missing [2]. The increasing frequency of natural disasters in Gorontalo has significantly impacted the

community, particularly concerning nutrition, which is closely linked to the health of disaster-affected populations.

Nutritional management in disaster situations is integral to handling refugees quickly and appropriately. Infants and toddlers are the most vulnerable groups and require exceptional nutritional management. Food assistance for infants and toddlers during and after a disaster is still challenging because they can only consume some types of food provided in the evacuation center [3, 4].

Post-disaster nutritional challenges in Indonesia represent a critical public health concern, particularly given the country's susceptibility to frequent natural disasters, including volcanic eruptions, floods, and landslides. Toddlers are one of the most vulnerable demographic groups affected by these events, often experiencing significant nutritional deficiencies that can lead to malnutrition and, in severe cases, acute malnutrition or deficiencies in essential micronutrients [5, 6]. Existing literature highlights several contributing factors to this issue: the disruption of breastfeeding due to separation from mothers, the prevalence of infant formula and feeding bottles, inadequate knowledge regarding the preparation of locally sourced foods for infants and toddlers, and inappropriate feeding practices that increase the risk of morbidity and mortality, especially post disasters. Research indicates that the mortality rate among infants and children suffering from micronutrient deficiencies is notably higher, with toddler mortality rates estimated to be 2–3 times greater than those for all age groups, including infants aged 0–6 months. Furthermore, post-disaster nutritional management is suboptimal, particularly concerning the unique nutritional requirements of the toddler population. Contributing factors include limited access to nutritious food, inconsistent distribution, and logistical and resource constraints. Additionally, a lack of awareness and understanding of appropriate food preparation for infants and toddlers in refugee settings exacerbates these challenges [7, 8].

Proposed solutions include providing coordinated emergency nutrition services by integrating health cadre training and cross-sectoral collaboration between the government, non-governmental organizations (NGOs), and local communities. Specific interventions for children under five include providing locally based supplementary foods, micronutrient supplementation such as vitamin A and iron, and educating parents about the importance of

safe and appropriate complementary feeding practices during evacuation [8–10]. Implementing evidence-based nutrition interventions can reduce malnutrition rates in children under five and improve post-disaster nutritional resilience.

Government agencies, community organizations, and self-help initiatives need to effectively optimize the response to the food and nutrition crisis resulting from the disaster. This is primarily due to a need for more familiarity with rapid and appropriate action in critical situations [7, 11]. Numerous print and electronic media reports highlight complaints regarding the delayed assistance for disaster survivors, underscoring the necessity for a more systematic approach to this issue. Therefore, it is imperative to implement rapid and evidence-based post-disaster nutrition management strategies to ensure that refugees, particularly vulnerable populations such as infants and toddlers, receive adequate nourishment and maintain their nutritional status.

METHODS FOR LITERATURE SEARCHING

This study used a systematic review design to assess toddler nutrition management in post-disaster conditions in Indonesia. This design was chosen because it allows for in-depth analysis of empirical findings from related literature. Data were collected through article searches covering national and international studies using databases such as Science Direct, ProQuest, and relevant local journals. This study focuses on nutrition management strategies and their impacts on toddlers, especially nutritional stability after a disaster. Data were collected through literature searches filtered based on keywords such as “post-disaster toddler nutrition,” “emergency nutrition management,” and “nutrition assistance in evacuation.” Relevant literature included empirical studies, case reports, and theoretical reviews on the effectiveness of nutrition interventions in emergency disaster situations.

NUTRITIONAL INTERVENTION FOLLOWING DISASTER OCCURRENCE

The present review shows that post-disaster nutritional interventions for toddlers in Indonesia include various forms, including the distribution of ready-to-eat food, locally-based complementary feeding (MP-ASI), micronutrient supplementation, and educational services

for caregivers. Several NGOs and the government have been actively involved in setting up public kitchens in affected areas to provide foods readily accepted by toddlers, such as mung bean porridge and high-protein foods [9]. In addition, various supplementation programs have also been implemented, significantly to increase the intake of vitamin A, iron, and other supplements that are important for the development of toddlers affected by malnutrition [10], as well as the provision of educational services for caregivers and affected families.

The first intervention, which included distributing ready-to-eat food in disaster-affected areas, was vital in ensuring that toddlers' daily calorie needs were met. This food was prepared through public kitchens managed by NGOs and the government, which collaborated to ensure the availability of safe, nutritious, and easily consumed food for toddlers in evacuation sites [6, 12].

