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Food Intake, Infectious Disease, and Environmental Sanitation in Toddlers Aged 6-24 Months in Cibatu Health Center, Garut

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ABSTRACT

Introduction: Indonesia is a developing nation with complex issues, particularly regarding nutrition. Stunting is a nutrient deficiency that persists over time as a result of being fed food that is not sufficient to meet nutritional requirements. This study aimed to analyze the relationship between food intake, illness, and environmental sanitation in the stunting category in toddlers aged 6-24 months at Cibatu Health Center, Garut, in 2022.

Methods: This was a correlational analytical study with a cross-sectional design. The population in this study was all toddlers with stunting (aged 6-24 months) at Cibatu Health Center, Garut, with a total sample of 99 people. The sampling technique used was total sampling. The analysis techniques used were univariate, bivariate, and multiple correlation analyses with a significance level of $p < 0.05$.

Results: There was a significant relationship between food intake, environmental sanitation, and the incidence of infectious diseases in the stunting category, where the p-value (each) was <0.05. Food intake (X1), infectious diseases (X2), and environmental sanitation (X3) had a significant relationship with the stunting category (Y), where the p-value was < 0.05.

Conclusion: Food intake, environmental sanitation, and the incidence of infectious diseases had a significant relationship with the stunting category at Cibatu Health Center, Garut.

Highlights:
1. This study found a significant relationship between food intake, environmental sanitation, and the incidence of infectious diseases in toddlers with stunting.
2. Each variable (food intake, infectious diseases, and environmental sanitation) demonstrated a significant association with the stunting category, indicating their importance in addressing stunting in the target population.

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Introduction

Indonesia is a developing nation with complex issues, particularly regarding nutrition. It turned out that the nutrition cases in Indonesia and other developing nations differed from those in developed nations, with Indonesia experiencing multiple nutritional issues. One of the conditions of malnutrition that has become a major concern all over the world, particularly in developing nations, is stunting, which affects children's slow growth as well as their low levels of immunity, intelligence, and productivity.[1]

Malnutrition/stunting is a major cause of immunodeficiency worldwide. There is a strong link between malnutrition and infection and infant mortality. Poor nutrition will make children thin, weak, and susceptible to infection, especially because of epithelial integrity and inflammation.[2] Stunting is a nutrient deficiency that persists over time due to being fed insufficient food to meet nutritional requirements. Environmental and human factors (hosts) contribute to this situation, exacerbated by a lack of nutrient intake.[3] Long-term malnutrition causes stunting, affecting a child's body and brain growth.[4]

Malnutrition, low birth weight, non-exclusive breastfeeding, indoor air pollution, overcrowding, having parents who smoke, zinc deficiency, mother's parenting experience, co-morbidities, education level of mothers, the presence of caregivers, air humidity, vitamin A deficiency, birth order, and outdoor air pollution are among the many risk factors being taken into consideration when determining the amount of stunting that occurs in toddlers.[5]

Stunting is caused by several things, not just by children under the age of five and pregnant women suffering from malnutrition. While specific nutrition interventions are typically implemented in the health sector, they only make up 30% of the total, while nutrition interventions that are sensitive to a variety of sectors such as food safety, the prevalence of infectious diseases, the availability of clean water and the environment sanitation, education, social, and so on make up 70% of the total.[6]

Children's performance suffers greatly from stunting and malnutrition. The development of a child's brain during the golden period (0-3 years) will cause brain cells not to grow perfectly. This is because 80-90% of the number of brain cells is formed from the womb until the age of 2 years.[2] If the disturbance continues, there will be a decrease in the intelligence quotient (IQ) test score by 10-13 points. The decline in IQ development will result in loss generation, meaning that these children will become a burden on society and the government, because it is proven that families and the government have to pay high health costs because their citizens get sick easily.[6]

Infectious diseases, poor sanitation, and poor environmental hygiene bring on digestive disorders. These conditions divert energy from growth to the body's resistance to infection, particularly fever.[7] Moreover, when children are ill, they typically lose their appetite, which reduces their intake of nutrients. As a result, a child's brain cell growth, which should be extremely rapid during the first two years of life, slows down. Additionally, the child is at risk of suffering from stunting, which causes mental and physical growth to be disrupted, hence that their potential cannot develop to its full potential.

