Characteristics of disease in children at earthquake evacuation camps in West Pasaman Regency and Pasaman Regency in 2022

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Abstract: Extraordinary occurrences of infectious diseases may occur when earthquakes result in large population movements to unplanned and overcrowded shelters with limited access to safe food and water sources. An earthquake with a magnitude 6.1 shook West Pasaman Regency, West Sumatra Province, on Friday (2/25/2022). Many disaster victims sleep in open areas so that they are exposed to dust, heat, and poor hygiene. Method: A descriptive study conducted retrospectively from pediatric patient data who came to health facility tents in refugee camps in West Pasaman and Pasaman Regency, collected from February 2022 to April 2022. The total number of visits was 247 pediatric patients. Air-borne disease suffered by 78.5%, followed by food and water-borne diseases (13%) and vector related disease (2.8%). Acute respiratory infection is the most common disease suffered by 184 cases (74.4%) followed by acute diarrhea (5.2%). There were also 8 cases of measles that were potential for outbreaks infectious diseases. Airborne disease is the most common disease suffered by refugees, followed by food-water borne and vector related disease. The availability of complete data on diseases can facilitate the implementation of optimal health services and help prevent the occurrence of outbreaks among disaster victims.

1 Introduction

The definition of disaster according to law no. 24 of 2007 about Disaster Management is an event or series of events that threatens and disrupts people's lives and livelihoods caused by either natural factors and/or non-natural factors or human factors, resulting in human casualties, environmental damage, property loss, and psychological impact [1].

Disaster risk index data shows that West Sumatra is one of the provinces with a high disaster index, with an index score of 150.24. The districts in West Sumatra that have the highest disaster score index are Agam, West Pasaman and Mentawai Districts [2]. Data for 2021 shows that West Sumatra Province has been hit by various disasters such as one earthquake, 23 landslides, 58 floods and fires. forests 16 times, and extreme weather 118 times [3].

Emergency action is required to save human victims and their environment during disasters, which can happen abruptly or gradually and affect regular daily patterns. Natural, man-made, or non-natural disasters all result in property losses, environmental harm, human casualties, and psychological effects that, in some cases, might impede a country's development (Figs. 1 and 2) [4].

There are many different types of disasters, such as natural disasters (such as volcanic eruptions, earthquakes, storms, droughts, heat waves, flooding, and tsunamis) and those caused by armed conflict (such as political unrest, terrorism, civil war, and genocide [5]. Geographically speaking, Indonesia is one of the nation's most vulnerable to natural disasters, including earthquakes, tsunamis, mountain eruptions, etc. This is because the country is situated where three major plates the Eurasian, Pacific, and Indo-Australian plates meet [6]. Natural catastrophes inflict death and injury, disrupt economic growth and activity, destroy infrastructure, uproot communities, and raise the possibility of infectious disease outbreaks. Natural catastrophes impacted 61.7 million people worldwide in 2018, resulting in 10,373 fatalities and millions of dollars' worth of losses [7].

Fig. 1. Health facility tent at Timbo Abu, Pasaman Barat

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Fig. 2. Health facility tent at Aur Village, Pasaman

Earthquakes are the second most frequently reported natural disaster (after floods) and the first among geophysical disasters [8]. Friday, February 25, 2022, at 08.39 a.m. local time, an earthquake with a magnitude of 6.2, later revised to 6.1, struck West Pasaman Regency, West Sumatra [3]. The earthquake caused 4 fatalities, 37 serious injuries, 310 minor injuries, and approximately 10,000 people to be displaced at 35 evacuation points located in Talamau District, Pasaman District, and Kinali District of West Pasaman Regency. In addition, in Pasaman Regency, 6 people died, 5 people were seriously injured, 36 people were slightly injured, 3 thousand people were displaced, and 4 people were buried in landslide material [9].

Refugees are people or groups of people who have been forced or forced to flee or leave their homes or places where they used to live, especially because of or to avoid various problems. In general, the problems that give rise to displacement are the impact of armed conflict, vulnerable situations characterized by widespread acts of violence in general, violations of human rights, natural or man-made disasters. These refugees do not cross internationally recognized state borders [2, 10, 11]

Refugees' patterns in Indonesia vary greatly depending on the type of disaster, duration of evacuation and preparation efforts. The insert refugee pattern, namely that refugees stay in the homes of relatives. Refugees are concentrated in public places or in prepared barracks. Another pattern of evacuation is in emergency tents on either side of their houses damaged by the disaster [1, 2, 10–12].

