
THE RELATIONSHIP BETWEEN FOOD AVAILABILITY, HOUSEHOLD FOOD SECURITY, AND THE HISTORY OF INFECTIOUS DISEASES WITH THE INCIDENCE OF MALNUTRITION IN TODDLERS

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ABSTRACT

The aim of this study is to investigate and analyze the relationship between food availability, household food security, and history of infectious diseases with the occurrence of malnutrition in toddlers. The method used in this research is an analytical survey with a cross-sectional study design. The population in this study is toddlers aged 12-59 months in the disaster-prone area of Pantoloan, with a sample of toddlers aged 12-59 months. The results of the study show a significant relationship between food availability and the occurrence of malnutrition in toddlers ($p = 0.000$). This means that toddlers who do not have guaranteed food availability in the last 12 months have a greater risk of experiencing malnutrition. However, no significant relationship was found between a history of infectious diseases and the occurrence of malnutrition ($p = 0.566$), possibly due to the mild and non-persistent nature of malnutrition, which does not affect the toddlers' immune system. Furthermore, a significant relationship was found between household food security and the occurrence of malnutrition ($p = 0.006$). Many families still need to prioritize adequate nutrition for their family, thus improving access to food to meet nutritional needs is still necessary. The study implies a deeper understanding of the factors influencing malnutrition in toddlers in disaster-prone areas and provides a basis for the development of appropriate interventions to improve the nutritional status of toddlers. Efforts to improve food availability and household food security are expected to reduce the risk of malnutrition in toddlers in the area.

Keywords: Malnutrition, Food Availability, Household Food Security, History of Infectious Diseases.

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INTRODUCTION

Malnutrition is a disorder resulting from an imbalance of nutrients needed for growth, thinking activities, and all things related to life. Malnutrition in toddlers is a serious public health problem. This problem often occurs in developing countries, one of which is Indonesia. Geographically, 70-80% of children with malnutrition live in low and middle-income countries. In Asia, malnutrition is the most common cause of death among children under five (Pravana et al., 2017).

Based on data from the World Health Organization (WHO), the prevalence of malnutrition and malnutrition in 2019 globally was 13%. The highest prevalence of malnutrition and malnutrition is in Southeast Asia at 25.5%. Based on 2018 Basic Health Research (Riskesdas) data in Central Sulawesi, the prevalence of under-five children experiencing malnutrition is 4.8%, under-nutrition 18.6%, good nutrition 74.7%, and over-nutrition 1.8% (RI, 2018). Based on data from the Palu City Health Service, in 2018, the number of cases of malnutrition was 818 people, and this increased to 921 children

under five in 2019. Based on data from the Pantoloan Health Center, the number of cases of malnutrition in 2019 after the disaster was 18 people; in 2020, it was 43 people, and in 2021, the Pantoloan Community Health Center is in 1st place out of 13 Community Health Centers in the city of Palu which experience many cases of malnutrition with a total of 157 children under five. The working area of the Pantoloan Community Health Center is located close to the coastline, which was affected by the natural disaster of the tsunami and earthquake that occurred on September 28, 2018.

The nutritional problem that arises after a disaster is the need for more consumption of balanced nutritious food in infants and toddlers due to economic factors (Hutagaol, 2019). Cases of malnutrition in 2018 and 2019 in Central Sulawesi increased following the earthquake and tsunami disaster on September 28, 2018. The effects of the disaster caused emergencies in various fields, including those involving food and health issues. Insufficient food supplies are the beginning of a process of decreasing health status, which in the long term will directly affect the level of fulfillment of post-disaster nutritional needs (Nasrul et al., 2019).

Nutritional problems in toddlers are a disruption to their health and well-being due to an imbalance between intake and the body's need for food and the influence of the interaction of infectious diseases. An imbalance in nutritional intake can result in malnutrition. Good nutritional status is needed to determine whether there is malnutrition in children under five (Ahmadi, 2013). Good dietary status will increase productivity and create opportunities for better economic conditions (Ministry of Health, 2019). History of infectious diseases, food availability, and level of food security are several factors that influence the occurrence of cases of malnutrition in toddlers. Given that food shortages remain the leading cause of death for 2.5 million children each year, it is challenging to realize the potential for more than 100 million underweight children under the age of five (IMT & ANGRAINI, nd).