Poor environmental sanitation impacts surrounding health, starting with personal hygiene, clean water sources, house density, ventilation, humidity, and food cover usage. Smoking habits also have an impact on children's health, particularly in the respiratory and digestive tracts, where children are more likely to contract illnesses such as colds, coughs, and diarrhea.[8]

Until 2021, 354 stunting incidents have been recorded in Cibatu Health Center working area, according to data. Where 139 were included in the short category, and 215 were very short, several problematic nutritional statuses that were important to monitor included food intake, the incidence of infectious diseases, and the health of the environment in Garut, which needed attention in dealing with the stunting case. This prompted the authors to conduct a study on the aspects of food intake, the incidence of infectious diseases, and environmental health regarding the relationship between environmental sanitation and the stunting category in toddlers aged 6-24 months in the working area of Cibatu Health Center, Garut.[9] This study aimed to analyze the relationship between food intake, illness, and environmental sanitation in the stunting category in toddlers aged 6-24 months in the working area of Cibatu Health Center, Garut.

Methods

Research Design

This was a correlation analytical survey study with a cross-sectional design. The population in this study was all toddlers with stunting (6-24 months) in the working area of Cibatu Health Center, Garut, in 2022 with a total of 99 people. The sample size in this study was all toddlers with stunting (6-24 months) who met the inclusion and exclusion criteria in the working area of Cibatu Health Center, Garut, in 2022. The sampling technique in this study used a total sampling technique.

The independent variables in this study were environmental sanitation, food intake, and incidence of illness. Environmental sanitation can be seen in drinking water sources, personal hygiene, and waste disposal. Instruments used to measure environmental sanitation in this study were interviews and questionnaires. Food intake is the amount of single or varied foods a person eats daily. The instruments used to measure food intake in this study were FatSecret,[10] list of food ingredients composition (DKBM),[11] and Food Composition Databases (FCDB).[12] Incidence of acute respiratory infections (ARI) or diarrhea in the last 6 or 3 months includes the frequency and duration of illness suffered. The instrument used to measure this variable was a questionnaire. Meanwhile, the dependent variable in this study was stunting. Stunting is the height of a toddler who is shorter than the height should be based on the age of the toddler. The instrument used to measure this variable is to look at the book of maternal and child health (MCH).[13]

Data analysis techniques used univariate, bivariate, and multiple correlation analyses using Statistical Package for the Social Sciences (SPSS) software version 23.0. Data analysis was conducted to measure the level of relationship between variables. It is said to be related if they have a p-value of < 0.05.

Licensing Stage

After the supervisor and examiner approved the proposal, the author made an ethical request to the Ethics Commission Committee, Faculty of Medicine, Universitas Airlangga, Surabaya. Furthermore, the author applied for a research permit from the health office to conduct a study in the working area of Cibatu Health Center, Garut. After obtaining research permits, the author conducted a study in the working area of Cibatu Health Center, Garut. The author conducted a preliminary data survey at the health center and a preliminary study with several health volunteers and nutritionists at Cibatu Health Center.

Results

Relationship between Food Intake with Stunting Category

Table 1 shows the results of the analysis of food intake with the incidence of stunting using the Chi-Square statistical test. A p-value of 0.020 was obtained, meaning < 0.05. It can be concluded that there was a significant relationship between food intake and the stunting category.