One of the impacts of disasters on the declining quality of life of the population can be seen from the various public health problems that occur (Fig.3). Disasters followed by evacuation have the potential to cause health problems that start with problems in other fields/sectors. Earthquakes, floods, landslides and volcanic eruptions, in the short term can have an impact on fatalities, victims of serious injuries requiring intensive care, increased risk of infectious diseases, damage to health facilities and water supply systems. The emergence of health problems, among others, begins with a lack of clean water which results in poor personal hygiene, poor environmental sanitation which is the beginning of the proliferation of several types of infectious diseases [13].

Insufficient food supplies are also the beginning of the process of declining health levels, which in the long term will directly affect the level of fulfillment of nutritional needs of disaster victims. The existing evacuation shelters often do not meet health requirements so that directly or indirectly they can reduce the body's immune system and if not addressed immediately will cause problems in the health sector. Meanwhile, the provision of health services in disaster conditions often encounters many obstacles due to damaged health facilities, inadequate number and types of medicines and medical devices, limited health workers and operational funds. This condition can certainly have worse impacts if not handled immediately [14].

Morbidity that occurs after a disaster due to damaged environmental conditions, health services and refugee density is the emergence of diseases, both infectious and non-infectious diseases. Non-infectious diseases that arise include physical injuries (broken bones) and degenerative diseases (heart, hypertension, stroke). Meanwhile, infectious diseases include infectious diseases immediately after trauma (wounds, sepsis), direct infectious diseases and indirect infectious diseases (airborne, waterborne, foodborne, vectorborne) [15].

Infectious diseases are a problem that needs great attention, given the potential for the emergence of extraordinary events (KLB) or outbreaks of infectious diseases. Epidemics can happen when earthquake catastrophes force huge numbers of people into crowded, unplanned shelters with limited access to clean water and food. Aside from the direct effects of earthquakes on sanitary conditions, outbreaks can also arise from the breakdown of water and sanitation infrastructure. The prevalence of infectious diseases depends on the disaster; waterborne diseases, foodborne diseases, and vectorborne diseases are prevalent in hurricanes and floods, while airborne diseases are prevalent in all types of natural disasters [8].

Fig. 3. Medical services at health facility tents.

The population of West Pasaman Regency in 2021 was 467,876, while the population of Pasaman Regency in 2022 was 307,425 [16, 17]. In a disaster, children make up between 25–30% of those injured [18, 19]. Special biological, social, and ethical elements make caring for pediatric populations special, necessitating further considerations in emergency response and disaster preparedness approaches [18, 20, 21]. Infants, toddlers, and children are vulnerable groups during disasters because they are groups that are at high risk of experiencing greater impacts than other community groups. Protection of vulnerable groups is carried out by providing priority handling in the form of rescue, evacuation, security, health, and psychosocial services [4].

Therefore, it is important to know the characteristics of diseases experienced by these vulnerable groups in post-disaster refugee camps in order to provide optimal health services and prevent extraordinary events for disaster victims.

2 Method

A descriptive study conducted retrospectively from pediatric patient data who came to the health facility tents in refugee camps in West Pasaman and Pasaman districts were collected by The Disaster Team of Department of Child Health, Faculty of Medicine, Universitas Andalas and The Indonesian Pediatric Society Disaster Team West Sumatra Branch, data collected from February 2022 to April 2022. (Shown in Fig. 4)

Fig. 4. The disaster team of Department of Child Health, Faculty of Medicine, Universitas Andalas

3 Results

During the study period, there were 247 pediatric patients who came to health facility tents in evacuation sites in West Pasaman Regency and Pasaman Regency. Children who visited the health facility tents were found to be more female (54.7%) than male (45.3%), and the age of children who visited was more in the age group 1–5 years (51.4%), followed by the age group 6–17 years (39.3%) and <1 year (9.3%). The characteristics of the study subjects can be seen in Table 1.