Based on the above background, the objective of this research is to identify and analyze the relationship between food availability, household food security, and history of infectious diseases with the occurrence of malnutrition in toddlers. Therefore, the benefits of this study are expected to provide a deeper understanding of the factors influencing malnutrition in toddlers in disaster-prone areas. Additionally, this research is also expected to serve as a basis for the development of appropriate interventions to improve the nutritional status of toddlers, thereby facilitating efforts to improve food availability and household food security to reduce the risk of malnutrition in toddlers in the area.

METHOD

This type of research is an analytical survey with a cross-sectional study design. This research was conducted in the Pantoloan disaster-prone area, Central Sulawesi. The selection of research locations used the purposive sampling method. Data collection will be carried out in April 2023.

The population in this study were toddlers aged 12-59 in the Pantoloan disaster-prone area, Central Sulawesi. The sampling technique in this research used purposive sampling. The samples in this study were toddlers aged 12-59 months who were in the working area of the Pantoloan

Community Health Center, Palu City, Central Sulawesi. The process stages that will be carried out in this research are depicted in the flow diagram in Figure 1 below:

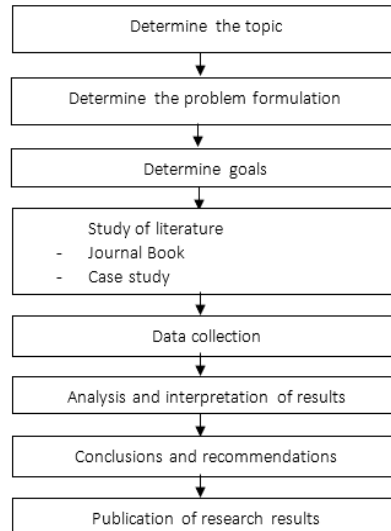


Figure 1. Research Flowchart

RESULTS AND DISCUSSION

Univariate Analysis

Univariate analysis was carried out to see a descriptive picture of the dependent and independent variables studied using tables based on the research results obtained. The univariate results in this study are as follows:

Malnutrition

The frequency distribution of malnutrition among children under five in the Pantoloan disaster-prone area, Central Sulawesi, is seen in Table 1:

Table 1. Frequency Distribution of Malnutrition Events in Toddlers in the Pantoloan Disaster Prone Area, Central Sulawesi

No.	Nutritional status	Frequency (n)	Percentage (%)
1.	Normal	30	35.2
2.	Malnutrition	55	64.8
	Total	85	100

Based on Table 1. Shows that from 85 samples of toddlers aged 12-59 months in the Pantoloan disaster-prone area, Central Sulawesi, there were 55 malnourished toddlers (64.8%) and 30 typical toddlers (33%).

Food availability

The frequency distribution of food availability in the Pantoloan disaster-prone area, Central Sulawesi, is seen in Table 2:

Table 2. Frequency Distribution of Food Availability in the Pantoloan Disaster Prone Area, Central Sulawesi.

No.	Food availability	Frequency (n)	Percentage (%)
1.	Guaranteed	38	44.7
2.	Not Guaranteed	47	55.3

No.	Food availability	Frequency (n)	Percentage (%)
	Total	85	100

Table 2 shows that the frequency of guaranteed food availability in the last 12 months was 38 people (44.7%), and the frequency of food availability that was not guaranteed was 47 people (55.3%).

History of Infectious Diseases

The frequency distribution of infectious disease history in potential disaster areas in the Pantoloan Community Health Center working area, Palu City, can be seen in Table 3:

Table 3. Frequency Distribution of History of Infectious Diseases

No	History of Infectious Diseases	Frequency (n)	Percentage (%)
1	No History	70	82.4
2	There's History	15	17.6
	Total	85	100.0

Table 3 shows that 70 children (82.4%) had no history of infectious diseases, and 15 (17.6%) had a history of infectious diseases.

Household Food Security

The frequency distribution of household food security in potential disaster areas in the working area of the Pantoloan Community Health Center, Palu City, can be seen in Table 4:

Table 4. Frequency Distribution of Household Food Security

No	Household Food Security	Frequency (n)	Percentage (%)
1	Food Insecure	37	43.5
2	Food Security	48	56.6
	Total	85	100.0

Based on Table 4, 48 children under five were food secure (56.6%), and 37 children (43.5%) were food insecure.