Table 1. Analysis of food intake with stunting categories

			Stunting Category			
			Stunting			Chi-Square p-values
			Short	Very Short	Total	
Recommended Dietary Allowances (RDA)	≥ 80%	Frequency	16	1	17	.020
		%	17.8	1.1	18.9	
	< 80%	Frequency	48	25	73	
		%	53.3	27.8	81.1	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	

Source: Research data, processed

Relationship between Environmental Sanitation with Stunting Category

Table 2 shows that the results of environmental sanitation analysis using the Chi-Square statistical test obtained an overall p-value < 0.05. It can be concluded that there was a significant relationship between environment sanitation with the stunting category, where the source of water had a p-value of 0.024 < 0.05, handwashing behavior had a p-value of 0.021 < 0.05, food cover usage had a p-value of 0.020 < 0.05, waste disposal had a p-value of 0.021 < 0.05, home density had a p-value of 0.017 < 0.05, smoking habit had a p-value of 0.024 < 0.05, separate kitchen had a p-value of 0.020 < 0.05, wide ventilation had a p-value of 0.026 < 0.05, and stove usage had a p-value of 0.001 < 0.05.

Table 2. Analysis of environmental sanitation with the stunting category

			Stunting Category			
			Stunting			Chi-Square p-values
			Short	Very Short	Total	
Source of Water	Fulfilled	Frequency	30	19	49	.024
		%	33.3	21.1	54.4	
	Not fulfilled	Frequency	34	7	41	
		%	37.8	7.8	45.6	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	
Handwashing Behavior	Fulfilled	Frequency	46	12	58	.021
		%	51.1	13.3	64.4	
	Not fulfilled	Frequency	18	14	32	
		%	20	15.6	35.6	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	
Food Cover Usage	Fulfilled	Frequency	44	11	55	.020
		%	48.9	12.2	61.1	
	Not fulfilled	Frequency	20	15	35	
		%	22.2	16.7	38.9	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	
Waste Disposal	Fulfilled	Frequency	18	14	32	.021
		%	20	15.6	35.6	
	Not fulfilled	Frequency	46	12	58	
		%	51.1	13.3	64.4	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	
Home Density	Fulfilled	Frequency	20	19	39	.017
		%	22.2	21.1	43.3	
	Not fulfilled	Frequency	44	7	51	
		%	48.9	7.8	56.7	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	
Smoking Habit	Fulfilled	Frequency	7	4	11	.024
		%	7.8	4.5	12.3	
	Not fulfilled	Frequency	57	22	79	
		%	63.3	24.4	87.7	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	
Separate Kitchen	Fulfilled	Frequency	27	18	45	.020
		%	30	20	50	
	Not fulfilled	Frequency	37	8	45	
		%	41.1	8.9	50	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	
Wide Ventilation	Fulfilled	Frequency	41	10	51	.026
		%	45.6	11.1	56.7	
	Not fulfilled	Frequency	23	16	39	
		%	25.6	17.8	43.3	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	
Stove Usage	Fulfilled	Frequency	46	9	55	.001
		%	51.1	10	61.1	
	Not fulfilled	Frequency	18	17	35	
		%	20	18.9	38.9	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	

Source: Research data, processed

Relationship between Infectious Disease with Stunting Category

Table 3 shows that the results of the analysis of the incidence of infectious disease using the Spearman-rho statistical test, a p-value of 0.021 was obtained, meaning < 0.05. It can be concluded that there was a significant relationship between infectious disease and the stunting category.

Table 3. Analysis of infectious disease with stunting category

			Stunting Category			
			Stunting		Total	Spearman-rho p-values
			Short	Very Short		
Infectious Disease	≥ 3 times	Frequency	46	12	58	.021
		%	51.1	13.3	64.4	
	< 3 times	Frequency	18	14	32	
		%	20	15.6	35.6	
Total		Frequency	64	26	90	
		%	71.1	28.9	100	

Source: Research data, processed

Relationship between Food Intake, Infectious Disease, and Environmental Sanitation with Stunting Category

Table 4 shows that the value of Sig. F Change was 0.003, means 0.003 < 0.05. It can be concluded that food intake (X1), infectious disease (X2), and environmental sanitation (X3) had a significant relationship with the stunting category (Y) simultaneously. Table 4 shows R (Coefficient Correlation) as big as 0.385. It could be concluded that the level of connection between food intake (X1), infectious disease (X2), and environmental sanitation (X3) with the stunting category (Y) had a low connection.