Table 1. Research subject characteristics

Variable	*F*	%
Gender		
Boy	112	45.3%
Girl	135	54.7%
Age		
<1 year old	23	9.3%
1-5 years old	127	51.4%
6-17 years old	97	39.3%

The study showed that the most common disease suffered by children affected by the earthquake was acute respiratory tract infection (ARI) (74.4%), followed by acute diarrhea (5.2%), impetigo and measles (3.2% and 3.2%). Data on the top ten most common diseases among pediatric patients who came to health facility tents at evacuation sites in West Pasaman Regency and Pasaman Regency can be seen in Table 2.

Table 2. Top ten most common diseases

Disease	*f*	%
Acute respiratory tract infection	184	74.4
Acute diarrhea	13	5,2
Impetigo	8	3.2
Measles	8	3.2
Scabies	7	2.8
Allergic/irritant contact dermatitis	7	2.8
Dyspepsia	3	1.2
Ginggivitis Tinea Tension headache	2 2 2	0.8 0.8 0.8

The type of infectious disease in pediatric patients who came to health facility tents in evacuation sites in West Pasaman Regency and Pasaman Regency was mostly airborne diseases (78.5%), followed by food and waterborne diseases (13%). The research data can be seen in Table 3.

Table 3. Type of infectious diseases

Type of infectious disease	*f*	%
Air borne disease	194	78.5
Food and waterborne disease	32	13
Vector related disease	7	2.8

4 Discussion

Natural catastrophes have a detrimental physical, social, and psychological impact on children, who are a particularly vulnerable group [22]. This study collected data from 247 pediatric earthquake survivors who came to the Disaster Team Tent of the Department of Pediatrics, the Faculty of Medicine of Universitas Andalas and the West Sumatra Branch of the IDAI Disaster Team in the evacuation camps from February to April 2022. Air-borne, water-food borne, vector-borne diseases, and skin and soft tissue infections were mostly reported in the pediatric population of earthquake survivors. The primary causes of illness were seasonal factors, overcrowding during an evacuation, malnourishment, and water resource contamination [22].

Female pediatric patients slightly outnumbered male pediatric patients (54.7%: 45.3%), in contrast to pediatric earthquake survivors in Turkey in 2023, where males outnumbered females (50.9% male and 49.1% female). The age group that visited the health post the most was the age range of 1–5 years (51.4%). Whereas among the Turkish earthquake victims in 2023, the most common age group was 6–12 years old (36.8%) [23].

The most common disease suffered was acute respiratory infection (ARI) (74.4%), this is in accordance with data observed in the post-earthquake period in various parts of the world. Most people affected by earthquakes live in overcrowded refugee camps, among the risk factors include poor personal hygiene, contaminated drinking water, and insufficient air ventilation that allow them to suffered acute respiratory infectious diseases [24]. The second most common disease is acute diarrhea, which can be caused by a lack of access to adequate water supplies as a result of water network damage after a disaster and/or sewage contamination, which is typical issue [22]. There was no emergency disease suffered by refugee children, the clinical condition of patients was stable, and no patients complained of physical injuries due to trauma.

Air-borne disease is one of the most typical findings discovered after earthquakes. 42.3% of the 108 pediatric patients evaluated following the 2015 Gorkha earthquake had respiratory tract infections. Giri et al.'s study supported the findings of Wang et al.'s, which said that children are among the most vulnerable populations and that earthquakes can have an impact on children of various ages. Among the 1,057 patients analyzed, children from households and regions severely impacted by the earthquake had a considerably greater rate of patients needing hospitalization for pneumonia. The study reported by Tan et al. on the Pariaman earthquake in West Sumatra reported respiratory infections as the most common diagnosis (47.2%), musculoskeletal/joint (31.6%), skin infections (13.3%), and gastrointestinal diseases (18.2%). Therefore, it is essential to the livelihoods of displaced communities to guarantee that there are efficient systems for the surveillance and registration of infectious diseases, functioning primary health care facilities, functioning water and sanitation systems, and temporary shelter support [24, 25].