Bivariate Analysis

Bivariate analysis was used to determine the relationship between two variables, namely the independent variable, which includes food availability, Covid-19 pandemic conditions, parenting patterns, and the mother's level of nutritional knowledge, with the dependent variable, namely the incidence of malnutrition in toddlers aged 12-59 months. The statistical test used is the Chi-Square test, with a confidence level of 90%.

The relationship between food availability and the incidence of malnutrition in children under five.

The relationship between food availability and the incidence of malnutrition among children under five in the Pantoloan disaster-prone area, Central Sulawesi, was analyzed using Crosstabs in the Chi-Square test. The results of the relationship analysis can be seen in Table 5:

Table 5. Relationship between Food Availability and Incidence of Malnutrition in Toddlers

Availability Food	Nutritional status				n	p-value
	Normal	Malnutrition				
	n	%	n	%		
Guaranteed	25	29.4%	13	15.3%	38	0,000
Not Guaranteed	5	5.9%	42	49.4%	47	
Total	30	35.3%	55	64.7%	85	

From the data in Table 5. above, it shows that of the 38 toddlers who had guaranteed food availability in the last 12 months, 25 people (29.4%) were ordinary, and 13 toddlers (15.3%) were undernourished. Meanwhile, of the 47 toddlers whose food availability was not guaranteed in the last 12 months, 5 people (5.9%) were ordinary, and 42 children (49.4%) were malnourished.

Based on the results of the Chi-Square test, $p = 0.000$, so $p < 0.1$. H_0 is rejected, and H_1 is accepted, meaning that there is a significant relationship between food availability and the incidence of malnutrition among children under five in the disaster-prone area of Pantoloan, Central Sulawesi. Forty-two children who were not guaranteed food availability in the last 12 months experienced malnutrition compared to 16 children who were certified food availability in the previous 12 months.

Relationship between history of infectious disease and incidence of malnutrition

The relationship between a history of contagious disease and the incidence of malnutrition in potential disaster areas in the Pantoloan Community Health Center working area, Palu City, was analyzed using crosstabs (Cross Tabulation) in the Chi-Square test. The results of the analysis are seen in table 6:

Table 6. Relationship between history of infectious disease and incidence of malnutrition in Potential Disaster Areas in the Pantoloan Community Health Center Working Area, Palu City

History of Infectious Diseases	Nutritional status				n	p-value
	Malnutrition		Normal			
	n	%	n	%		
There's History	11	12.9	4	4.7	15	0.566
No History	45	42.9	25	29.4	70	
Total	56	65.9	29	34.1	85	

The data in Table 6 above shows that of the 15 toddlers who had a history of infectious disease, 11 people, or (12.9%) experienced malnutrition, and 4 people (or 4.7%) were normal, while of the 70 toddlers who had no history of the disease, There were 45 infections (42.9%) who experienced malnutrition with normal nutritional status of 25 children or (34.1%).

Based on the results of the Chi-Square test, $p = 0.566 < 0.1$. So H_0 is accepted, and H_1 is rejected, meaning that there is no significant relationship between the history of infectious diseases and the incidence of malnutrition in potential disaster areas in the Pantoloan Health Center working area, Palu City. Toddlers who do not have a history of infectious diseases are 45 more likely to experience malnutrition than toddlers who have contagious diseases.

The Relationship between Household Food Security and Incidence of Malnutrition

The relationship between the history of infectious disease and the incidence of malnutrition in potential disaster areas in the Pantoloan Community Health Center working area, Palu City, was analyzed using crosstabs (Cross Tabulation) in the Chi-Square test. The results of the analysis are seen in table 7:

Table 7. Relationship between household food security and incidence of malnutrition

Household Food Security	Nutritional status				n	p-value
	Malnutrition		Normal			
	n	%	n	%		
Food Security	25	29.4	23	27.1	48	0.006
Food Insecure	31	36.5	6	7.1	37	

Household Food Security	Nutritional status				n	p-value
	Malnutrition		Normal			
	n	%	n	%		
Total	56	65.9	29	34.1	85	

From the data in Table 7 above, it shows that of the 48 food-secure households, 25 people (29.4%) experienced malnutrition, 23 people (27.1%) had normal nutritional status, and 31 people (36%) were food insecure. 5% experienced malnutrition, and 6 people (7.1%) had normal nutritional status.