Table 4. Analysis of food intake, infectious disease, and environmental sanitation with stunting category

Model Summary							
					Statistics Change		
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.385[a]	.148	.119	.428	.148	4.995	.003

a. Predictors: (Constant), Sick Incident, Sanitation Environment, AKG
Source: Research data, processed

Discussion

Relationship of Food Intake with *Stunting* Category

Based on the results, it can be concluded that there was a significant relationship between food intake and the stunting category. In this study, it was shown that there were 17 toddlers with adequate recommended dietary allowance (RDA) (18.9%) and 73 toddlers with inadequate RDA (81.1%). For RDA criteria, more than 80% is sufficient.

The results of this study are in accordance with the study by Paramitha (2012).[14] Stating that the lack of food intake given by parents to their children, children will tend to be stunted more often. The nutritional content given to children through food intake must be able to meet their needs. Therefore, it is very important to buy food and items that are useful for children's health.[14]

When toddlers are fed incorrectly, their growth will be disrupted, and they may become short, thin, or even malnourished. A person's level of nutritional sufficiency can be predicted by the frequency with which they eat, as well as by how much protein and energy they need to maintain body functions and grow muscles as a regulator, a fuel, and for the development and upkeep of body tissues.[15]

Food intake is not the only factor contributing to stunting, heredity and infectious diseases are included. The child's body always needs more energy to fight disease because of the recurrent infectious diseases they have experienced since they were babies. The child will experience malnutrition and eventually stunting if this need is not met by adequate intake.[15]

Relationship between Environmental Sanitation with Stunting Category

Based on the results, it can be concluded that there was a significant relationship between environmental sanitation and the stunting category. Factors that can increase the risk of stunting in a residential environment include living conditions which include a lack of clean water supply and inadequate sanitation. Children's development with water and sanitation has a close relationship. Children who come from households with poor water and sanitation facilities are at risk of experiencing stunting. In contrast, families with children of a normal height typically have adequate water and sanitation facilities.[16]

This study is in line with the study of Simanjuntak, *et al*. (2018), which stated that there was a correlation between poor environmental sanitation and stunting in toddlers in Cimarga Village, Sumedang.[17] The one-sample Kolmogrov-Smirnov test revealed a significant correlation (p-value = 0.000) between the availability of clean water and stunting toddlers, as well as a significant correlation (p-value = 0.000) between environmental sanitation and stunting toddlers.[18] According to Oktarina and Zilda (2012), children who are initially stunted have a 17% chance of reaching normal height if they come from households with access to clean water and sanitation.[19]

Relationship between Infectious Disease with Stunting Category

Based on the results, it can be concluded that there was a significant relationship between infectious diseases and the stunting category. In this study, it was shown that there were 32 toddlers with infectious diseases less than 3 times in the last 3 months (35.6%) and 58 toddlers with diseases more than 3 times in the last 3 months (64.4%). This study is similar to a study conducted by Welasasih and Wirjatmadi (2012) which stated that there was a significant relationship between the length of illness and the nutritional status of stunting toddlers in Kembangan Village, Kebomas, Gresik, with p-value = 0.012 (p-value < 0.05).[20] The results showed that half of the toddlers in the study were stunted. Additionally, the majority of toddlers (80.77%) experienced a high frequency of illness, meaning they were getting sick three or more times per month.[18] Children who suffer from infectious diseases for a longer duration of time are more likely to experience stunting on top of being more likely to experience sequelae due to general infectious disease which will weaken the child's physical condition.[21]