The measles virus is extremely contagious and can be transmitted by sneezing, coughing, or close contact with contaminated nose or throat secretions. The 2004 Indian Ocean tsunami devastated a community whose level of basic vaccine coverage was seen to have an impact on the transmission of measles, particularly in children under the age of fifteen. A large vaccination program did not prevent occasional cases of measles from occurring, and after the 2004 tsunami disaster in Banda Aceh, Indonesia, there was a cluster of 35 cases in a susceptible community living in disorganized and crowded settlements in the North Aceh region [25].

The ingestion of water or food polluted with harmful microorganisms (viruses, bacteria, and parasites) from human or animal waste is the primary cause of waterborne and foodborne illnesses. With a median of 168.8 cases per week per 1000 evacuees, acute respiratory illness (ARI) was the most prevalent infectious disease during the 2011 earthquake disaster in Japan. Acute gastroenteritis came in second with a median of 23.7 cases per week per 1000 evacuees [24-26].

Skin infections and wounds are terms used to describe the infiltration of one or more types of bacteria into tissues. The environment in which the injury occurs, the severity of the injury, the microorganisms on the injured person's skin, the microorganisms the person has been exposed to during wound healing, and the person's overall health and immune status all play a major role in determining the type of wound infection. Following an earthquake, trauma injuries disturb the immune system's delicate balance and increase the risk of infectious problems. An extended period spent under debris might result in serious injuries and a higher chance of acquiring infections. Wound and skin infections were reported after the Izmit (Turkey) earthquake in 19 99, the Kashmir (Pakistan) earthquake in 2005, the Sumatra-Andaman earthquake (Indonesia) in 2004, and the Yogyakarta (Indonesia) earthquake in 2006. In the first three months after the 1999 Izmit earthquake, squamous erythematous, itchy, neurocutaneous dermatoses, and eczema predominated and were caused by psychoemotional factors associated with the earthquake [24].

Disruptions to water supplies, health services, and sanitation systems after an earthquake can raise the likelihood of infectious disease outbreaks. To reduce the impact on the impacted population, it is imperative to put in place efficient preventive measures. In these circumstances, vaccination becomes a crucial instrument in defending against the spread of illnesses including measles, cholera, typhoid, and hepatitis A. Several research related to catastrophes have highlighted the significance of particular vaccinations in managing and reducing illnesses following earthquakes [27].

The world can learn from the natural disasters that have affected different countries at different times in the past. Specifically, there are valuable lessons to be learned from the natural disasters that followed the COVID-19 pandemic, which disrupted immunization programs and caused a resurgence of common infectious diseases in children. Following the 1991 Mount Pinatubo earthquake, there was a measles outbreak in the Philippines, with 18,000 cases of the disease documented [22]. Children’s

affected by the earthquake in West Pasaman and Pasaman districts were found to have 8 cases of measles (3.2%) in the refugee camps and have the potential to become an extraordinary event.

The limitation of this study is that the data obtained only comes from recording pediatric patient visits at health posts by The Disaster Team of Department of Child Health, Faculty of Medicine, Universitas Andalas and The Indonesian Pediatric Society Disaster Team West Sumatra Branch in refugee camps. The data obtained is not a combination of all the data from the disaster volunteer team who participated in serving the health problems of children affected by the disaster, so it cannot represent the complete condition of the disease that occurs in children affected by the disaster.

5 Conclusion

The total number of visits to health posts by children affected by the earthquake in West Pasaman Regency and Pasaman Regency in 2022 was 247 patients. The distribution of diseases suffered by children was obtained. Airborne disease is the most common disease suffered by refugees, followed by food-water borne disease and vector related disease. ARI is the most common disease suffered by refugees, namely 184 cases, followed by diarrhea in 13 cases.

Future research during a disaster should be able to collect all data from volunteers in all posts at the disaster site, including from existing health facilities. The government should have a good surveillance and coordination system so that the activities and records of each volunteer can be collected and published in one main register, so that they can be taken into consideration by the government in making quick and appropriate policies, especially in the health sector related to disasters experienced. Especially in handling and preventing specific infectious diseases after disasters, including curative efforts (handling cases), surveillance of potential infectious diseases and identification of risk factors at disaster sites, as well as promotional and preventive efforts in order to minimize risk factors at disaster sites.

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