Based on the results of the Chi-Square test, $p = 0.006 < 0.1$. So H_0 is rejected, and H_1 is accepted, meaning that there is a significant relationship between household food security and the incidence of malnutrition in potential disaster areas in the Pantoloan Community Health Center working area, Palu City. Toddlers from food-insecure households were more likely to experience malnutrition, namely 31 (36.5%).

Discussion

The Relationship between Food Availability and Malnutrition in Toddlers

Food availability is the provision of food for the population in an area within a certain period, which can be in the form of food and drinks originating from plants, livestock, and fish. Family food availability is the family's ability to meet food needs in sufficient quantities, both in quantity and nutritional quality, for all family members (Suryana, 2003). Food availability is the first activity that determines food consumption. So, efforts to achieve excellent or optimal community nutritional status begin with providing adequate food. Sufficient food availability is obtained through domestic food production through agricultural efforts in producing staple foods, side dishes, vegetables, and fruit (Widaryanti, 2019)

Food availability is one of the indirect causal factors that will later be related to the nutrition of children under five in a family. Food availability can be a determinant of malnutrition that occurs in society. If food availability is met, nutritional status will automatically become better, and this can result in a decline in health status. Thus, food availability is closely related to nutrition and health. Food availability that is less than the proper amount over a long period can result in malnutrition even though the toddler does not suffer from the disease (Rahmah et al., 2020). The availability of food in the family greatly influences the amount of food intake of family members. The better the availability of food for a family, it is possible to fulfill all nutritional needs (Priswanti, 2005).

The results of the study showed that of the 38 toddlers whose food availability was guaranteed in the last 12 months, 25 people (29.4%) were ordinary, and 13 children (15.3%) were undernourished. Meanwhile, of the 47 toddlers whose food availability was not guaranteed, In the last 12 months, there were 5 people (5.9%) who were normal and 42 children (49.4%) who were malnourished. Based on the results of the Chi-Square test, $p = 0.000$, so $p < 0.1$. H_0 is rejected, and H_1 is accepted, meaning that there is a significant relationship between food availability and the incidence of malnutrition among children under five in the disaster-prone area of Pantoloan, Central Sulawesi. Forty-two children who were not guaranteed food availability in the last 12 months experienced malnutrition, compared to only 16 children who were certified food availability in the

previous 12 months. This happens because food availability is not guaranteed, which can affect the nutrition of toddlers and other family members.

Based on the results of the interviews, it is also known that most of the respondents in the Pantoloan Community Health Center working area are the heads of the household who work as laborers, and most of their income is below the minimum wage. Families with an economic level whose income is below the minimum wage experience difficulties in meeting their food needs due to the inability to provide food that should meet their children's nutritional needs. Hence, malnutrition among toddlers is still a problem in this place (Ramadhina, 2019). The availability of sufficient food in the family or community also does not necessarily guarantee that the nutritional needs of each family member are met because a person's nutritional adequacy depends entirely on what they eat (Priswanti, 2005).

The results of this research are strengthened by research (Rahmah et al., 2020), where the results of the analysis of the relationship between food availability and the incidence of malnutrition in children under five. The results of research using the Chi-Square test obtained a p-value = 0.001, which shows that there is a significant relationship between food availability and incidence of malnutrition and malnutrition among toddlers living around the Untung Raya Community Health Center. This research is also in line with research (Melati, 2014); the results of the analysis using the Chi-Square test obtained $p = 0.014$ ($p < 0.05$), and it can be concluded that there is a significant relationship between food availability and the nutritional status of toddlers (malnutrition). In research (Arlus et al., 2017), which is also in line with this research, the results show a relationship between food availability and the nutritional status of toddlers (malnutrition) according to the BB/U classification ($p = 0.000$).