Infectious disease can be caused by inadequate nutritional intake in children and mothers during pregnancy

and inadequate access to sanitation and clean water. Lack of access to sanitation and clean water, as well as poor hygiene behavior in children, can cause diarrhea, resulting in malabsorption of nutrients and impact on growth. This is in line with a study conducted by Desyanti and Nindya (2017), which stated that a history of frequent diarrhea in the last 3 months increased the risk by 3.619 times on the incidence of stunting in toddlers aged 24-59 months.[22]

Relationship between Food Intake, Infectious Disease, and Environmental Sanitation with Stunting Category

Based on the results, it can be concluded that food intake (X1), infectious diseases (X2), and environmental sanitation (X3) had a significant relationship with the stunting category (Y) simultaneously. Table 4 shows an R-value (correlation coefficient) of 0.385, meaning that the level of relationship between food intake (X1), infectious diseases (X2), and environmental sanitation (X3) with the stunting category (Y) simultaneously had a low relationship. This study is similar to a study conducted by Kirana, *et al*. (2016), which demonstrated that environmental sanitation (handwashing, food processing, and the quality of water sources) and knowledge were associated with the prevalence of stunting in toddlers in Rambah Health Center.[23] Several factors, including environmental sanitation, food processing, and the mother's awareness of stunting, can influence one of the causes of stunting.[23] Children under 5 years old will suffer from adverse effects on their health and nutrition from poor environmental sanitation.[24]

Stunting (dwarf/short) is a toddler condition where this situation is obtained by measuring body length or height based on the child's age whose results (<-2SD) are from the World Health Organization (WHO) child growth standards. In the future, children who experience stunting will find it difficult to achieve optimal physical development as well as cognitive development. The causes of stunting can come from socio-economic factors, lack of nutritional intake in pregnant women, environmental sanitation conditions, infections experienced by babies or mothers during pregnancy, and many other factors.[25]

Strength and Limitations

This study can provide additional information and insights for health workers, especially those at Cibatu Health Center, Garut, regarding what impacts or has a relationship with the incidence of stunting. Therefore, health workers in the working area of Cibatu Health Center, Garut, can provide counseling to breastfeeding mothers on taking care of toddlers by providing adequate food intake, maintaining cleanliness, and maintaining the health of toddlers with the purpose of stunting does not occur in toddlers. The limitations of this study were only knowing the relationship between food intake, infection, and environmental sanitation with the stunting category without knowing various other factors such as knowledge, family support, attitudes, and exposure to mass media advertising. Hence, the authors tried to ask about other factors that also support the stunting category in toddlers. This study only took a population of 99 people in the working area of Cibatu Health Center, Garut. Future studies may be able to take a larger sample than this study. This study only focused on samples in the work area of Cibatu Health Center, Garut, and it would be better if further studies could be performed in all Garut Health Centers.

Conclusion

Based on the results of the study, it can be concluded that food intake had a significant relationship with the stunting category in the working area of Cibatu Health Center, Garut. Environmental sanitation had a significant relationship with the stunting category in the working area of Cibatu Health Center, Garut. Infectious diseases had a significant relationship with the stunting category in the working area of Cibatu Health Center, Garut. Food intake, environmental sanitation, and infectious diseases all had a relationship with the stunting category in the working area of Cibatu Health Center, Garut.

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Conflict of Interest
The authors declared there is no conflict of interest.

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Ethical Clearance
This study had received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga, Surabaya (No. 190/EC/KEPK/FKUA/2022) on 03-10-2022.

Authors' Contributions
Conceptualizing and designing the study, collecting data, analyzing, interpretating, creating tables, and writing the initial draft of the manuscript: DY. Reviewing and providing feedback on the manuscript, leading to revisions for clarity and accuracy: LD and AS. All authors contributed and approved the final version of the manuscript.

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