The second intervention involves the provision of locally sourced minimal processing adequate complementary foods (MP-ASI), which is vital for enhancing both the affordability and acceptability of nutrition for toddlers. Locally available foods, such as porridge enriched with vegetables and sources of vegetable or animal protein, are generally well-received by toddlers and contribute to the sustainability of the intervention. These ingredients can be easily sourced from local communities, ensuring better accessibility [9]. Furthermore, this program often includes educational components for caregivers, focusing on delivering developmentally appropriate MP-ASI in terms of texture, frequency, and portion size, tailored to the child's nutritional needs at various stages of growth and development [5]. In addition, maintaining stringent food hygiene practices is crucial during this stage, as it significantly impacts the quality of food presentation in post-disaster scenarios [3, 13]. Failure to adhere to these hygiene standards can lead to new health issues, including gastrointestinal diseases such as diarrhea, typhoid fever, and other digestive tract infections [14, 15]. Implementing effective food safety measures is essential to prevent these potential health risks and ensure the well-being of affected populations.

The third intervention, micronutrient supplementation, encompasses essential vitamins such as vitamin A and minerals like iron and zinc. This intervention is crucial due to the heightened risk of micronutrient deficiencies in toddlers following a disaster. Research indicates that such deficiencies can profoundly affect a toddler's immune function, physical

growth, and cognitive development. Consequently, distributing vitamin A and iron supplements has become standard in emergency nutrition management, especially for toddlers in evacuation centers. This practice aims to mitigate the adverse effects of micronutrient deficiencies [7, 10]. Supplementation is typically administered in the form of capsules or syrups, designed for ease of consumption, with dosages tailored to meet the specific nutritional requirements of the toddlers.

The fourth intervention focused on providing nutritional education services specifically designed for caregivers and families of toddlers, acknowledging their critical role in ensuring the sustainability and effectiveness of nutritional practices. This educational initiative encompassed essential knowledge regarding the importance of nutrition in toddler development, informed choices about nutritious foods, and the safe preparation of appropriate complementary feeding (MP-ASI). The program employed direct socialization, practical training sessions, and the dissemination of informational materials, such as leaflets and posters, at evacuation centers. The caregivers were supported with the necessary knowledge and skills, and the intervention aimed to enhance their ability to provide adequate nutrition for toddlers while effectively utilizing available food assistance resources at these sites [8].

Through a combination of these interventions, the post-disaster emergency nutrition program is designed to provide comprehensive nutritional support for children under five, thereby helping to reduce the prevalence of malnutrition and supporting their nutritional recovery in emergencies.

FACTORS INHIBITING NUTRITIONAL INTERVENTION FOLLOWING DISASTER OCCURRENCE

Inhibiting factors in post-disaster nutrition interventions for infants and toddlers in Indonesia are significant challenges in maintaining and improving the nutritional status of this vulnerable group. The present review indicates that several key factors can reduce the effectiveness of emergency nutrition programs, including limited infrastructure, limited trained human resources, funding constraints, and weak inter-agency coordination. Each inhibiting factor requires special attention to ensure the program can run optimally and sustainably.

The first factor, limited infrastructure in disaster-affected areas, presents a substantial barrier to the effective distribution and implementation of nutrition programs. Damage to road networks, insufficient transportation resources, and inadequate food storage facilities impede the timely and equitable distribution of nutritious food. Such infrastructural damage often affects primary access routes to evacuation sites, thus delaying food distribution efforts and hindering the delivery of essential aid to populations in critical need, particularly vulnerable groups such as toddlers [6, 8]. Furthermore, the need for more healthcare facilities and public kitchens at numerous evacuation sites further complicates the execution of interventions that necessitate rapid and sustained logistical support [16].

The second factor contributing to the suboptimal success of the program is the need for more trained human resources in emergency nutrition management. Research indicates that health workers operating in disaster-affected areas often lack adequate training for delivering emergency nutrition interventions, particularly for addressing the specific nutritional requirements of toddlers in crises [7, 17]. Additionally, educators, female workforce representatives, and self-help groups play a critical role in supporting healthcare professionals by enhancing coordination and facilitating educational initiatives within the community. Collaboration is essential for improving health literacy and promoting effective health interventions [18, 19]. This needs to improve expertise to ensure the effective implementation of nutrition programs, particularly in accurately assessing young children's nutritional needs and consistently executing appropriate feeding protocols. To enhance the efficacy of nutrition interventions, specialized personnel, such as trained nutritionists, must ensure comprehensive and effective execution of all program components.

The third inhibiting factor is funding. The scarcity of government funding and the limited financial support from NGOs have resulted in unsustainable program implementation. The structure of these funding mechanisms often exacerbates the issue, as many grants are short-term and primarily focused on immediate emergency response, neglecting the crucial recovery phase [20]. This insufficient funding landscape has significant implications, leading to inadequate access to nutritious food supplies and challenges in sustaining nutrition education programs, which are essential for ensuring the long-term viability of health initiatives.

Another inhibiting factor is inter-agency coordination at the disaster site. Research shows that the lack of coordination between the various actors involved, from the government, NGOs, and local communities, needs to be more consistent in food distribution and other nutritional assistance. The lack of understanding of roles and responsibilities between agencies and complex bureaucracy often hinders the smooth implementation of programs and prevents toddlers in specific locations from receiving assistance promptly [20]. This weak coordination also causes duplication of programs in some areas and a lack of intervention in others, resulting in uneven distribution of assistance.