Likewise, in research (Ramadhina, 2019) titled The Relationship between Family Food Availability and Feeding Patterns for Toddlers with the Nutritional Status of Toddlers in Paya Geli Village, Sunggal District, where the research obtained as many as 77 families (80.2%) whose family food availability was guaranteed by undernourished category, namely 3 toddlers (31.1%) and there are 19 families (19.8%) whose family food availability is not guaranteed with the nutritional status of toddlers based on the BB/U index with the undernourished category namely 5 toddlers (5, 2%) and stated that there was a relationship between family food availability and the nutritional status of toddlers (malnutrition) according to BB/U ($p = 0.007$).

Relationship between history of infectious disease and incidence of malnutrition in toddlers

Infectious diseases are a collection of types of diseases that quickly attack, especially children, caused by viral infections, bacterial infections, and parasitic infections. Factors that can cause malnutrition in toddlers are mostly related to poor diet and severe and recurrent infections, especially in underprivileged populations (Idris et al., 2020).

The results showed that of the 15 toddlers who had a history of infectious diseases, 11 people, or (12.9%) were malnourished, and 4 people, or (4.7%) were ordinary, while of the 70 toddlers who had no history of infectious diseases, there were 45 people (42.9%) who experience malnutrition with normal nutritional status of toddlers are 25 people or (34.1%).

Based on the results of the Chi-Square test, $p = 0.566 < 0.1$. So H_0 is accepted, and H_1 is rejected, meaning that there is no significant relationship between the history of infectious diseases

and the incidence of malnutrition in potential disaster areas in the Pantoloan Community Health Center working area, Palu City. Toddlers who do not have a history of infectious diseases are 45 more likely to experience malnutrition than toddlers who have contagious diseases. Children who suffer from infectious diseases for a longer duration are more likely to have a more significant impact on nutritional status and are more likely to experience sequelae due to general infections, which will weaken the child's physical condition (Tasman, 2020). Pantoloan Community Health Center is a community health center with the highest number of diarrhea cases following the earthquake and tsunami disaster among community health centers in the city of Palu. The population is 274 people and 81 families; in the MDMC refugee camp, the population is 282 people and 74 families, with 209 cases of diarrhea in all age groups in 2019.

Meanwhile, the results of the latest research obtained by researchers are different because several toddlers who experienced infectious diseases such as acute respiratory infections/diarrhea were immediately taken to the nearest health center and treated quickly so as not to affect the nutritional status of the toddlers so that the duration of the toddler's illness was not long. So, the infectious diseases experienced by toddlers are not factors that influence toddlers' experiencing malnutrition.

This research is in line with research conducted by (Idris et al., 2020) that there is no significant relationship between providing a history of infectious disease and the incidence of malnutrition ($p = 0.934$). Most of the contagious diseases suffered by toddlers in the last three months were immediately taken by the parents of the respondents for treatment to the nearest health center or health facility to get first aid so that the toddlers recovered quickly and the duration or length of time the toddlers suffered from the disease was relatively short (Idris et al., 2020).

This research is also in line with research conducted by (Lestari & Pakkan, 2019) that there is no significant relationship between providing a history of infectious disease and the incidence of malnutrition ($p = 1.00$). This is because toddlers who have malnutrition are still in the mild category and are not prolonged, so they cannot affect the toddler's immune system (Lestari & Pakkan, 2019).

Other research that is in line is (Kasim et al., 2019) that there is no significant relationship between providing a history of infectious disease and the incidence of malnutrition ($p = 0.665$). The main factors in the emergence of infectious diseases are poor environmental conditions and low immunity status. An environment in the house that is full of cigarette smoke also causes children to be more susceptible to respiratory tract infections. Low immunity status, apart from making it easier for children to get infections, also causes the duration of infectious diseases to be longer (Kasim et al., 2019). Other research that is in line with (Pakkan 2019) is that there is no significant relationship between a history of infectious disease and the incidence of nutritional status of children under five ($P = 1.00$). This is because the illness suffered by the toddler is not prolonged, and the toddler's immune system is stable (Lestari & Pakkan, 2019).

The Relationship between Household Food Security and the Incidence of Malnutrition in Toddlers

Food security is an essential aspect of achieving Sustainable Development Goals (SDGs). The second goal of the SDGs is to end hunger, reach food security imp, improve nutrition, and encourage

sustainable agriculture (Arisman, 2008). If food security is always less than adequate within a certain period, it can result in malnutrition even though you do not suffer from the disease (Afrizal, 2017).