Overall, these inhibiting factors point to the need for a more integrated approach and improvements in infrastructure, health worker capacity, funding, and inter-agency coordination systems to increase the effectiveness and sustainability of post-disaster nutrition interventions for young children in Indonesia.

SUSTAINABILITY OF POST-DISASTER NUTRITION ASSISTANCE PROGRAM

The sustainability of post-disaster nutrition assistance programs is an important aspect often overlooked in addressing nutrition in children under five in disaster-affected areas. Several studies have highlighted that although nutrition interventions provided during the emergency response period are often effective in reducing the prevalence of malnutrition in children under five, the sustainability of these programs after the emergency phase ends still faces various challenges. This sustainability is critical to ensure that affected children under five can maintain optimal nutritional status over time, even when the emergency phase is over and external assistance begins to decrease [8, 21].

One approach proposed by several studies is the integration of nutritional support programs into community health services on an ongoing basis. This approach utilizes existing health infrastructure and makes nutritional support programs part of regular services. Through this integration, monitoring toddler nutritional status, providing micronutrient supplements, and educating families can be carried out continuously under the supervision of local health workers [16]. This ongoing service also allows early detection of declining nutritional status and can help prevent the recurrence of malnutrition in toddlers after they leave the refugee camp.

Government support is a critical component in the sustainability of post-disaster nutrition programs. Through appropriate budget allocation and the formulation of strategic policies, government entities play an essential role in enhancing the infrastructure and logistics necessary for these sustainable initiatives [17]. Furthermore, policies prioritizing the allocation of funds for long-term recovery — rather than solely focusing on immediate emergency response — are vital for effectively implementing nutrition programs in disaster-prone communities [22]. Without consistent financial support, many programs face premature termination due to inadequate funding, which ultimately hinders the long-term objective of improving the nutritional status of infants and toddlers.

In addition to policy and funding support, community empowerment is essential in the sustainability of nutrition assistance programs. Programs that involve communities, especially mothers and caregivers of toddlers, in implementing and monitoring nutrition have the potential to be more successful in the long term. Continuous education to the community about the importance of nutrition, how to prepare nutritious complementary foods, and routine monitoring of toddlers are expected to create an environment that independently supports toddlers' nutritional health [9]. Through this empowerment, the community can have sufficient knowledge and skills to implement good nutrition practices after the formal program ends.

Furthermore, partnerships between government and NGOs are needed to strengthen the sustainability of post-disaster nutrition programs. This collaboration allows for sharing resources, knowledge, and strategies in implementing programs with broad impacts. NGOs can assist the government in training local health workers, mobilizing additional resources, and introducing new technologies or methods of nutrition monitoring that can improve the program's effectiveness [10].

The sustainability of post-disaster nutrition assistance programs necessitates a comprehensive and multidimensional approach. This approach should prioritize integrating nutrition services into existing public health frameworks, supported by robust policy initiatives and dedicated budget allocations from governmental entities. Additionally, fostering community empowerment and establishing collaborative partnerships with non-governmental organizations (NGOs) are essential components. By adopting this method, nutrition programs can extend their benefits beyond immediate emergency response, facilitating more significant

and lasting improvements in the nutritional health of toddlers residing in disaster-prone regions. Such an integrated strategy is critical for ensuring that nutrition initiatives are effective in crisis and resilient in future challenges.

CONCLUSION

Post-disaster nutritional intervention management for children under five in Indonesia includes the distribution of ready-to-eat meals, locally-based complementary feeding, micronutrient supplementation, and education for caregivers. These interventions have proven effective in the short term in reducing malnutrition rates but face serious obstacles, such as limited infrastructure, human resources, funding, and inter-agency coordination. The sustainability of the programs after the emergency response phase is still minimal, which can put children at risk of malnutrition again when assistance decreases. These findings highlight the importance of integrating nutritional assistance programs into public health services and the need for more sustained policy support from the government and community empowerment to increase long-term effectiveness.

This review contributes to understanding the barriers and sustainability needs associated with post-disaster nutrition interventions. It underscores the necessity of a multidimensional approach that involves collaboration among government agencies, NGOs, and local communities. The findings indicate that emergency nutrition interventions should extend beyond immediate responses; they must also foster an environment conducive to the long-term nutritional health of children. Additionally, further research is warranted to identify effective strategies for enhancing inter-agency collaboration and to investigate technology-based methods for ongoing nutrition monitoring. Such initiatives are critical for improving nutritional resilience among vulnerable populations in disaster-affected regions.

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Author contributions

All authors participated in the conceptualization and planning of the original study; likewise, all participated in data collection, analysis, and organization, as well as in the writing, review, and approval of the manuscript.

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Conflict of interest

Nothing to declare.

Supplementary material

None.

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