The results of the study showed that from 85 respondents, 25 people (29.4%) of 48 food-secure households were malnourished, and 23 people (27.1%) had normal nutritional status. In contrast, 31 people who were food insecure (36.5%) experienced malnutrition, and 6 people (7.1%) had normal nutritional status. Based on the results of the Chi-Square test, $p = 0.006 < 0.1$. So H_0 is rejected, and H_1 is accepted, meaning that there is a significant relationship between household food security and the incidence of malnutrition in potential disaster areas in the Pantoloan Community Health Center working area, Palu City.

Toddlers from food-insecure households were more likely to experience malnutrition, namely 31 (36.5%). Food insecurity has become a strategic issue in Indonesia. Food production and demand that still need to be balanced are the main reasons why the urgency of dealing with food insecurity is a government priority. Population growth continues to increase, causing basic food needs to grow as well. Socioeconomics is a concept used to measure socioeconomic status. A low family economy will have an impact on the family's purchasing power. Apart from that, low quality and quantity of food consumption is a direct cause of malnutrition in children under five. Common socio-economic conditions are related to health problems faced due to ignorance and inability to overcome these various problems (Kartiningrum, 2015).

A person's income level will influence the food sources they consume; this results in nutritional intake, which in turn affects the nutritional status of children (Nurrizky & Nurhayati, 2018). The economic growth in the Pantoloan area is still unstable due to the natural disaster that befell the people of Central Sulawesi in 2018. Demographic conditions are very conducive, and the climate is tropical, which alternates between hot sunlight and sudden rain. Based on the results in the field, there are still many families whose income is below the average regional minimum wage for the district. Many families still need to prioritize fulfilling adequate nutrition for the family, so access to food to meet nutritional needs still needs to be improved.

This research is in line with research conducted by (Jayarni & Sumarmi, 2018) that there is a significant relationship between household food security and the incidence of malnutrition ($p = 0.045$). Good food security will produce good nutritional security. Nutritional security, which is nutritional intake and nutritional status, is a prerequisite for the formation of healthy individuals (Jayarni & Sumarmi, 2018).

This research is in line with research conducted by (Arlus et al., 2017) that there is a significant relationship between household food security and the incidence of malnutrition. In vulnerable and food-insecure families, there are many toddlers whose nutritional status is good, whereas in food-secure families, there are also toddlers whose nutritional status is poor. So nutritional status can be influenced by several factors, namely, adequate food, family income, parental education, parenting patterns for children/toddlers, and consumption of nutritious food (Arlus et al., 2017).

This research is in line with research conducted that there is a significant relationship between household food security and nutritional status ($p = 0.000$). Farmer households in the research location are generally households that have relatively low incomes or are below the Regency Minimum Wage (UMK), so their welfare level is still lacking. This means that farming households still

spend a larger share on their food needs and still need to prioritize meeting adequate nutrition for the family (Safitri et al., 2017).

This research is in line with research conducted by (Ramadani & Sodikin, 2020) that there is a significant relationship between household food security and nutritional status ($p = 0.0001$). Food needs are physiological needs. This basic physiological need is a very crucial need for humans because humans can survive with food. When humans get sufficient and nutritious food, they will be able to continue their life (Ramadani & Sodikin, 2020).

CONCLUSION

Based on the results of research that has been carried out, the following conclusions were obtained: 1) There is a relationship between food availability and the incidence of malnutrition among children under five in the disaster-prone area of Pantoloan, Central Sulawesi ($p = 0.000$). This means that children under five who were not guaranteed food availability in the last 12 months were more likely to experience malnutrition. 2) There is no relationship between a history of infectious disease and the incidence of malnutrition in potential disaster areas in the Pantoloan Community Health Center working area, Palu City ($p = 0.566$). This is because toddlers who have poor nutritional status are still in the mild category and are not prolonged, so they cannot affect the toddler's immune system. 3) There is a relationship between providing household food security and the incidence of malnutrition in potential disaster areas in the working area of Pantoloan Community Health Center, Palu City ($p = 0.006$). Many families still need to prioritize fulfilling adequate nutrition for the family, so access to food to meet nutritional needs still needs to be improved.

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